

EFFECT OF CHEWING GUM USE ON ORAL HYGIENE AND VOLATILE SULPHUR COMPOUND CONCENTRATION

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ABSTRACT

Chewing of gum has been favoured by many people because of its beneficial effects. The objective of this study was therefore to determine the difference between the oral hygiene status, organoleptic assessment, self perception of malodour as well as the mouth- air volatile sulphur compound concentration of chewing gum users and non chewing gum users as well as to determine reasons for chewing gum. Eighty- two young adults were involved in this cross-sectional study. Data collected include chewing gum use, frequency of chewing, type of gum chewed; reason for chewing and for discarding chewed gum as well as self perception of oral malodour. Their oral hygiene status was determined using the simplified oral hygiene index (OHI-S) and organoleptic assessment was done. The objective measurement of the VSC was also done using the Halimeter[®]. Majority (88.9%) of the females chew gum (P= 0.05) as well as 88.5% of the participants who reported self-perception of oral malodour. Eighty percent of participants with strong concentration of VSC (i.e. > 250ppb), 78.7% with noticeable odour and 66.7% with poor oral hygiene also chew gum. Reasons for chewing gum include its sweet taste (18.5%), to stay awake (19.5%), to remove impacted food (12.3%), to mask the smell of food (10.7%) and to reduce the urge to smoke (1.5%). It can be concluded that there is no difference between the oral hygiene status, organoleptic assessment, self perception of oral malodour as well as the mouth- air volatile sulphur compound concentration of chewing gum users and non chewing gum users. The reasons given for chewing gum are similar to those previously reported and chewed gum is discarded once the reason for chewing is no longer there.

Introduction

Chewing of gum has been favoured by many people because of its ability to improve concentration, relax and ease tension, moisten the mouth, help stay alert and awake, resist the urge to smoke, reduce ear discomfort while flying, satisfy snack

craving, prevent heartburn after meals and improve long term memory.¹ Apart from the aforementioned general benefits, chewing gum has been found useful as a drug delivery system.² It has also been reported to have the ability to significantly increase salivary flow rate, raise the plaque-pH levels, reduce extrinsic stain formation and improve oral malodour.³⁻⁶ Chewing of gum has also been found to have non dental therapeutic effect. It has been reported to stimulate bowel motility after colorectal surgery.⁷

A systematic review concluded that the use of sugar-free chewing gum as an adjunct to toothbrushing resulted in significant reduction in plaque accumulation although there was no significant effect on the severity of gingivitis.⁸ This suggests that chewing of

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gum may have a positive effect on an individual's oral health. However, not much has been done on oral health effects of the use of chewing gum among Nigerians.

This study was therefore aimed at determining the difference between the oral hygiene status, organoleptic assessment, self perception of malodour as well as the mouth-air volatile sulphur compound concentration of chewing gum users and non chewing gum users. This is necessary to serve as a guide for a properly designed study which will determine a cause-effect relationship between chewing gum use and oral hygiene. Another objective of the study was also to determine reasons for chewing gum and reasons for discarding chewed gum.

Methods

This pilot study was carried out at the Periodontology Clinic of the University of Benin Teaching Hospital, Nigeria. Eighty-two young adults, who were part of a larger study to determine the relationship between the concentration of VSC in mouth air of young adults and the health of their periodontium, were randomly selected. Informed consent was obtained from the participants and the protocol for human participation was reviewed and approved by the Ethics and Research Committee of the University of Benin Teaching Hospital, Nigeria.

The history of chewing gum use, frequency of chewing, type of gum chewed, reason for chewing, reason for discarding chewed gum as well as perception of oral malodour was taken. Other clinical parameters measured include the oral hygiene status (using the simplified oral hygiene index (OHI-S) by Greene and Vermillion⁹) and organoleptic assessment (using a scale ranging from 0 to 5 based on the study by Rosenberg et al ¹⁰). For the purpose of this study, the organoleptic scores were grouped into two. Score 0 made

up the group without odour while scores ²⁻⁵ made up the group with odour. The objective measurement of the VSC was also done using the Halimeter[®] manufactured by the Interscan Corporation.¹¹ For standardization, all study participants brushed the night before and omitted toothbrushing on the morning the measurement of the clinical parameters was done.

The data was analyzed using the Statistical Package for Social Sciences (SPSS Inc, Chicago Illinois, USA) version 15.0 for frequency distributions and cross tabulation. Chi square test was done to test statistical significance. P values < 0.05 were considered statistically significant.

Results

All the studied young adults were under 40 years. The male to female ratio was 1.3:1. Majority (68.3%) had no perception of oral malodour and 79.3% claimed to chew gum. Normal concentration of VSC was recorded in 43.9% of the participants and none of them had the organoleptic assessment score greater than score 3. Also, 55.8% had a good oral hygiene. (Table 1)

Majority (88.9%) of the females chewed gum (P= 0.05) and more of the participants who reported self- perception of oral malodour (88.5%) chewed gum (P= 0.145). Eighty percent of participants with strong concentration of VSC (i.e. > 250ppb), 81.3% with weak concentration of VSC (181-250ppb) and 77.8% with normal concentration of VSC (0-180ppb) reported chewing of gum (P= 0.953). Eighty-one percent with no odour (score 1) and 78.7% with noticeable odour also chewed gum (P= 0.824). Also, 38 participants (77.6%) with good oral hygiene, 25 participants (83.3%) with fair oral hygiene and 2 participants (66.7%) chewed gum (P= 0.718) (Table 2). Reasons given by participants for chewing

Table 1: Frequency table of the studied variables

Variables	n (%)
Sex	
Male	46 (56.1)
Female	36 (43.9)
Perception of malodour	
Yes	26 (31.7)
No	56 (68.3)
Chewing gum use	
Never	17 (20.7)
Frequently	10 (12.2)
Occasionally	55 (67.1)
Concentration of VSC	
Normal = 0-180 ppb	36 (43.9)
Weak = 181-250 ppb	16 (19.5)
Strong = >250 ppb	30 (36.6)
Organoleptic score	
Score 0= no appreciable odour	21 (25.6)
Score 1= barely noticeable odour	41 (50.0)
Score 2= slight but noticeable odour	19 (23.2)
Score 3= moderate odour	1 (1.2)
Oral hygiene status	
Good	49 (59.8)
Fair	30 (36.6)
poor	3 (3.7)
Total	82 (100.0)

Table 2: Relationship between chewing gum use and the studied variables.

Variable	Chewing gum use			X ²	P value
	Yes n (%)	No n (%)	Total n (%)		
Gender					
Male	33 (71.7)	13 (28.3)	46 (100.0)	3.810	0.051
Female	32 (88.9)	4 (11.1)	36 (100.0)		
Malodour Perception					
Yes	23 (88.5)	3 (11.5)	26 (100.0)	2.124	0.145
No	42 (75.0)	14 (25.0)	56 (100.0)		
Concentration of VSC					
Normal = 0-180 ppb	28 (77.8)	8 (22.2)	36 (100.0)	0.097	0.953
Weak = 181-250 ppb	13 (81.3)	3 (18.8)	16 (100.0)		
Strong = >250 ppb	24 (80.0)	6 (20.0)	30 (100.0)		
Organoleptic score					
Group with no odour	17 (81.0)	4 (19.0)	21 (100.0)	0.049	0.824
Group with odour	48 (78.7)	13 (21.3)	61 (100.0)		
Oral hygiene status					
Good	38 (77.6)	11 (22.4)	49 (100.0)	0.661	0.718
Fair	25 (83.3)	5 (16.7)	30 (100.0)		
poor	2 (66.7)	1 (33.3)	3 (100.0)		

Table 3: Participants' reasons for chewing gum and for discarding the chewed gum

Answer	Male n (%)	Female n (%)	n (%)
Reasons for chewing gum			
For its sweet taste	4 (12.1)	8 (25.0)	12 (18.5)
To stay awake	11 (33.3)	5 (15.6)	16 (19.5)
To reduce urge to smoke	0 (0.0)	1 (3.1)	1 (1.5)
To reduce hunger	0 (0.0)	1 (3.1)	1 (1.5)
To remove impacted food	2 (6.1)	6 (18.8)	8 (12.3)
To reduce smell of food	4 (12.1)	3 (9.4)	7 (10.7)
To exercise the jaws	2 (6.1)	0 (0.0)	2 (3.1)
To feel cool	4 (12.1)	2 (6.2)	6 (9.3)
Multiple reasons	6 (18.2)	6 (18.8)	12 (18.5)
Total	33 (100.0)	32 (100.0)	65 (100.0)

$X^2 = 15.92, P = 0.069$

Table 4: Relationship between participants’ reasons for chewing gum and the type chewed.

Reasons for chewing gum	Types of chewing gum			Total n (%)
	Sugared n (%)	Sugar free n (%)	Coffee containing n (%)	
For its sweet taste	12 (100.0)	0 (0.0)	0 (0.0)	12 (100.0)
To stay awake	12 (75.0)	0 (0.0)	4 (25.0)	16 (100.0)
To reduce urge to smoke	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
To reduce hunger	1 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
To remove impacted food	5 (62.5)	3 (37.5)	0 (0.0)	8 (100.0)
To reduce smell of food	3 (42.9)	3 (42.9)	1 (14.2)	7 (100.0)
To exercise the jaws	1 (50.0)	1 (50.0)	0 (0.0)	2 (100.0))
To feel cool	5 (83.3)	1 (16.7)	0 (0.0)	6 (100.0)
Multiple reasons	8 (66.7)	0 (0.0)	4 (33.3)	12 (100.0)
Total	48 (73.8)	8 (12.3)	9 (13.9)	65 (100.0)

$X^2 = 32.12, P = 0.01$

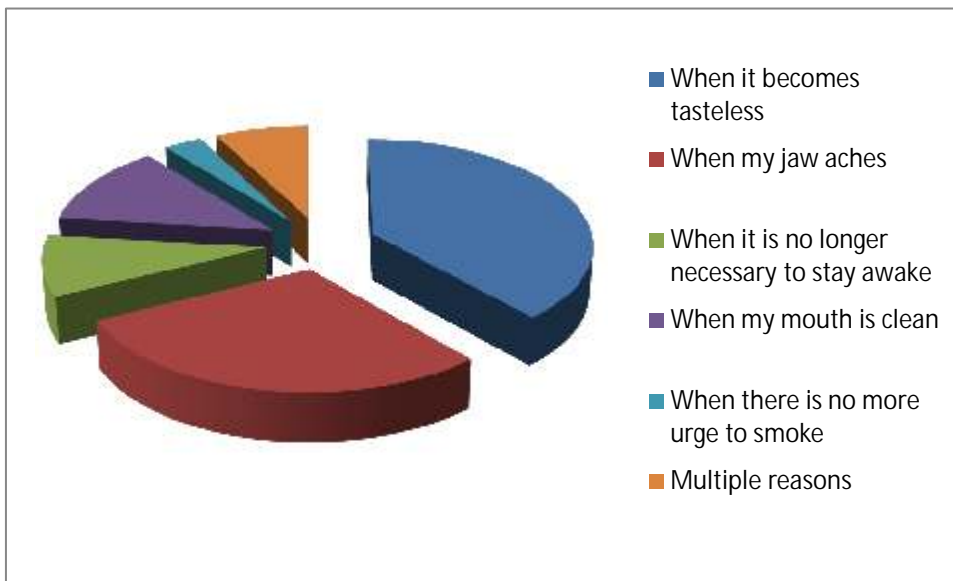


Fig 1: Participants’ reasons for discarding chewed gum.

gum include; for its sweet taste (18.5%), to stay awake (19.5%), to reduce the urge to smoke (1.5%), to reduce hunger (1.5%), to remove impacted food (12.3%), to reduce smell of food (10.7%), to exercise the jaws (3.1%) and to feel cool (9.3%). More than one of reasons was given by 18.5% of the participants (Table 3). More of the females (25.0%) chewed gum for its sweet taste while more of the males (33.3%) chewed gum to stay awake. More of the males chewed gum to feel cool when compared with the females ($P= 0.069$) (Table 3).

Out of the 65 participants who chewed gum, 73.8% chewed sugared chewing gum, 12.3% chewed sugar-free chewing gum and 13.9% chewed coffee containing chewing gum. All the participant who chewed gum for the sweet taste chewed the sugared type and only 25% who chewed gum to stay awake chew the coffee containing type ($P= 0.01$) (Table 4).

Participants discard chewed gum when it becomes tasteless (38.5%), when jaw aches (29.2%), when it is no longer necessary to stay awake (9.2%), when the mouth is clean (12.3), when there is no more urge to smoke (3.1%) and for more than one of these listed reasons (7.7%) (Fig 1).

Discussion

The percentage of the females who chew gum is more than the percentage of males who chew gum in this study. Chewing gum may be considered stylish and as a useful weight loss tool in some quarters. Also, women are generally considered more stylish and more weight conscious than men. This pattern is therefore not surprising. The surprising thing however was that majority of the participants in this study who chew gum for a stylish reason ("to feel cool") were males.

Chewing gum has been reported to have a long-term effect on the organoleptic score of individuals.¹² This study was however not able to confirm this long-term effect as

majority of the study participants with oral malodour and majority of those without any appreciable odour all claim to chew gum. Furthermore, none of the participants in this study claimed to chew the minty type of chewing gum which may have masking effect on oral malodour.

Although a previous study¹³ reported that chewing gum could considerably reduce VSC levels in mouth air, the result from this study did not show any clear difference in the VSC concentration of individuals who chew gum and those who do not. Majority of the study participants, notwithstanding their VSC concentration grouping, reported chewing gum.

The effect of chewing gum on oral hygiene status could also not be established by this study. More participants in each group of oral hygiene status (good, fair or poor) reported chewing gum. This result is similar to that of a previous study where the effect of chewing sugar-free gum on plaque and gingivitis scores, in the absence of tooth brushing, could not be established.¹⁴ However, what can be established is that only a few of the chewing gum users in this study make use of the sugar-free type which is generally considered beneficial to oral health.¹⁵

Most of our study participants claimed that they chew gum to stay awake. It has been previously suggested that chewing gum increases alertness.¹⁶ It was suggested that although chewing gum improved selective and sustained attention, it failed to improve memory.¹⁷ Another study also reported that chewing gum seems to have a positive effect on subjective alertness, but the evidence on alertness biomarkers is not consistent.¹⁸ Furthermore, gum base containing sucrose has been said to induce relaxed concentration effect and arousal tendency.¹⁹ It has been reported that higher caffeine intakes do not necessarily result in additional increases in

alertness²⁰ and this may be why fewer people who use chewing gum to stay awake in this study make use of the coffee containing type.

Other health related reasons for chewing gum have also been reported. Chewing gum forms of nicotine replacement therapy have been said to increase the chances of willing individuals to successfully stopping smoking.²¹ It is therefore not surprising that few individuals in this study claimed the reason for chewing gum is to stop smoking. However, chewing gum form of NRT was not reported in this study. This may be because chewing gum form of NRT is still not easily available in our setting.

Many oral health effect of chewing gum have been reported. A school-based oral health education (OHE) programme assessing the effect of sugar-free chewing gum on the oral health status of children over a period of 2 years reported some positive effect improving the children's oral hygiene.²² It has also been reported by other studies that chewing gum may promote periodontal health²³ and reduce oral malodour.^{13, 24} This study supports all the above documented effects of chewing gum because many of the participants in this study gave oral health related reasons for chewing gum.

Despite the fact that there is anecdotal evidence that chewing gum may cause Temporomandibular joint pain, a few of the study participants make use of chewing gum to exercise the jaws. This study however did not report any previously reported non dental related reason for chewing gum. This may be because the study was carried out among dental patient who probably focused on giving dental related responses.

The reasons given for discarding chewed gum in this study suggest that individuals discontinue chewing of gum once the reason for starting it in the first place is no longer there. These reasons are self determined and

do not require any outside influence. The limitation of this study is that, just like any other study that relies partly on self reported data, there may have being some level of recall bias which may result in over estimation or under estimation.

Conclusion

It can be concluded that there is no difference between the oral hygiene status, organoleptic assessment, self perception of malodour as well as the mouth-air volatile sulphur compound concentration of chewing gum users and non chewing gum users. The reasons given for chewing are similar to those previously reported and chewed gum is discarded once the reason for chewing is no longer there.

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