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The prevalence, distribution, and radiological evaluation of dentigerous cysts in a Lebanese sample

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ABSTRACT

Purpose: This study was performed to evaluate the prevalence, distribution, and radiological features (as per the Shear classification) of dentigerous cysts in a Lebanese sample.

Materials and Methods: It was an epidemiological, cross-sectional, 5-year retrospective study of 137 dentigerous cysts treated at Lebanese Army Dental Departments. The collected data comprised demographic and radiological information corresponding to patients from July 2015 to July 2020. Syndromic cases were excluded. Demographic data and the radiological features of cases were studied and analyzed.

Results: Dentigerous cysts were treated in 109 patients (58.7% males and 41.3% females; mean age: 28.3 ± 16.3 years) out of 6,013 patients (52% males and 48% females), with a prevalence of 1.8%. Dentigerous cysts were more commonly found in patients in their second and third decades of life than in older age groups. Of the 109 patients, 22.9% had multiple dentigerous cysts. Of the 137 cysts, 71.5% were mandibular. The most prevalent anatomical location was the posterior mandible, followed by the posterior maxilla. The most commonly involved tooth was the mandibular third molar. Regarding radiological types, the central type was the most common (60.6%), followed by the lateral type (29.2%), and the circumferential type (10.2%).

Conclusion: The results of this study were similar to studies of other populations in terms of distribution and features. Multiple non-syndromic dentigerous cysts were more common than reported in other studies, which warrants further clinical studies to reveal previously undetected factors. ***(Imaging Sci Dent 2021; 51: 291-7)***

KEY WORDS: Dentigerous Cyst; Jaw Cysts; Prevalence; Radiology

Introduction

Dentigerous cysts are the second most commonly observed type of odontogenic cysts after radicular cysts, and are the most common developmental cyst of the jaws.[1,2] Arising from the dental follicle of an unerupted or developing tooth, a dentigerous cyst encloses its crown and is attached to its neck at the level of the cementoenamel junction.[1,3] Dentigerous cysts occur most frequently in the posterior mandible and posterior maxilla, and are most often associated with an unerupted or impacted third molar; the second most prevalent location is the maxillary canine, but some dentigerous cysts occur around premolars, and very rarely, around incisors and supernumerary teeth.[1,2]

Dentigerous cysts are usually of a developmental nature, but may be of inflammatory origin, especially in children and young adolescents.[4,5] Odontogenic cysts, including dentigerous cysts, are universally considered as non-neoplastic and benign jaw pathologies;[1] however, despite being non-neoplastic, dentigerous cysts are known to have neoplastic potential and their epithelial lining may show the development of benign tumors (such as ameloblastoma, adenomatoid odontogenic tumor, or complex odontoma) or malignant tumors (such as mucoepidermoid carcinoma and squamous cell carcinoma).[1,6]

Dentigerous cysts are usually asymptomatic and are not painful unless secondarily infected, and some dentigerous cysts are not noticed until after they have significantly enlarged or caused a pathologic fracture (especially very

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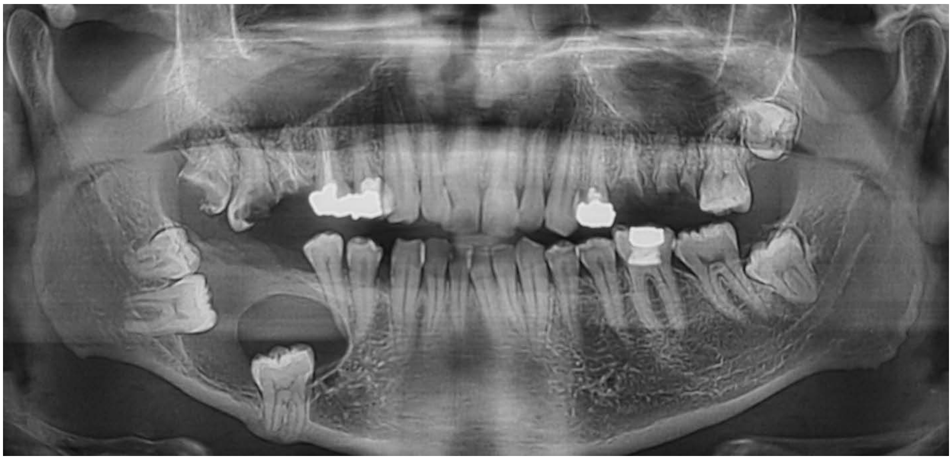

Fig. 1. A 35-year-old male patient presenting with a dentigerous cyst of the central type, enclosing the crown of an impacted right permanent mandibular first molar. The right mandibular second and third molars were displaced by the cyst towards the right mandibular ramus.

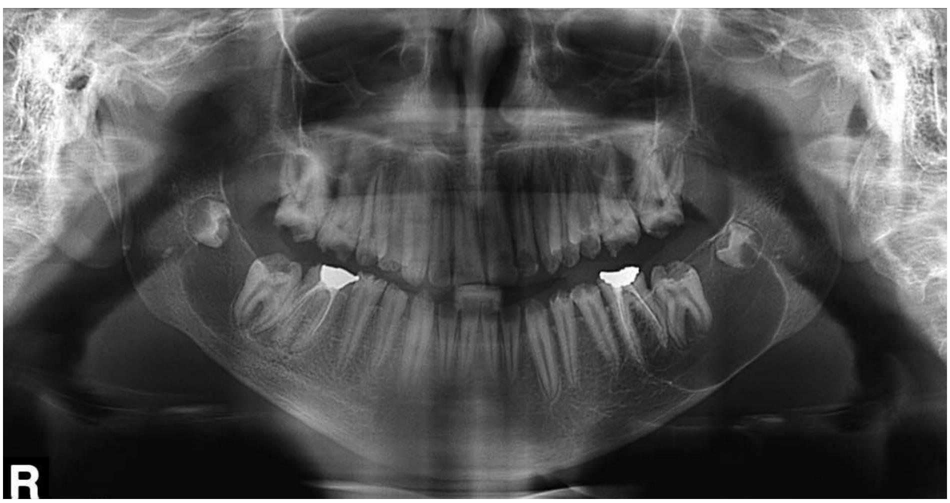

Fig. 2. A 15-year-old male patient presenting with bilateral mandibular dentigerous cysts associated with permanent second molars; the left one belongs to the circumferential type and the right one to the lateral type.

large mandibular dentigerous cysts).[1-3] Dentigerous cysts are often incidentally detected during routine radiological examinations or after noticing the absence or a delayed eruption of a permanent tooth, tooth crowding due to tooth displacement caused by the pressure exerted by the cyst, or silent cortical expansion, especially in large dentigerous cysts.[1,3,7-9] Some dentigerous cysts resorb one or both cortical plates (buccal/palatal, buccal/lingual), while others, after having resorbed the totality of the cortex, may appear translucent and may be compressible.[1,3] Furthermore, dentigerous cysts have a greater tendency than other jaw cysts to produce root resorption of adjacent teeth.[1,10]

Radiologically, a dentigerous cyst is usually a well-demarcated, unilocular, radiolucent lesion associated with the crown of an unerupted or impacted tooth.[1,3,7-9] Shear and Speight[1] classified dentigerous cysts into 3 radiological types or variations: the central variety or type, in which the crown is enveloped symmetrically by the dentigerous cyst (Fig. 1); the lateral type, in which the peri-coronal follicle dilates only on 1 aspect of the crown (Fig. 2); and the circumferential type, in which the entire tooth appears to be enveloped by the dentigerous cyst (Fig. 2).

Relying solely on radiological and clinical features of dentigerous cysts can lead to a mistaken diagnosis, as odontogenic keratocysts, ameloblastomas, ameloblastic fibromas, and adenomatoid odontogenic tumors may also be associated with unerupted teeth, which renders a histological examination mandatory to establish a final diagnosis.[1-3]

Several studies have evaluated the clinicopathological features, incidence, and distribution of dentigerous cysts in different populations.[11-23] Nevertheless, to the authors' knowledge, none has yet studied the radiological types as per the classification of Shear. Therefore, the aim of this study was to investigate the prevalence, distribution, and radiological features of dentigerous cysts in a Lebanese sample.

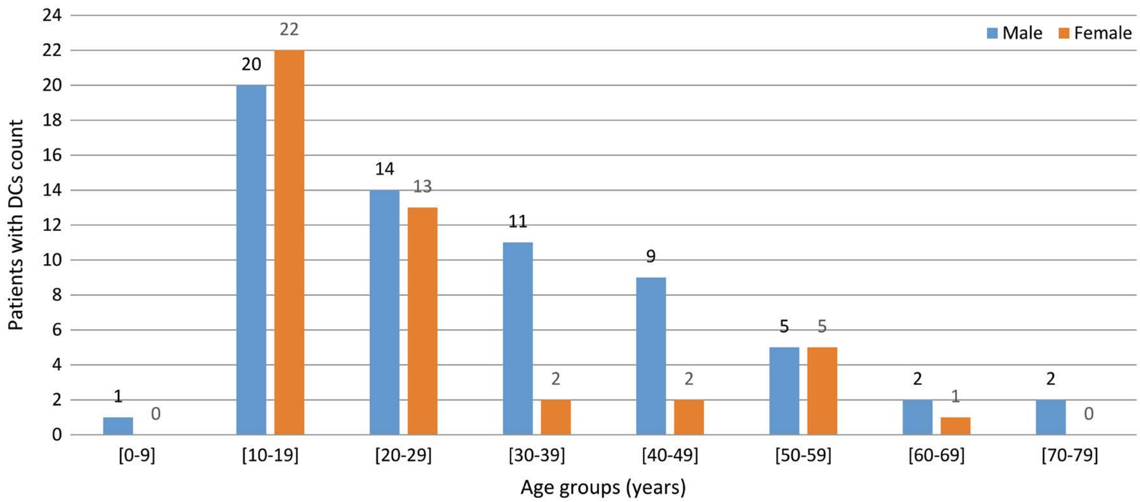

Fig. 3. Age and sex distribution of the patients with dentigerous cysts.

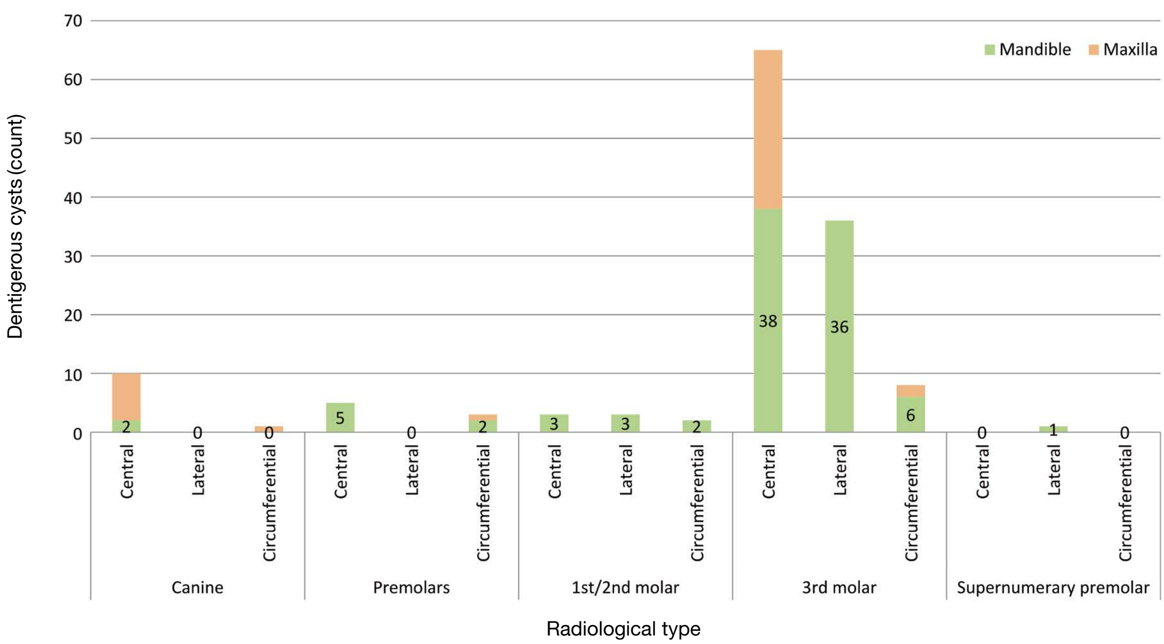

Fig. 4. Anatomical location and associated tooth distribution of the 137 dentigerous cysts in terms of radiological types.

Materials and Methods

This study was approved by the Institutional Review Board of the Military Medicine Directorate of the Lebanese Army, Lebanon. It was an epidemiological, cross-sectional, 5-year retrospective study of Lebanese patients treated at Lebanese Army Dental Departments. Data collection took place from August 2020 to November 2020; the collected data comprised demographic information (age and sex), digital panoramic radiographs for the classification of radiological types, histological reports, anatomic location, and associated tooth information corresponding to patients who presented to the dental centers from July 2015 to July 2020. The anatomic sites of dentigerous cysts were subclassified as anterior and posterior for each mandible and maxilla; in the current study, the anterior zone was considered to extend from right canine to left canine in both maxilla and mandible, while the posterior zone comprised the area from the first premolar to the third molar. Only histologically confirmed cases were included in this study, while 1 female and 1 male patient with cleidocranial dysplasia syndrome and presenting multiple dentigerous cysts

Table 1. General demographic characteristics of the study population and distribution and radiological features of dentigerous cysts

Features			Number (%)
Initial sample size			6,013
Mean age of initial study population			38.2 ± 16.9 years (6-92 years)
Age groups of initial study population (years)			
0-9			71 (1.2%)
10-19			818 (13.6%)
20-29			1150 (19.1%)
30-39			1329 (22.1%)
40-49			1132 (18.8%)
50-59			801 (13.3%)
60-69			442 (7.4%)
70-79			201 (3.3%)
≥80			69 (1.1%)
Age groups of patients (years)			
0-9		M : F = 1 : 0	1 (0.9%)
10-19		M : F = 20 : 22	42 (38.5%)
20-29		M : F = 14 : 13	27 (24.8%)
30-39		M : F = 11 : 2	13 (11.9%)
40-49		M : F = 9 : 2	11 (10.1%)
50-59		M : F = 5 : 5	10 (9.2%)
60-69		M : F = 2 : 1	3 (2.8%)
70-79		M : F = 2 : 0	2 (1.8%)
Location			
Maxilla (N = 39, 28.5%)*			
	Anterior	Incisors	0 (0.0%)
		Canine	9 (6.6%)
	Posterior	First premolar	0 (0.0%)
		Second premolar	1 (0.7%)
		First-second molar	0 (0.0%)
		Third molar	29 (21.2%)
Mandible (N = 98, 71.5%)			
	Anterior	Incisors	0 (0.0%)
		Canine	2 (1.5%)
	Posterior	First premolar	1 (0.7%)
		Second premolar	6 (4.4%)
		First molar	1 (0.7%)
		Second molar	7 (5.1%)
		Third molar	80 (58.4%)
		Supernumerary premolar	1 (0.7%)

*: $P < 0.05$ compared with the mandible

associated with supernumerary teeth were excluded from the study. Panoramic radiographs of patients with histologically confirmed dentigerous cysts were evaluated and classified according to the classification of Shear[1]; dentigerous cysts appearing to envelop symmetrically the crowns of the associated teeth were classified as central, those dilating on 1 aspect (mesial or distal) of the involved teeth were classified as lateral, and those appearing to enclose the entire associated tooth were classified as circumferential.

The data obtained were transferred into and analyzed using SPSS version 26 (IBM Corp, Armonk, NY, USA). The distributions of categorical and continuous variables were presented as frequency/percentage and mean ± standard deviation, respectively. The chi-square or Fisher exact test was carried out for categorical variables, and the Student *t*-test was used for continuous variables; non-parametric tests were also used as needed. A *P* value < 0.05 was considered to indicate statistical significance, and all tests were 2-sided.

Results

Prevalence, sex, and age distributions

In this sample, 109 patients including 64 males (58.7%) and 45 females (41.3%), with a male-to-female ratio of 1.4 : 1, out of 6,013 patients (3,129 males and 2,884 females; mean 38.2 ± 16.9 years; age range, 6-92 years) had dentigerous cysts, reflecting a prevalence of 1.8%. The chi-square test showed no statistically significant difference in prevalence between males and females ($P>0.05$). A wide range of age distribution was observed in patients with dentigerous cysts (9-78 years), with an average age of 28.3 ± 16.3 years. With respect to age distribution, the prevalence of patients in this study presenting with dentigerous cysts in their first decade of life was low (1.4%), whereas the prevalence of patients with dentigerous cysts in the 10- to 19-year-old age group (5.1%) was higher, followed by the 20- to 29-year-old age group (2.3%); therefore, patients with dentigerous cysts in their second and third decades were found more frequently than those in older age groups (Fig. 3). Among the 109 affected patients, 84 (77.1%) presented single dentigerous cysts, while 25 (22.9%) presented multiple cysts (Fig. 2) (22 patients had 2, and 3 patients had 3 dentigerous cysts). Multiple dentigerous cysts in females (31.1%) were somewhat more common than in males (17.2%) ($P>0.05$). In this sample, the mean age of male patients (30.2 ± 17.0 years) was higher, but not significantly, than that of female patients (25.5 ± 14.9 years, $P>0.05$); the mean age of patients having a single dentigerous cyst (30.1 ± 17.2 years) was higher than that of patients having multiple dentigerous cysts (22.4 ± 11.2 years, $P>0.05$), but this difference was not significant as well.

Location

The total number of studied dentigerous cysts was 137, the majority of which were located in the mandible (98 cysts, 71.5%). No significant difference in jaw distribution was seen between males and females ($P>0.05$). The distribution according to anatomical location and associated tooth is shown in Table 1. The mean age of patients with maxillary dentigerous cysts (18.6 ± 9.9 years) was significantly lower than that of patients with mandibular cysts (30.3 ± 16.1 years, $P<0.05$). The most prevalent anatomical location was the posterior mandible with 96 cases (70.1%), followed by the posterior maxilla with 30 cases (21.9%) and the anterior maxilla with 9 cases (6.6%); the most common site for dentigerous cysts was the mandibular molar region (64.2%). Therefore, mandibular third molars were the most commonly involved teeth (58.4%), followed by maxillary third molars (21.2%) and maxillary canines (6.6%). Out of 98 dentigerous cysts located in the mandible, 7 were associated with second molars, 6 with second premolars, and 1 with a supernumerary premolar, whereas among the 39 dentigerous cysts in the maxilla, only 1 involved a second premolar (Table 1).

Radiological types and distribution

Regarding the radiological types of the 137 dentigerous cysts in this study, 83 (60.6%) were central, 40 (29.2%) lateral, and 14 (10.2%) circumferential; as for the jaw distribution, the lateral radiological type was exclusively found in the mandible, while 89.7% of maxillary dentigerous cysts were central.

The most prevalent radiological type in the posterior mandible was central, with 46 cases (47.9%), followed by the lateral type with 40 cases (41.7%) and the circumferential type with 10 cases (10.4%); in the posterior maxilla, 27 cases (90%) were associated with central dentigerous cysts and 3 cases (10%) with circumferential cysts. In addition, 8 central dentigerous cysts and 1 circumferential dentigerous cyst were found in the anterior maxilla, and both mandibular canines showed central radiological presentation (Fig. 4). The mean age difference of 9.3 ± 3.9 years between the lateral (32.75 ± 2.3 years) radiological type and the central type (23.4 ± 1.6 years) was found to be statistically significant ($P<0.05$). No significant difference was found between males and females regarding the radiological type of dentigerous cysts in this sample ($P>0.05$), whereas the radiological type showed a significant association with jaw predilection ($P<0.05$).

Discussion

This study evaluated the prevalence of dentigerous cysts in a Lebanese sample, and studied their distribution and radiological features.

In this study, the mean age of patients with dentigerous cysts was 28.3 ± 16.3 years, which is similar to results found in other studies; a Taiwanese study[11] showed a mean age of 33.0 ± 19.5 years, similar to a Canadian study[12] with a mean age of 35 ± 17 years; moreover, a Singaporean/Malaysian study[13] showed a mean age of 30.2 ± 17.3 years, and an Italian one[14] reported a mean age of 31 ± 19.8 years for dentigerous cysts. In contrast, an Iranian study[15] showed a lower mean age (21.5 ± 14.5 years), and 2 other studies showed higher scores regarding the mean age of patients having dentigerous cysts: a French study[16] reported an average age of 44.9 ± 16.8 years, and a British one[17] showed a mean age of 40.8 ± 18.1 years.

The present study showed a peak incidence in the second and third decades of life (5.1% and 2.3% respectively), which supports the results reported in the majority of other studies.[7,11-13,19-21] However, a Brazilian study,[18] a Chilean study,[22] and an Italian study[14] reported a peak incidence in the first and second decades, while a British study[17] showed a peak incidence in the fifth decade.

In the current study, there were more males with dentigerous cysts than females, with a male-to-female ratio of 1.4 : 1, but this result was not statistically significant. A Mexican study[26] showed a male-to-female ratio of 1.62 : 1 with a statistically significant difference ($P < 0.05$). All other studies[7,11-22] showed a male predilection, with male-to-female ratios ranging from 1.18 : 1[20] to 2.35 : 1[15]. Lin et al.[11] reported a significantly higher mean age in males (35.2 ± 19.8 years) with dentigerous cysts than in females (29.1 ± 18.6 years) ($P < 0.05$), which is similar to the present results, although the present results were not statistically significant ($P > 0.05$).

The current study showed that dentigerous cysts were more frequently observed in the mandible (71.5%) than in the maxilla (28.5%); this finding is similar to that of previous studies.[7,11,12,14-23] Conversely, Yeo et al.[13] reported a slightly higher percentage of dentigerous cysts in the maxilla (50.9%) than in the mandible (49.1%). Similar to the results of this study, the majority of the previous studies[7,11-13,15,17-20,22] found that the most affected region was the posterior mandible (third molar site), yet few[14,19] reported that the second most affected site was the maxillary third molar; on the contrary, many studies[13,15,17-20,22] reported a higher percentage in the anterior maxilla, especially in the canines, after the posterior mandible and before the posterior maxilla. Lin et al.[11] reported that the second most affected teeth after the mandibular third molars were supernumerary teeth, without specifying whether they were maxillary or mandibular. An Italian study[14] reported the highest frequency of dentigerous cysts in the anterior maxilla, followed by the posterior mandible (premolars), and posterior maxilla (premolars).

Dentigerous cysts are usually single, but multiple and bilateral cysts have been reported to be associated with inherited syndromes such as cleidocranial dysplasia and Maroteaux-Lamy syndrome (mucopolysaccharidosis type VI).[24-27] De Biase et al.[28] reported bilateral mandibular dentigerous cysts after prolonged usage of calcium channel blocker (an antihypertensive drug) and cyclosporine A (an immunosuppressant drug). Only a few papers[26,27,29] reported non-syndromic multiple dentigerous cysts. In the present study, 22.9% of patients presented multiple dentigerous cysts, and none of them had known syndromes or systemic conditions. This percentage is very high compared to those reported by Zhang et al.[12] (3%) and Lin et al.[11] (1.8%). A case of a 15-year-old male with generalized amelogenesis imperfecta (a genomic developmental condition of the dental enamel characterized by hypoplasia and/or hypomineralization affecting the structure and clinical appearance of all teeth)[30] showed bilateral mandibular dentigerous cysts associated with the second molars, this case was not excluded from the study because no data in the literature have yet reported any association between this condition and the development of dentigerous cysts.

To the authors' knowledge, the present study is the first to examine the radiological variants of dentigerous cysts according to the classification of Shear[1]. Of the 137 studied and analyzed dentigerous cysts, 60.6% presented with the radiological characteristics of the central type, where the crown of the impacted tooth is symmetrically enveloped and to which pressure is applied, pushing it away from its direction of eruption; thus, mandibular molars may be found at the lower border of the mandible or in the ramus, and maxillary canines can be pushed into the maxillary sinus up to the orbital floor.[1] Furthermore, 29.2% presented with the radiological features of the lateral variant, which is a radiological appearance resulting from the dilation of the cyst only on one aspect of the tooth; this type is frequently observed in partially erupted mandibular third molars[1]. Finally, 10.2% presented with the radiological features of the circumferential type, in which the whole tooth appears to be plunging into the cyst.[1]

This is the first study on dentigerous cysts conducted in a Lebanese population sample, and to the best of the authors' knowledge, the first one in the international literature to study and analyze the radiological types. In this study, dentigerous cysts were not uncommon and were similar in distribution and features to other studies on different populations; however, multiple dentigerous cysts were not found to be rare, as previously suggested, which warrants further clinical studies to identify previously undetected factors.

Conflicts of Interest: None

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