

## INTRODUCTION

Replacing missing teeth has always been a major matter in dentistry, and with the advancements that have risen lately, dental implants have been the treatment of choice.

The demand on replacing missing teeth with dental implants has witnessed a drastic increase all around the world recently, making it of utmost importance for dentists to understand the basic knowledge about implants. A major segment of understanding dental implants is for dentists to also acquire enough awareness and recognition towards the maintenance of these implants, making implant maintenance a fundamental discipline in dentistry.

An essential area of maintaining implants and having long term success after placement is the understanding of their structure and the relationship between implants and the surrounding tissues. The area encapsulating the implant is divided into two zones: a soft tissue zone, and a hard tissue zone. It is important to be aware of the fact that any peri-implant infection arises from the existence of an oral bacterial biofilm.

Another important matter that dentists should be aware of regarding implants, is the complete understanding of the two terms; 'peri-implant mucositis' and 'peri-implantitis'. The former refers to gingival inflammation around the implant, while the latter includes bone loss around the implant in addition to gingival inflammation.

Various protocols for implant maintenance are followed, but they all have in common basic points that dentists should include in their regimen such as taking radiographs and measuring the health of the gingiva, including bleeding on probing, probing depths, mobility, and inflammation. Furthermore, patient education on oral hygiene instructions around their implants has always been an integral part of the maintenance of implants.

Looking at the high demands of replacing missing teeth with dental implants, it is crucial for dentists to have a basic understanding of the anatomy and nature of surrounding tissues around implants as well as their maintenance to ensure longevity and survival.

## OBJECTIVES

- Assess the attitude and clinical assessment of implants of four generations of dentists
- Assess the radiograph protocols at maintenance appointments of four generations of dentists
- Assess the overall knowledge on implant maintenance protocol of four generations of dentists
- Evaluate whether a knowledge gap exists between the generations of dentists.

## METHODS & MATERIAL

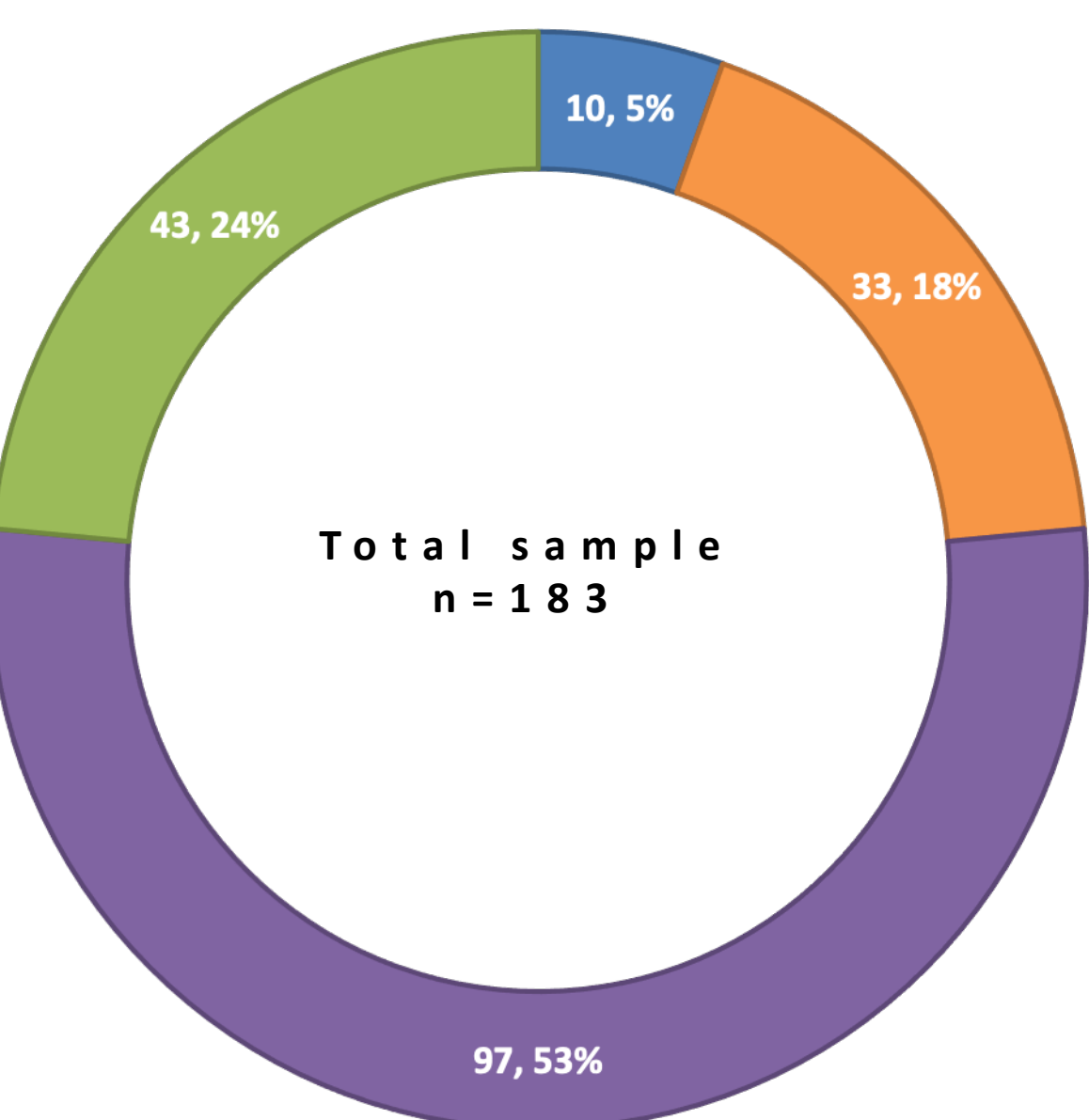
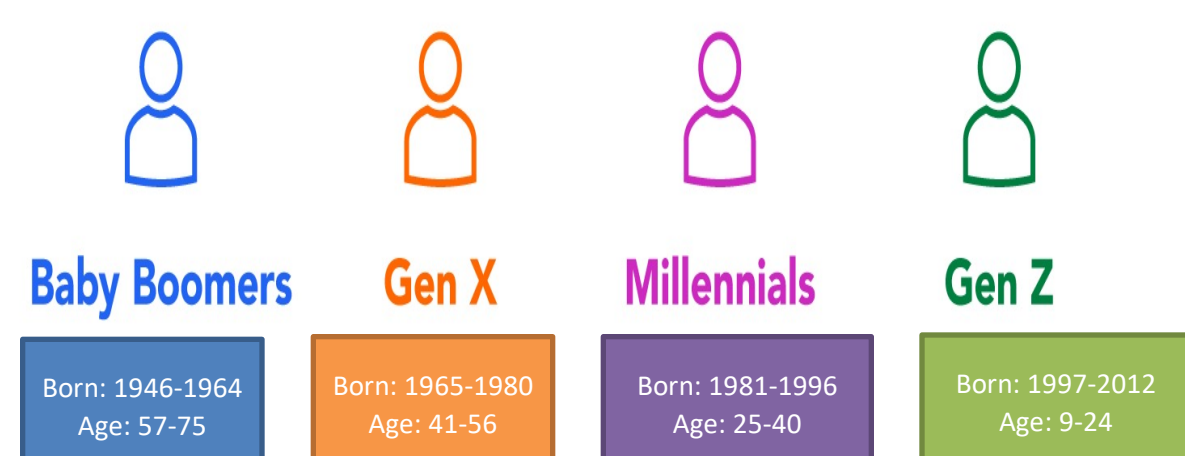
This is an observational cross-sectional study that was conducted among registered dentists by the Saudi Commission for Health Specialties (SCFHS) in Makkah region, Kingdom of Saudi Arabia. Registered dentists outside of Makkah region as well as undergraduate dental students were excluded from the study.

A sample of 183 dentists was conveniently sampled and they were divided into four main groups based on their respective generation; Baby Boomers, Generation X, Millennials and Generation Z.

A self-administered questionnaire consisting of a total of 22 questions was developed on an online platform and was sent by the email. The questionnaire consisted of three parts assessing the attitude and the clinical assessment of implants, assessing the radiographs protocols done at maintenance, and evaluating the overall knowledge regarding implant maintenance protocol, the questionnaire was delivered in English language.

Results were analyzed using SPSS program. The analysis focused on three main aspects: attitude and clinical assessment of implants, the radiograph protocols, and the overall knowledge regarding implant maintenance protocol; and correlated to the different generations of dentists by using the Chi-square test (Monte Carlo). Finally, the scores were correlated with the independent categories using Mann-Whitney and one-way ANOVA tests.

## RESULTS



**Table legend:**  
 $\chi^2$ : Chi square test  
 MC: Monte Carlo (Chi-square test)  
 $p_0$ : p values for comparing between group I with each other generation  
 $p_1$ : p values for comparing between group II and III  
 $p_2$ : p values for comparing between group II and IV  
 $p_3$ : p values for comparing between III and IV  
 \*: Statistically significant at  $p \leq 0.05$

Assessment	Question	What year were you born in?								$\chi^2$	P		
		Total sample (n=183)		Group I Baby Boom. (n=10)		Group II Gen X (n=33)		Group III Millennials (n=97)				Group IV Gen Z (n=43)	
		No.	%	No.	%	No.	%	No.	%	No.	%		
Clinical Assessment of Dental Implants	<b>Do you Evaluate the amount of adjacent keratinized tissue?</b>												
	Yes	157	85.8	8	80.0	33	100.0	73	75.3	43	100.0	25.101*	$MC_p < 0.001^*$
	No	26	14.2	2	20.0	0	0.0	24	24.7	0	0.0		
	$p_0$					0.049*		1.000		0.033*			
	Sig. bet. grps.					$p_1=0.001^*, p_2=-, p_3<0.001^*$							
Radiographic Assessment of Dental Implants	<b>Do you probe around the implant?</b>												
	Yes	147	80.3	5	50.0	28	84.8	75	77.3	39	90.7	9.729*	0.021*
	No	36	19.7	5	50.0	5	15.2	22	22.7	4	9.3		
	$p_0$					0.036*		0.118		0.008*			
	Sig. bet. grps.					$p_1=.460, p_2=0.490, p_3=0.060$							
Assessment of knowledge regarding implant maintenance protocol	<b>Do you routinely take panoramic radiographs for the implants?</b>												
	Yes	102	55.7	10	100.0	15	45.5	51	52.6	26	60.5	10.138*	0.017*
	No	81	44.3	0	0.0	18	54.5	46	47.4	17	39.5		
	$p_0$					0.002*		0.005*		0.021*			
	Sig. bet. grps.					$p_1=0.548, p_2=0.193, p_3=0.387$							
Assessment of knowledge regarding implant maintenance protocol	<b>When do you take radiographs to check the bone level?</b>												
	Once a year	43	23.5	4	40.0	4	12.1	26	26.8	9	20.9	15.251*	$MC_p = 0.016^*$
	Every 6 months	60	32.8	2	20.0	6	18.2	39	40.2	13	30.2		
	Every 3 months during the 1st year and annually and thereafter	80	43.7	4	40.0	23	69.7	32	33.0	21	48.8		
	$p_0$					0.099		0.456		0.543			
	Sig. bet. grps.					$p_1=0.001^*, p_2=0.192, p_3=0.203$							
Assessment of knowledge regarding implant maintenance protocol	<b>During routine implant maintenance, upon probing around the implant PD is 4-5 mm without radiographic bone loss, the suggested treatment is .....</b>												
	No treatment needed	21	11.5	1	10.0	3	9.1	14	14.4	3	7.0	25.848*	$MC_p < 0.001^*$
	Mechanically debridement and oral hygiene instructions	76	41.5	0	0.0	7	21.2	52	53.6	17	39.5		
	Mechanical debridement plus local anti-infective therapy (e.g. chlorhexidine)	86	47.0	9	90.0	23	69.7	31	32.0	23	53.5		
	$p_0$					0.213		0.001*		0.042*			
	Sig. bet. grps.					$p_1=0.001^*, p_2=0.225, p_3=0.046^*$							
Assessment of knowledge regarding implant maintenance protocol	<b>During routine implant maintenance, upon probing around the implant PD &gt; 5 mm with &gt; 2 mm radiographic bone loss, the suggested treatment is .....</b>												
	No therapy needed	16	8.7	0	0.0	0	0.0	10	10.3	6	14.0	12.701*	$MC_p = 0.032^*$
	Mechanical debridement and local anti-infective therapy only	37	20.2	4	40.0	5	15.2	24	24.7	4	9.3		
	Resective or regenerative surgery.	130	71.0	6	60.0	28	84.8	63	64.9	33	76.7		
	$p_0$					0.177		0.579		0.033*			
	Sig. bet. grps.					$p_1=0.055, p_2=0.049^*, p_3=0.105$							

## DISCUSSION

Based on market research, the overall number of dental implants sold has been increasing and the highest market share in 2016 was of European Countries, followed by those of North America and Asia Pacific.

Long-term success of dental implant therapy largely depends on patients' adherence to daily and professional oral hygiene maneuvers and to maintenance recall programs. A typical implant maintenance protocol normally includes the same procedures performed during a routine recall for patients with natural dentition.

A sequence of four major steps is employed depending on the severity and extent of the lesion. These include mechanical debridement, antiseptic cleaning, local or systemic antibiotic therapy, and finally, a surgical approach.

The long time that has passed since graduation may explain why almost half of the participants in this study did not receive formal training on dental implant maintenance. Dental implants may not have been part of their curriculum at undergraduate levels.

Within the confines of this study, the greatest limitation was the response rate and resultant sample size, but different educational backgrounds, continuous education, specialization, and scope of practice may be influential factors despite the mere age difference in generations.

## CONCLUSION

Significant differences among different generations of practicing dentists existed in only a few minor aspects of the implant maintenance protocol, indicating that personal approaches to the maintenance protocol maybe followed.

Regardless of when the primary dental degree was achieved and to which generation does the dentist belong to, acquiring knowledge through continuous dental education (CDE) and acquiring clinical expertise throughout the years of practice may resolve any generation gaps in knowledge.

Following guidelines issued by professional dental bodies and high levels of evidence insures a mainstream of practice that is evidence-based and back-sourced in emerging areas of dental practice.

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