



INTRODUCTION

Combustible tobacco products are commonly smoked in the form of cigarettes. It is often demanding for cigarette smokers to quit smoking, as nicotine is addictive¹ and its withdrawal elicits unpleasant symptoms including state of confusion or nervousness, headache, and constipation.² Other modes of combustible tobacco product usage include the use of cigars, pipes, and waterpipes (also known as shisha, hookah, and narghile). Waterpipe usage is a traditional norm in Middle-Eastern countries including Saudi Arabia, Qatar, and Kuwait³; however, studies^{4,5} have reported that waterpipe usage is increasing in other countries including Brazil, the United States, the United Kingdom, and Australia. Waterpipe users often perceive that this form of nicotine consumption is less harmful to health than conventional cigarette smoking.⁶ It is generally assumed that waterpipe smoke prior to inhalation filters through water, which absorbs various chemicals and carcinogens.⁷ Nevertheless, evidence from pertinent indexed literature confirms that waterpipe usage is by no means less hazardous to health than conventional cigarette smoking,⁸ and the latter is linked with the aetiopathogenesis of serious health hazards including cardiovascular and respiratory diseases and cancer.

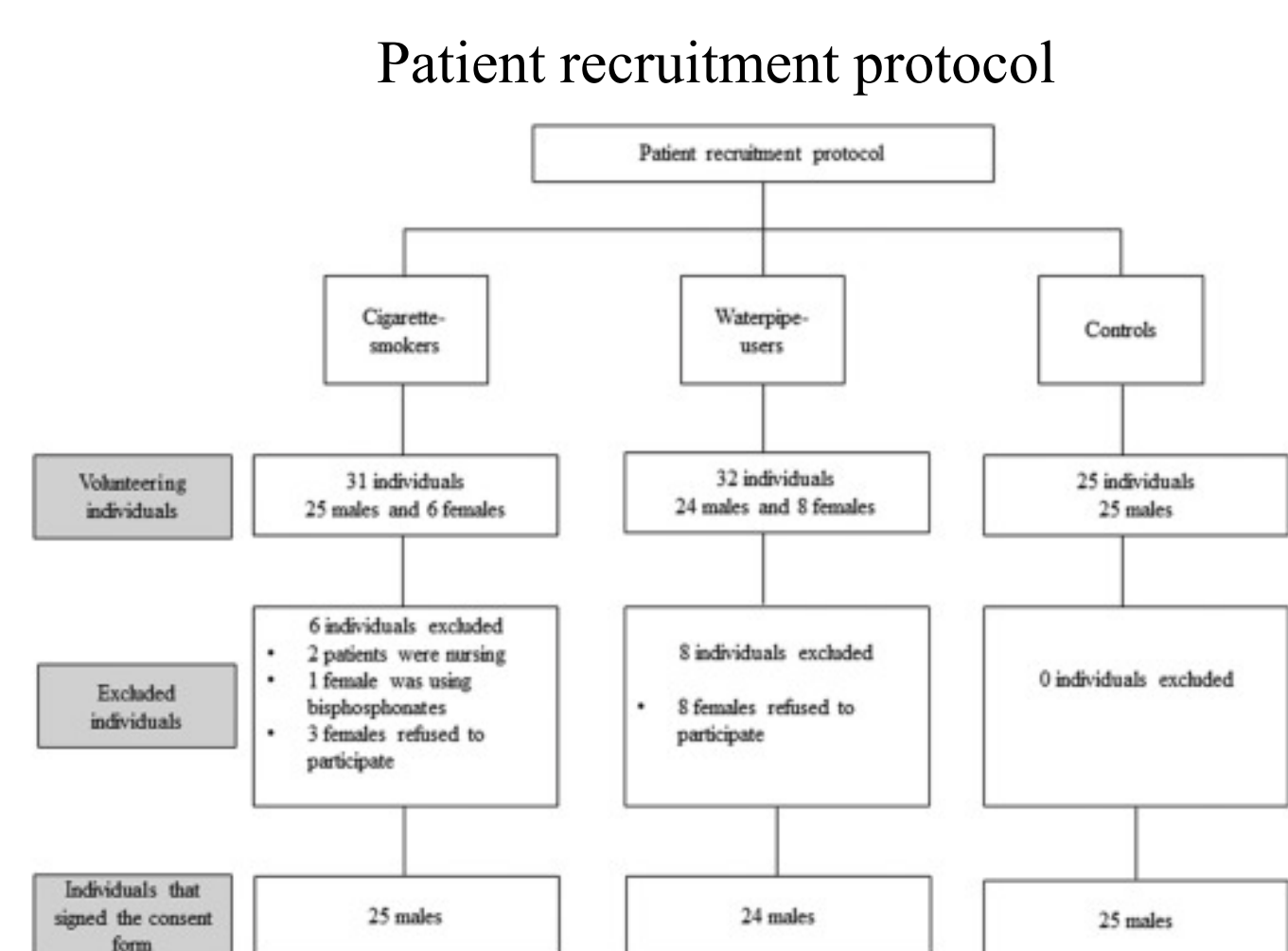
METHODS & MATERIAL

Waterpipe users, cigarette smokers, and never smokers were included. Demographic details were collected using a questionnaire. Characteristics of implants (dimensions, jaw location, depth of placement, insertion torque, and duration in function) were recorded. Peri-implant modified plaque and gingival indices (mPI and mGI), probing depth (PD), and crestal bone loss (CBL) were recorded in all groups. Volume of PISF and levels of AGEs were determined using standard techniques. Sample-size estimation was done on data from a pilot investigation, and correlation between clinicoradiographic and immunoinflammatory parameters was assessed using logistic regression models. Probability values <.05 were considered statistically significant.

RESULTS

In all, 25, 25, and 24 cigarette smokers, never smokers, and waterpipe users, respectively, were examined. All participants were male and had comparable mean ages. Cigarette smokers and waterpipe users had a smoking history of 20.2 ± 3.5 years and 18.8 ± 0.6 years, respectively. The mPI (P < .01), CBL (P < .01), PD (P < 0.01), and mGI (P < .01) were significantly higher in cigarette smokers and waterpipe users than never smokers. There was no significant difference in clinicoradiographic status and AGE concentrations in waterpipe users and cigarette smokers. A statistically significant correlation was recorded between AGEs and PD in cigarette smokers (P < .01) and waterpipe users (P < .01).

RESULTS



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Implant-related parameters of the study group

Parameters	Cigarette smokers	Waterpipe users	Never smokers
No. of patients	25	24	25
Gender (male)	25	24	25
Mean age (all patients)	51.3 ± 5.2 years	53.8 ± 2.4 years	49.6 ± 0.9 years
Duration of smoking/habit in years	20.2 ± 3.5 years	NA	NA
Number of cigarettes smoked daily	12.6 ± 2.2 cigarettes	NA	NA
Pack-years	18.3 ± 0.5 pack years	NA	NA
Duration of waterpipe usage in years	NA	18.8 ± 0.6 years	NA
Daily waterpipe usage (number of times daily)	NA	6.1 ± 0.5 times daily	NA
Duration in minutes of each session of waterpipe usage	NA	22.1 ± 5.5 minutes	NA
Number of puffs per session of waterpipe usage	NA	21.5 ± 0.7 puffs per session	NA
Daily tooth-brushing, No. (%)			
Once	20 (80%)	18 (72%)	6 (24%)
Twice	5 (20%)	33 (28%)	19 (76%)
Daily flossing, No. (%)			
Once	—	—	—
Twice	—	—	—

Peri-implant soft-tissue inflammatory parameters and crestal bone loss

Peri-implant clinical and radiographic parameters	Cigarette smokers	Waterpipe users	Never smokers
Modified plaque index	2.7 ± 0.4*	2.4 ± 0.2*	0.4 ± 0.07
Modified gingival index	0.6 ± 0.004	0.5 ± 0.007	0.8 ± 0.1
Probing depth	4.7 ± 0.4 mm*	4.5 ± 0.4 mm*	1.7 ± 0.2 mm
Crestal bone loss (mesial surface)	2.7 ± 0.2 mm*	2.5 ± 0.4 mm*	0.3 ± 0.05 mm
Crestal bone loss (distal surface)	2.4 ± 0.3 mm*	2.3 ± 0.2 mm*	0.2 ± 0.004 mm

* Compared with controls (P < .01).

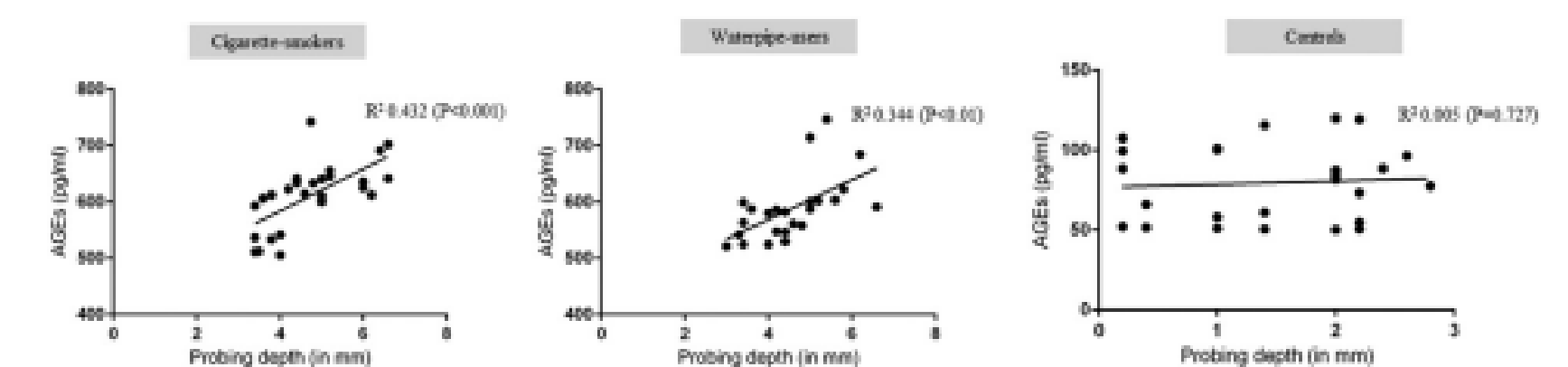
RESULTS

Volume of peri-implant sulcular fluid and concentrations of advanced glycation endproducts in the study groups

Parameters	Cigarette smokers	Waterpipe users	Never smokers
PISF volume (in µL)	3.25 ± 0.07 µL*	3.03 ± 0.2 µL*	0.3 ± 0.005 µL
AGEs concentration (pg/ml)	611.1 ± 37.4 pg/ml*	587.8 ± 41.6 pg/ml*	79.5 ± 6.4 pg/ml

* Compared with controls (P < .01).

Correlation between peri-implant probing depth and levels of advanced glycation endproducts in the study groups



DISCUSSION

Our results are in agreement with the hypotheses, as scores of mPI, PD, CBL, and PISG AGE levels were significantly higher amongst waterpipe users and cigarette smokers compared with never smokers. Various explanations from a histologic, microbiologic, as well as immune-inflammatory perspective can be proposed to explain the results of our study. The present results clearly demonstrated no statistically significant difference in scores of mPI, PD, CBL, and PISG AGE levels amongst waterpipe users and cigarette smokers. Naderi et al⁹ investigated the histopathologic alterations in gingival epithelium and connective tissue amongst 28 tobacco smokers and 32 controls (nonsmokers). The results showed that loss of polarity and normal epithelium pattern, such as bulbous rete ridges, and increased parabasal cells were more often manifested in tobacco smokers (~82%) than nonsmokers (~6%).⁹ From a microbiological point of view, counts of pathogenic bacteria have been reported to be markedly high in oral biofilm (OB) of tobacco smokers in contrast with never smokers.

DISCUSSION

Scientific evidence has confirmed that gingival inflammation, PD, and bone loss around dentition and implants are markedly high in smokers compared with never smokers.¹⁰ It is also pertinent to mention that gingival bleeding is a well-known clinical marker of gingival inflammation^{11,12} and is often a manifestation that convinces patients to seek dental consultation and/or related treatment. However, as per current results, there was no difference in the mGI amongst waterpipe users and cigarette smokers and never smokers. One clarification for this is that nicotine has vasoconstrictive effects on gingival vasculature.¹³ In other words, gingival bleeding is often masked in habitual nicotine product users compared with never smokers, which makes tobacco smokers unaware of the ongoing inflammatory process. It is therefore important to educate the population through community-based health awareness programmes about the deleterious effects of nicotine products on oral as well as systemic health. Routine community-based oral health promotion campaigns may play a role in achieving this objective.

CONCLUSION

In conclusion, waterpipe usage is not less hazardous to peri-implant tissue health than conventional cigarette smoking. Patients with dental implants should be cautioned about the detrimental effects of tobacco products on oral health in general and peri-implant health specifically.

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