

## DENTISTS' AWARENESS OF THE INTERRELATION BETWEEN MAXILLARY SINUSITIS AND DENTAL ORIGIN (SOURCE, RIYADH CITY, SAUDI ARABIA: A CROSS-SECTIONAL STUDY)

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### ABSTRACT

**Aim:** Evaluation and awareness among dental practitioners regarding maxillary sinusitis of odontogenic origin and rising awareness among dental practitioners regarding maxillary sinusitis of odontogenic origin, raising the knowledge level and reducing misdiagnosis.

**Method:** A cross-sectional online survey was conducted from December 2020 to June 2021. The surveyed participants had different dental degrees and specialties working in government, academic sectors, and private clinics in Saudi Arabia. The questionnaires included demographic variables, professional characteristics, odontogenic maxillary sinusitis (OMS) clinical presentation, prevalence, source, symptoms, and professionals' ability to distinguish OMS from other causative factors.

**Results:** 50% believe OMS is a prevalent disease. (57.6%) knew the clinic presentation of OMS. (85.7%) agreed that OMS could cause dental pain, and (65.7%) agreed that OMS does not necessarily cause dental pain. Only (34.8%) can distinguish symptoms of OMS from other causes of rhinitis. The majority (79.5%) cannot diagnose patients having maxillary sinusitis or OMS only by clinical symptoms, and (65.7%) do not think OMS necessarily causes pain. (69%) did not attend any continuous education lecture(s)/course(s) regarding maxillary sinusitis.

**Conclusion:** Participants have adequate knowledge regarding OMS, presentation, prevalence, and source. With uncertainty to distinguish symptoms of OMS from other causative factors of rhinitis. As a result, more than half of the participants reported the need to consult Era-Nose-Throat (ENT) specialists when they suspect maxillary sinusitis. More than half of the participants will consult an ENT specialist when they suspect OMS.

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## INTRODUCTION

Odontogenic sinusitis is an inflammatory condition of the paranasal sinuses that is the result of dental pathology, most often resulting from prior dentoalveolar procedures, infections of maxillary dentition, or maxillary dental trauma .

Taschieri S, Torretta S, Corbella S, et al.2015 reported Maxillary sinusitis of dental origin (or odontogenic sinusitis) is a broad term used to describe any degree of sinus infection and symptoms caused by multiple dental etiologies, including periodontal or endodontic disease, root fractures, dental implants, extractions, oral antral fistulae, and iatrogenic causes, such as extruded dental materials, displaced teeth or foreign bodies.

Maxillary sinusitis of dental origin is a well-known medical condition in dental care and ENT specialists' care. Kretzschmar DP, et, al. 2003 registered that The relationship between dental infections and sinus disease is well documented in the dental and medical literature. Numerous investigators since have discovered this condition, also termed odontogenic sinusitis, is a common disease process

A study was conducted by Longhini et al., where five patients were prospectively examined for OMS with previous endoscopic sinus surgery (ESS) failure. The study concluded that the unrecognized periapical abscess not detected by the dentist is a cause of ESS failure (Longhini et al., 2010). In a recent publication, the study reported an increase in the maxillary bacterial sinusitis of dental origin up to 40%, which is very high compared to the reported incidence of 10% (Patel & Ferguson, 2012). Various odontogenic diseases involve the maxillary sinus, from the sinus lining to the adjacent paranasal sinuses and dental tissues or from the adjacent bone with expansion into the sinus. Although the exact etiopathogenesis of maxillary sinusitis is still uncertain, common causes are known to be iatrogenic and related to dental treatment of a posterior maxil-

lary tooth or implant procedures (S. M. Kim, 2019). The molar region has a frequency of involvement of 47.68%, followed by the first molar (22.51%), the third molar (17.21%), and the second molar (3.97%). The premolar region is 5.96%, followed by the canine at 0.66% (Arias-Irimia et al., 2010; S.-B. Kim et al., 2016). Maxillary sinusitis is a prevalent disease estimated to affect 10–41% of all patients with sinusitis (Lee & Lee, 2010; Longhini & Ferguson, 2011; Melgn, et al., 1986). However, OMS is reported to be frequently overlooked and missed in the initial assessment of unilateral maxillary sinusitis, which can lead to a delayed diagnosis and treatment (Cartwright & Hopkins, 2015; Patel & Ferguson, 2012). A recent development in understanding the association between the maxillary sinus and dental origin in diagnosis, pathogenesis, and treatment was established. It requires clinicians to be aware to provide the best treatment for their patients (Workman et al., 2018). This study aims to enlighten dentists' knowledge regarding odontogenic sinusitis's incidence, clinical presentation, and pathophysiology. The study's results, which include dentists' knowledge of OMS, will help raise their awareness and reduce misdiagnosis, particularly in Saudi Arabia, where no such research has been conducted.

## METHODS

The present cross-sectional study was conducted using an online questionnaire containing 18 multiple-choice questions from December 2020 to June 2021. The questionnaire targeted dental practitioners of different degrees and specialties, including interns, general practitioners, restorative dentists, endodontists, pediatric dentists, orthodontists, oral surgeons, oral medicine, prosthodontists, and periodontists; Those participants worked in private clinics, hospitals, and health centers in Saudi Arabia were invited to participate in this study. The study included 210 participants, 100 males and 110 females. The survey consisted of two parts. The first

part gathered the sociodemographic data (including gender and age) and professional characteristics (specialty and job title). The second part addressed participants' knowledge of the interrelation between maxillary sinusitis and dental source, including symptoms, clinical signs, and risk factors. The answers to the second part of the questionnaire reflected the participants' knowledge, attitudes, and awareness of the interrelation between maxillary sinusitis and dental source using a five-level Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree).

Ethical approval for the study was obtained from the Institutional Review Boards (IRBs) No. E-21-6395. Values were presented as numbers and percentages. The Chi-square test was used to compare categories of participants based on gender, age group, and job title. The significance level was set at  $p \leq 0.05$ . For Windows, statistical analysis was performed with SPSS 23.0 (Statistical Package for Scientific Studies, SPSS, Inc., Chicago, IL, USA). Microsoft Excel was used to generate representative graphs.

## RESULTS

The study included 210 participants. These included 100 males (47.6%) and 110 (52.4%) females. Participants were categorized into four age groups: the (younger than 30 years) group, which included 168 participants (80%), while 37 participants (17.6%) were in the (30-39 years) group; four participants (1.9%) were in the (40-49 years) group and one participant (0.5%) were in the (50-59 years) group. Among specialty, 135 were general dentists (64.3%), 23 were restorative dentists, and endodontists (11%). The study also included six pedodontists (2.8%), five oral medicine specialists (2.4%), five orthodontists (2.4%), four maxillofacial surgeons (1.9%), four periodontists (1.9%), three prosthodontists (1.4%), and 25 (11.9%) were other specialties. According

to job title, the study included 60 interns (28.6%), 86 general dentists (41%), 12 university professors (5.7%), 20 specialists and consultants (9.5%) and 32 postgraduate students (15.2%). (Figure 1)

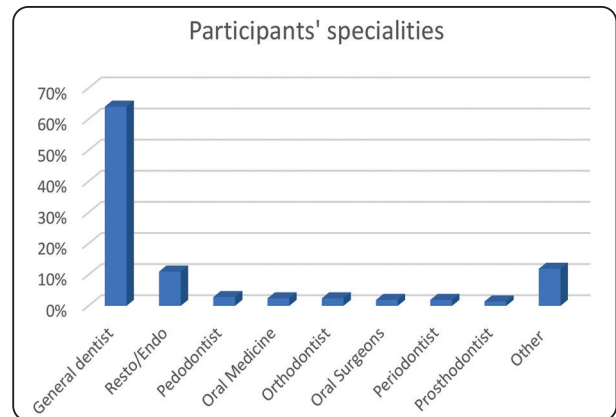


Fig. (1): A bar chart illustrates the percentage of each specialty among participants

Most of the participants (93.4%) agreed (or strongly agreed) that there is a relationship between teeth and maxillary sinusitis. Still, only 55.7% agreed (or strongly agreed) that they have sufficient information about this association and 85.7% agreed (or strongly agreed) that odontogenic maxillary sinusitis can cause dental pain.

Among the participants, 65.2% did not diagnose or treat cases of maxillary sinusitis with a periapical lesion, and 87.1% did not experience patients of maxillary sinusitis with marginal periodontitis. Most (78.1%) participants reported they would consult ENT specialists when they suspect maxillary sinusitis. Moreover, 57.6% will consult an ENT specialist when they suspect odontogenic maxillary sinusitis. About 57.6% knew the clinic presentation of maxillary sinusitis of dental origin, and 34.8% agreed or strongly agreed that they can distinguish symptoms of OMS from other causes of rhinitis. The majority (79.5%) cannot diagnose patients having maxillary sinusitis or OMS only by clinical signs, and 65.7% did not assume that odontogenic maxillary sinusitis of dental origin must cause dental pain. Almost 68% think odontogenic

maxillary sinusitis is more common unilateral, 50% think OMS is a prevalent disease, and 69% did not attend any continuous education lecture(s)/course(s) regarding maxillary sinusitis. (Table 1)

Experience in cases of maxillary sinusitis with periapical lesion significantly increased with age, with the absence of this experience in 71.4% of participants aged less than 30 years, in comparison to 40.5% and 50% in the (30-39 years) and (40-49 years) groups respectively ( $p=0.002$ ). Experience in cases of maxillary sinusitis with marginal periodontitis significantly increased with age, with the absence of this experience in 88.7% and 86.5% of participants aged less than 30 years or aging (30-39 years), respectively, in comparison to 50% in the (40-49 years) groups ( $p=0.007$ ). There was no statistically significant difference between participants of different age groups in the rest of the questionnaires. (Table 2)

A significantly higher percentage of males strongly agreed that there is a relationship between teeth and maxillary sinusitis ( $p=0.008$ ). A considerably higher percentage of males also strongly agreed that they have adequate information about this association ( $p=0.008$ ). In comparison, a significantly higher rate of females agreed (or strongly agreed) that odontogenic maxillary

sinusitis can cause dental pain ( $p=0.013$ ). A considerably higher percentage of males have seen cases of maxillary sinusitis with the periapical lesion (49%) compared to 21.8% of females ( $p=0.00$ ). Moreover, a significantly higher percentage of males have seen cases of maxillary sinusitis with marginal periodontitis (20%) compared to 6.4% of females ( $p=0.003$ ). A significantly higher rate of males (28%) assumes they can diagnose patients with maxillary sinusitis or OMS only by clinical symptoms, compared to 13.6% of females ( $p=0.01$ ). A significantly higher percentage of males (41%) attend continuous education lecture(s)/course(s) regarding maxillary sinusitis, in comparison to only 21.8% of females ( $p=0.003$ ).

There was no statistically significant difference between both genders in the rest of the questionnaire (Table 3). A significantly higher percentage of university professors (75%) and specialists/consultants (65%) have seen cases of maxillary sinusitis with the periapical lesion, in comparison to 37.2% and 34.4 % of general dentists and postgraduate students, respectively, and only 13.3 % of interns ( $p=0.000$ ). There was no statistically significant difference between participants of different job titles in the rest of the questionnaire. (Table 4)

TABLE (1) Shows the general response to the questionnaire (questions 5-18)

Question	Response	n	%
Q5- In general, is there a relationship between teeth and maxillary sinusitis?	Strongly agree	106	50.5
	Agree	90	42.9
	Neutral	10	4.8
	Disagree	4	1.9
Q6- Based on your knowledge, do you think you have adequate information about the association between teeth and maxillary sinus?	Strongly agree	36	17.1
	Agree	81	38.6
	Neutral	76	36.2
	Disagree	16	7.6
	Strongly Disagree	1	.5
Q7- Do you think the odontogenic maxillary sinusitis can causes dental pain?	Strongly agree	68	32.4
	Agree	112	53.3
	Neutral	25	11.9
	Disagree	5	2.4
Q8- Have you experienced cases where you see maxillary sinusitis with periapical lesion?	Yes	73	34.8
	No	137	65.2
Q9- Have you experienced cases where you see maxillary sinusitis with marginal periodontitis?	Yes	27	12.9
	No	183	87.1
Q10-Will you consult an ENT specialist when you suspect maxillary sinusitis?	Yes	164	78.1
	No	46	21.9
Q11- When you suspect odontogenic maxillary sinusitis, will you consult an ENT specialist?	Yes	121	57.6
	No	89	42.4
Q12. Based on your knowledge, do you know the clinic presentation of maxillary sinusitis of dental origin?	Yes	121	57.6
	No	89	42.4
Q13. Do you think you can distinguish symptoms of OMS from other causes of rhinitis?	Strongly agree	14	6.7
	Agree	59	28.1
	Neutral	106	50.5
	Disagree	25	11.9
Q14. Based on your knowledge, do you think you can diagnose patients having maxillary sinusitis or OMS only by clinical symptoms?	Yes	43	20.5
	No	167	79.5
Q15-Do you think patients with odontogenic maxillary sinusitis of dental origin must have dental pain?	Yes	72	34.3
	No	138	65.7
Q16- Based on your knowledge, do you think odontogenic maxillary sinusitis is more common unilateral?	Yes	143	68.1
	No	67	31.9
Q17- Do you think OMS is prevalent disease?	Yes	105	50
	No	105	50
Q18- Did you attend any continuous education lecture(s)/course(s) regarding maxillary sinusitis?	Yes	65	31
	No	145	69

TABLE (2) presents the comparison of knowledge among study participants to various questions according to age group.

Question	Response	< 30		30-39		40-49		50-59		$\chi^2$	P value
		n	%	n	%	n	%	n	%		
Q5	Strongly agree	84	50	20	54.1	2	50	0	0	9.63	0.381 ns
	Agree	76	45.2	11	29.7	2	50	1	100		
	Neutral	6	3.6	4	10.8	0	0	0	0		
	Disagree	2	1.2	2	5.4	0	0	0	0		
Q6	Strongly agree	26	15.5	9	24.3	1	25	0	0	7.72	0.807 ns
	Agree	62	36.9	15	40.5	3	75	1	1100		
	Neutral	65	38.7	11	29.7	0	0	0	0		
	Disagree	14	8.3	2	5.4	0	0	0	0		
	Strongly Disagree	1	.6	0	0	0	0	0	0		
Q7	Strongly agree	54	32.1	11	29.7	2	50	1	100	13.76	0.131 ns
	Agree	91	54.2	20	54.1	1	25	0	0		
	Neutral	19	11.3	6	16.2	0	0	0	0		
	Disagree	4	2.4	0	0	1	25	0	0		
Q8	Yes	48	28.6	22	59.5	2	50	1	100	15.07	0.002*
	No	120	71.4	15	40.5	2	50	0	0		
Q9	Yes	19	11.3	5	13.5	2	50	1	100	12.08	0.007*
	No	149	88.7	32	86.5	2	50	0	0		
Q10	Yes	129	76.8	32	86.5	2	50	1	100	3.81	0.282 ns
	No	39	23.2	5	13.5	2	50	0	0		
Q11	Yes	91	54.2	27	73	2	50	1	100	5.22	0.156 ns
	No	77	45.8	10	27	2	50	0	0		
Q12	Yes	91	54.2	25	67.6	4	100	1	100	5.99	0.112ns
	No	77	45.8	12	32.4	0	0	0	0		
Q13	Strongly agree	10	6	3	8.1	1	25	0	0	16.29	0.178ns
	Agree	45	26.8	13	35.1	0	0	1	100		
	Neutral	90	53.6	14	37.8	2	50	0	0		
	Disagree	19	11.3	6	16.2	0	0	0	0		
	Strongly Disagree	4	2.4	1	2.7	1	25	0	0		
Q14	Yes	33	19.6	8	21.6	2	50	0	0	2.5	0.475 ns
	No	135	80.4	29	78.4	2	50	1	100		
Q15	Yes	63	37.5	9	24.3	0	0	0	0	5.01	0.171 ns
	No	105	62.5	28	75.7	4	100	1	100		
Q16	Yes	115	68.5	26	70.3	2	50	0	0	2.82	0.419 ns
	No	53	31.5	11	29.7	2	50	1	100		
Q17	Yes	85	50.6	18	48.6	2	50	0	0	5.72	0.455 ns
	No	83	49.4	19	51.4	2	50	1	100		
Q18	Yes	53	31.5	12	32.4	0	0	0	0	2.31	0.511ns
	No	115	68.5	25	67.6	4	100	1	100		

Significance level  $p \leq 0.05$

TABLE (3) presents the comparison of knowledge among study participants to various questions according to Gender.

Question	Response	Male		Female		$\chi^2$	P value
		n	%	n	%		
Q5	Strongly agree	59	59	47	42.7	11.88	0.008*
	Agree	34	34	56	50.9		
	Neutral	7	7	3	2.7		
	Disagree	0	0	4	3.6		
Q6	Strongly agree	25	25	11	10	13.72	0.008*
	Agree	36	36	45	40.9		
	Neutral	35	35	41	37.3		
	Disagree	3	3	13	11.8		
	Strongly Disagree	1	1	0	0		
Q7	Strongly agree	36	36	32	29.1	10.86	0.013*
	Agree	43	43	69	62.7		
	Neutral	17	17	1	0.9		
	Disagree	4	4	8	7.3		
Q8	Yes	49	49	24	21.8	17.07	0.00*
	No	51	51	86	78.2		
Q9	Yes	20	20	7	6.4	8.69	0.003*
	No	80	80	103	93.6		
Q10	Yes	82	82	82	74.5	1.7	0.192 ns
	No	18	18	28	25.5		
Q11	Yes	63	63	58	52.7	2.26	0.132 ns
	No	37	37	52	47.3		
Q12	Yes	62	62	59	53.6	1.5	0.221 ns
	No	38	38	51	46.4		
Q13	Strongly agree	9	9	5	4.5	3.87	0.423 ns
	Agree	32	32	27	24.5		
	Neutral	45	45	61	55.5		
	Disagree	11	11	14	12.7		
	Strongly Disagree	3	3	3	2.7		
Q14	Yes	28	28	15	13.6	6.64	0.01*
	No	72	72	95	86.4		
Q15	Yes	39	39	33	30	1.88	0.17 ns
	No	61	61	77	70		
Q16	Yes	66	66	33	30	0.386	0.535 ns
	No	34	34	77	70		
Q17	Yes	48	48.0	57	51.8	1.34	0.513 ns
	No	52	52	53	48.2		
Q18	Yes	41	41	24	21.8	9.02	0.003*
	No	59	59	86	78.2		

Significance level  $p \leq 0.05$ , \*significant

TABLE (4) presents the comparison of knowledge among study participants to various questions according to job title.

Question	Response	Intern		General dentist		University professor		Specialist/ consultant		Postgraduate student		$\chi^2$	P
		n	%	n	%	n	%	n	%	n	%		
Q5	Strongly agree	31	51.7	37	43.0	9	75.0	11	55	18	56.3	19.44	0.078 ns
	Agree	25	41.7	45	52.3	3	25	5	25	12	37.5		
	Neutral	4	6.7	2	2.3	0	0	2	10	2	6.3		
	Disagree	0	0	2	2.3	0	0	2	10	0	.0		
Q6	Strongly agree	8	13.3	13	15.1	4	33.3	7	35	4	12.5	14.13	0.588ns
	Agree	23	38.3	33	38.4	5	41.7	8	40	12	37.5		
	Neutral	23	38.3	34	39.5	2	16.7	3	15	14	43.8		
	Disagree	5	8.3	6	7.0	1	8.3	2	10	2	6.3		
	Strongly Disagree	1	1.7	0	0	0	0	0	0	0	0		
Q7	Strongly agree	18	30	31	36	7	58.3	5	25	7	21.9	13.27	0.348ns
	Agree	37	61.7	41	47.7	4	33.3	12	60	18	56.3		
	Neutral	4	6.7	11	12.8	1	8.3	2	10	7	21.9		
	Disagree	1	1.7	3	3.5	0	0	1	5	0	0		
Q8	Yes	8	13.3	32	37.2	9	75	13	65	11	34.4	29.00	0.00*
	No	52	86.7	54	62.8	3	25	7	35	21	65.6		
Q9	Yes	2	3.3	16	18.6	2	16.7	4	20	3	9.4	8.81	0.066ns
	No	58	96.7	70	81.4	10	83.3	16	80	29	90.6		
Q10	Yes	45	75	63	73.3	11	91.7	19	95	26	81.3	6.33	0.176 ns
	No	15	25	23	26.7	1	8.3	1	5	6	18.8		
Q11	Yes	31	51.7	47	54.7	9	75	15	75	19	59.4	5.18	0.296 ns
	No	29	48.3	39	45.3	3	25	5	25	13	40.6		
Q12	Yes	30	50	51	59.3	9	75	15	75	16	50	6.25	0.182 ns
	No	30	50	35	40.7	3	25	5	25	16	50		
Q13	Strongly agree	3	5	5	5.8	2	16.7	2	10	2	6.3	22.46	0.129 ns
	Agree	16	26.7	20	23.3	3	25	10	50	10	31.3		
	Neutral	29	48.3	51	59.3	4	33.3	6	30	16	50		
	Disagree	11	18.3	8	9.3	1	8.3	2	10	2	6.3		
	Strongly Disagree	1	1.7	2	2.3	2	16.7	0	0	1	3.1		
Q14	Yes	11	18.3	20	23.3	3	25.0	6	30	3	9.4	4.26	0.371 ns
	No	49	81.7	66	76.7	9	75	14	70	29	90.6		
Q15	Yes	18	30	39	45.3	2	16.7	5	25	8	25	8.8	0.066 ns
	No	42	70	47	54.7	10	83.3	15	75	24	75		
Q16	Yes	39	65	56	65.1	8	66.7	13	65	27	84.4	4.62	0.329 ns
	No	21	35	30	34.9	4	33.3	7	35	5	15.6		
Q17	Yes	30	50	47	54.7	7	58.3	8	40	13	40.6	12.2	0.142 ns
	No	30	50	35	45.3	5	41.7	12	60	19	59.4		
Q18	Yes	19	31.7	30	34.9	4	33.3	4	20	8	25	2.32	0.667 ns
	No	41	68.3	56	65.1	8	66.7	16	80	24	75		

Significance level  $p \leq 0.05$ , \*significant



## DISCUSSION

The purpose of the current study was to evaluate and establish the awareness and the general knowledge level of maxillary sinusitis of odontogenic origin among dentists in Saudi Arabia. Descriptive Statistics and exploratory data analysis were used in this study, including a sample of Saudi dentists of various specialties. The overall results indicate a fair knowledge among Saudi Dentists. Most participants acknowledged the relationship between teeth and maxillary sinusitis. 50% of the participant think that OMS is a prevalent disease, and more than two-thirds believe odontogenic maxillary sinusitis is more common unilaterally. Troeltzsch M, Pache C, Troeltzsch M, et al. 2015 also indicates that more than 40% of maxillary sinusitis cases have an odontogenic etiology, increasing to more than 70% when maxillary sinus infections are unilateral.

A study done in Greece indicated that OMS might usually result from periapical or periodontal infection, endodontic lesions, dental implant infection, and oroantral communication and fistula. Obayashi N, Arijji Y, Goto M, et al. 2004 documented that sinus mucosal inflammation seen in 60% to 80% of patients with infections originating in the maxillary posterior teeth.

(Psillas et al., 2021) However, two-thirds of the surveyed participants did not experience any cases of maxillary sinusitis with the periapical lesion, and the majority did not experience maxillary sinusitis with marginal periodontitis.

A meta-analysis carried out 770 cases of the etiology of odontogenic maxillary sinusitis by Arias-Irimia et al. (Arias-Irimia et al. 2010) reported that iatrogenic factors such as implantological treatments, apicoectomies, and mainly dental extraction are the fundamental causes of OMS (55,97%). On the other hand, the etiology of OMS varies between authors. For instance, Otolaryngologists and Radiologists reported that the etiology of OMS is mainly from periodontal disease. Differently, dentists usu-

ally believe iatrogenic etiology is the leading main cause. (Longhini & Ferguson, 2011)

In this sample, most admitted that odontogenic maxillary sinusitis could cause dental pain. Nevertheless, about two-thirds did not think that odontogenic maxillary sinusitis of dental origin must cause dental pain. These results were supported by Longhini and Ferguson (Longhini & Ferguson, 2011). Dental pain only presented in six out of 21 (29%) patients.

Matsumoto Y.et.al. 2015 reported that Despite its prevalence, odontogenic sinusitis is frequently unrecognized by dentists, radiologists and ear, nose and throat (ENT) specialists, with its sequelae often misdiagnosed as sinogenic sinusitis. Studies show that during routine general examinations, dentists using periapical radiographs failed to diagnose odontogenic sinusitis in up to 86% of cases.

Furthermore, more than half of the participants reported they had sufficient information about this association and knew the clinical presentation of maxillary sinusitis of dental origin. However, only one-third can distinguish symptoms of OMS from other causes of rhinitis. As a result, the majority reported the need to consult an ENT specialist when they suspect maxillary sinusitis. And more than half will still consult an ENT specialist when they suspect odontogenic maxillary sinusitis. The confusion and lack of knowledge regarding OMS may be explained by the fact that only 31% of participants attended education lecture(s)/course(s) about maxillary sinusitis.

## CONCLUSION

Participants have adequate knowledge regarding OMS, presentation, prevalence, and source. With uncertainty to distinguish symptoms of OMS from other causative factors of rhinitis. As a result, more than half of the participants reported the need to consult ENT specialists when they suspect maxillary sinusitis.

Moreover Improved communication and referral relationships between dentists and ENT surgeons are essential to appropriate patient care when managing OMS .

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