

Evaluation of Effects of Tobacco Chewing on Reaction Times

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Abstract

Background: India has one of the highest rates of oral cancer in the world, partly attributed to high prevalence of tobacco chewing. The WHO predicts that tobacco deaths in India may exceed 1.5 million annually by 2020.[1] **Aims and objectives:** 1) To study the ART, VRT, CRT, in tobacco chewers of duration 1-5 years. 2) To study the immediate effects on ART, VRT, CRT after chewing a packet of Gutka in tobacco chewers. **Materials and methods:** The study was conducted on 25 apparently healthy male tobacco chewers of age group 20-25 years and equal number of healthy age and sex matched controls. Simple (random and alert) and discrimination times were recorded in both groups using response analyzer (YSRT- 0101). **Results and Conclusions:** Simple reaction times (random and alert) were shortened in tobacco chewers before and after chewing a packet of Gutka due to the stimulatory effect of nicotine. The discrimination reaction times were prolonged in tobacco chewers before chewing a packet of Gutka and reason is not known. Further studies are needed in this regard. After chewing a packet of Gutka the discrimination reaction times were shortened in the cases; again this is attributable to stimulatory effect of nicotine.

Keywords: Gutka; Reaction time; Tobacco chewers.

Introduction

Humans have used tobacco for about a thousand years.[2] In India tobacco is usually taken along with pan (beetel quid) either as powdered dried leaves (patti) or as a paste (kiwam, zarda). A new form of smokeless tobacco was developed which is a low nicotine product sold in small pouches of the size of tea bags.[3] An increase in consumption of smokeless tobacco is apparent among children and adolescents. Increasing trends in the use of smokeless tobacco have been noted among high school and college students. Use of smokeless tobacco indeed represents a healthy concern of growing magnitude for children and adolescents. As a consequence of its

addictive qualities, the consumption of smokeless tobacco often becomes a lifelong habit with cumulative and deleterious effects on health.[4]

In contrast to the voluminous literatures on the health effects of smoking, relatively little attention has been directed at smokeless tobacco and the factors that promote its use.[5]

More than 2000 chemical compounds have been identified in processed tobacco. Nicotine is a major component of tobacco. Nicotine administration has an effect on the functioning of the CNS.[4]

Reaction time has been defined as the time interval between the application of a stimulus and the response by the subject[6];

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or as the interval between go signal and onset of movement of electromyographic activity.[7] It evaluates performance of peripheral as well as central neural structures. It is an index of the biological efficiency of the brain mechanism and also reflects the effects of brain damage, mental disorders and other psychopathologies.[8]

Hence the present study was undertaken to evaluate the effects of chewing tobacco on reaction times.

Materials and Methods

The present study was conducted on twenty five apparently healthy male tobacco chewers of age group 20-25 years and equal number of healthy age and sex matched non tobacco chewers as controls(C). All of them were right handed and selected randomly. Duration of tobacco chewing was around 1-5 years and the number of packets being chewed were in the range of 2-10 packets per day. On an average the subjects chewed one packet of Gutka for 20-30 minutes.

Those subjects with history of diabetes, hypertension, mental apathies, neurological abnormalities or any diseases which affects the functioning of CNS, either in themselves or in their families were excluded from the study.

On the day before the study, Gutka chewers were instructed to abstain from Gutka chewing for at least three hours prior to the conduct of tests to avoid residual effects of their last Gutka chewing dose. And then the reaction times (ART, VRT, CRT, both simple and discrimination) were measured before(T1) and after 20 minutes of chewing a packet of Gutka(T2), in cases to determine the acute effects of the same on their reaction times.

The reaction times were measured using "Response-Analyzer" manufactured by "Yantrashilpa" electronics- 0101/pune [YSRT-0101]. This instrument works with a working supply of 10v.DC and equipped

with a very sensitive quartz clock which can measure up to 1/10th of a millisecond. Display accuracy of the instrument is + 0.01 sec and display range is 9.999 seconds maximum. It is a micro-processor based system that can be programmed to measure the response times of the subject to various sensory stimuli, eg: vision, sound, electrical, etc.

Different programmes are used for producing auditory, light and cutaneous stimuli; subjects are instructed to press a response microswitch(thumb switch) as quickly as possible after the presentation of the stimuli but never before. The intensity of stimuli was kept constant for all the subjects.

Data was tabulated and analyzed statistically using paired t test, chi-square test with Yate's correction factor.

Results

The results are expressed as mean + SD.

- 1) Right hand reaction times were shorter than left hand reaction times; the difference being statistically significant for both simple reactions time and discrimination times.
- 2) Simple reaction times (random) in T1 group were shorter compared to C group, the difference being statistically significant.
- 3) Simple reaction times (random) in T1 group were shorter compared to C group, the difference being not statistically significant.
- 4) Discrimination reaction times in T1 group were longer as compared to C group, the difference being statistically significant.
- 5) Among tobacco chewers, chewing a packet of Gutka significantly (statistically) shortens both simple and discrimination reaction times.
- 6) Simple and discrimination reaction

Table 1: Simple Reaction Times: Right Hand Average Values (in m.sec)

Type of reaction time	Parameters	(C) Control subjects Mean \pm SD (N=25)	(T1) Tobacco chewers before gutkha chewing Mean \pm SD (N=25)	(T2) Tobacco chewers after gutkha chewing Mean \pm SD (N=25)
R.R.T	A.R.T	269.46 \pm 3.79	266.02 \pm 3.57	245.07 \pm 2.93
	V.R.T	276.26 \pm 3.82	273.46 \pm 3.43	250.72 \pm 3.83
	C.R.T	282.24 \pm 4.90	279.62 \pm 3.72	255.81 \pm 3.57
AL. R.T	A.R.T	198.97 \pm 2.6	197.16 \pm 3.84	178.84 \pm 4.52
	V.R.T	205.07 \pm 4.45	203.33 \pm 3.71	182.77 \pm 4.4
	C.R.T	209.68 \pm 6.48	207.60 \pm 3.93	186.62 \pm 4.53

R.R.T C - T1 P < 0.05 (S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)
 AL. R.T C - T1 P > 0.05 (N.S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)

Table 2: Left Hand Average Values (in m.sec)

Type of reaction time	Parameters	(C) Control subjects Mean \pm SD (N=25)	(T1) Tobacco chewers before gutkha chewing Mean \pm SD (N=25)	(T2) Tobacco chewers after gutkha chewing Mean \pm SD (N=25)
R.R.T	A.R.T	272.92 \pm 3.48	269.32 \pm 4.05	247.80 \pm 3.42
	V.R.T	279.00 \pm 4.57	276.25 \pm 3.64	253.73 \pm 3.02
	C.R.T	285.133 \pm 5.37	282.08 \pm 3.68	258.46 \pm 3.49
AL. R.T	A.R.T	201.73 \pm 3.14	200.18 \pm 3.95	180.42 \pm 4.62
	V.R.T	206.96 \pm 4.84	205.44 \pm 4.03	184.73 \pm 4.58
	C.R.T	211.9 \pm 7.11	210.26 \pm 7.30	188.82 \pm 4.59

R.R.T C - T1 P < 0.05 (S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)
 AL. R.T C - T1 P > 0.05 (N.S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)

Table 3: Discrimination Reaction Times: Right Hand Average Values (in m.sec)

Type of reaction time	Parameters	(C) Control subjects Mean \pm SD (N=25)	(T1) Tobacco chewers before gutkha chewing Mean \pm SD (N=25)	(T2) Tobacco chewers after gutkha chewing Mean \pm SD (N=25)
D.R.T	A.R.T	307.51 \pm 6.02	312.52 \pm 7.41	290.4 \pm 7.79
	V.R.T	316.3 \pm 6.37	323.7 \pm 6.34	300.63 \pm 8.51

C - T1 P < 0.001 (H.S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)

Table 4: Left Hand Average Values (in m.sec)

Type of reaction time	Parameters	(C) Control subjects Mean \pm SD (N=25)	(T1) Tobacco chewers before gutkha chewing Mean \pm SD (N=25)	(T2) Tobacco chewers after gutkha chewing Mean \pm SD (N=25)
D.R.T	A.R.T	309.91 \pm 5.98	316.23 \pm 6.93	294.05 \pm 8.14
	V.R.T	318.18 \pm 6.10	326.75 \pm 6.58	304.46 \pm 7.05

C - T1 P < 0.001 (H.S) T1 - T2 P < 0.001 (H.S) C - T2 P < 0.001 (H.S)

Abbreviations

ART – auditory reaction time

CRT – cutaneous reaction time

N – number of subjects enrolled for the study

RT – reaction time

VRT – visual reaction time

times in T2 group were shorter as compared to C group, the difference being statistically significant.

Discussion

Right hand RTs were significantly shorter than the left hand RTs (in both random and alert). This may be due to the fact that, the right handers possess a right shift factor which predisposes them to performance of skilled movements by right hand.[9]

Simple reaction times (random and alert) in T1 group were shorter compared to C group, the difference being statistically significant. Also the reaction times (both simple and discrimination) in T2 group were shorter after chewing a packet of Gutka. This is because the subjects were programmed to respond in advance of the stimulus to move i.e., to preprogrammed. [10] Also nicotine in small doses stimulates the CNS.[2] Hence it could be due to the presence of residual amount of nicotine in tobacco chewers. Since preprogramming is an optional strategy, it is the nicotine which excites the nicotinic receptors in the adrenal medulla and causes the release of epinephrine. The increased sympatho adrenal response is also associated with an increase in alertness.[11]

Discrimination reaction times in T1 group were longer as compared to C group, the difference being statistically significant. But the exact cause of this is not known.

Conclusion

Simple reaction times were shortened in

tobacco chewers before and after chewing a packet of Gutka. This can be attributed to the stimulant effect of nicotine. But the discrimination reaction times were prolonged in tobacco chewers before chewing a packet of Gutka and reason is not known. Further studies are needed in this regard. After chewing a packet of Gutka the discrimination reaction times were shortened in the cases; again this is attributable to stimulatory effect of nicotine.

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