

*Rapid communication***Topographical features of smokeless tobacco use****Dorothy K. Hatsukami, Robert M. Keenan, and Deborah J. Anton**

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**Abstract.** There is an increasing prevalence of smokeless tobacco use. However, very little descriptive information is available on the pattern of use. This study examines topographical features of smokeless tobacco use in a male college-age population ( $N=56$ ). Subjects were required to use smokeless tobacco ad lib. for a period of 3 days. During this time, they were asked to record the time of onset and completion of each dip of smokeless tobacco. Smokeless tobacco use was significantly associated with time of day. The mean dips/day was 6.3 ( $SD \pm 2.2$ ), mean inter-dip interval was 102.6 ( $SD \pm 42.1$ ) min, mean duration/dip was 39.9 ( $SD \pm 16.5$ ) min, and mean total dip duration/day was 254.6 ( $SD \pm 129.3$ ) min. The mean grams of tobacco/dip was 1.97 ( $SD \pm 0.96$ ) and the total grams of tobacco used/day was 12.0 ( $SD \pm 6.8$ ) g. There were significant correlations between saliva cotinine and number of dips/day, mean duration/dip, total dip duration/day and mean inter-dip interval, suggesting that smokeless tobacco has the potential for producing dependence.

**Key words:** Smokeless tobacco – Topography

The increasing prevalence of smokeless tobacco use, especially among the male adolescent population, is raising concern regarding the possible physical dependence upon this product as well as the ensuing medical complications associated with its long-term use (USDHHS 1986; Hatsukami et al. 1987). Approximately 12 million people in the United States now use smokeless tobacco, with half of this population using smokeless tobacco weekly or more often (USDHHS 1986). This number represents a three-fold increase in the percentage of smokeless tobacco users (4.0% versus 12.8%) between the ages of 17 and 29 from 1970 to 1985, respectively. In spite of the increasing prevalence of smokeless tobacco use, very little descriptive information is available on the pattern of use. The present study details the topographical features of smokeless tobacco use in a male college-age population.

**Method**

Males ( $N=56$ ) between the ages of 18 and 30 years who used Copenhagen smokeless tobacco on a daily basis were recruited either by University newspaper advertisement or

word of mouth. Subjects who had a current history of alcohol or drug abuse, emotional or physical problems, were taking medications, or used nicotine in forms other than smokeless tobacco were excluded from the study. Subjects were paid \$50.00 for their participation.

Subjects were seen on an outpatient basis and required to come into the laboratory for 3 consecutive days in the late afternoon. Subjects were asked to refrain from tobacco use 30 min prior to the laboratory session. At the beginning of each session, they submitted a saliva cotinine sample. If subjects reported any smokeless tobacco use within 30 min prior to the session they were asked to rinse their mouth to minimize contamination of the saliva sample. They were then issued a new tin of tobacco, which was weighed prior to and following its use. In addition, an expired-air carbon monoxide sample was obtained to ensure abstinence from cigarettes. Subjects were asked to record their use of smokeless tobacco on a self-report form while using smokeless tobacco on an ad lib. basis. For each dip of tobacco, subjects were to record the time of onset and completion (when they expelled the tobacco) of each dip. The 1st day was considered adaptation and this data was excluded, while the 2nd and 3rd days were used in the data analysis. The values for 2nd and 3rd days were averaged for the following topographical features: (1) number of dips; (2) inter-dip interval; (3) duration/dip; (4) total dip duration/day; (5) tobacco weight/dip (total tobacco weight dipped per day/number of dips per day); and (6) total tobacco weight dipped/day. To test for significant relationships between saliva cotinine levels and the various topographical features, Pearson correlation coefficients were employed. The temporal distribution of the use of smokeless tobacco was assessed by recording the percent of dips occurring in each of nine 2-h blocks starting at 8 a.m. and ending at 2:00 a.m. A one-way analysis of variance was performed on the data to determine whether time was significantly associated with pattern of smokeless tobacco use.

**Results**

The mean age of the male smokeless tobacco users was 20.7 years ( $SD \pm 1.9$ ). The mean number of tins/week was 2.8 ( $SD \pm 1.5$ ), mean duration of smokeless tobacco use was 5.2 years ( $SD \pm 2.4$ ), and mean age of onset of use was 16.2 years ( $SD \pm 2.3$ ).

The results showed that the mean number of dips/day was 6.3 ( $SD \pm 2.2$ ) with a range of 2.5–12.5. The mean inter-

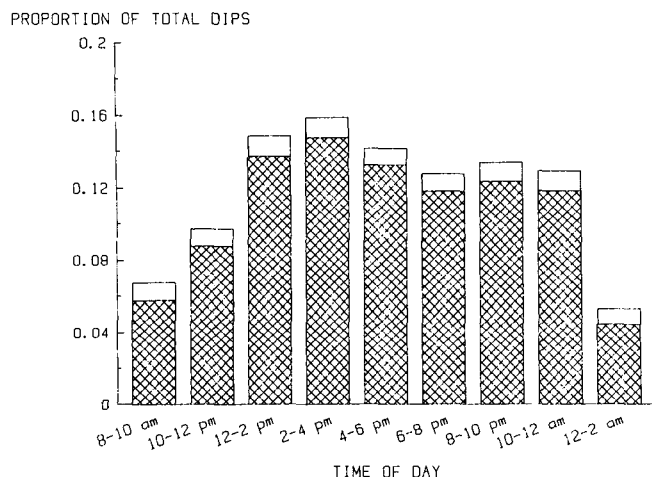


Fig. 1. Temporal analysis of smokeless tobacco use. □ Standard error; ■ mean

dip interval was 102.6 min ( $SD \pm 42.1$ ) with a range of 41.1–240.5 min. The mean duration/dip was 39.9 min ( $SD \pm 16.5$ ) with a range of 13.9–83.9 min. The mean total dip duration/day was, therefore, 254.6 min ( $SD \pm 129.3$ ) with a range of 41–588 min. The mean grams of tobacco/dip was 1.97 ( $SD \pm 0.96$ ) with a range of 0.62–5.91 g and mean total grams of tobacco used/day was 12.0 g ( $SD \pm 6.8$ ) with a range of 5.1–42.5 g. The mean saliva cotinine level was 280.22 ( $SD \pm 178.57$ ) ng/ml. There were significant relationships between saliva cotinine levels and number of dips/day ( $r = +0.53$ ,  $P < 0.001$ ), mean duration/dip ( $r = +0.36$ ,  $P < 0.01$ ), and total dip duration/day ( $r = +0.53$ ,  $P < 0.001$ ). There was a negative correlation between saliva cotinine and mean inter-dip interval ( $r = -0.42$ ,  $P < 0.005$ ). There were non-significant relationships between saliva cotinine and mean g/dip ( $r = 0.26$ ,  $P > 0.05$ ) and grams of smokeless tobacco used/day ( $r = -0.11$ ,  $P > 0.05$ ). Figure 1 shows the temporal distribution of the use of smokeless tobacco. The results showed that smokeless tobacco use was significantly associated with time of day ( $F = 37.3$ ,  $df = 494$ ,  $P < 0.0001$ ). There was a positively accelerating rate of use associated with the morning hours, a constant high-rate associated with the afternoon and evening hours, followed by a sharp decline in use around bedtime (see Fig. 1).

## Discussion

The results show that the average duration of exposure to smokeless tobacco is approximately 4.2 h per day. This is a clinically significant length of time given the carcinogenic nature of the substance. One individual had an average mouth exposure to smokeless tobacco of about 10 h/day. As in cigarette smoking, there appears to be great variability in the pattern of smokeless tobacco use between subjects, as evidenced by the range and standard deviations of the topographical variables. The topographical features which are the best correlates of nicotine exposure are the number

of dips/day, duration/dip, total dip duration/day, and the inter-dip interval. These results replicate those obtained from a previous study (Hatsukami et al. 1987). In that study, it was found that there were significant relationships between cotinine levels with duration of dips/day and number of dips/day. There was also no significant relationship found between saliva cotinine level and grams of tobacco used/day. Thus, the results from both studies confirm that frequency and durational components of smokeless tobacco use may be better predictors of nicotine exposure than the amount of tobacco used. That is, the amount of nicotine absorption is directly dependent on the duration and frequency of exposure to tobacco rather than the amount of tobacco used. The temporal pattern data shows that the highest frequency of smokeless tobacco use occurs during the afternoon and evening. Studies examining temporal variables among cigarette smokers show either no consistent control of temporal factors over cigarette smoking or significant intersubject variability in smoking pattern (Collins and Epstein 1978; Robinson and Young 1980; Morgan et al. 1985). The intersubject variability with regard to temporal events found among cigarette smokers may be present among smokeless tobacco users; however, it is also possible that smokeless tobacco users are a more homogeneous group or there are fewer restrictions involved in its use.

In conclusion, the correlation between smokeless tobacco use and cotinine is very similar to that found between cigarette smoking and cotinine (Zeidenberg et al. 1977). These results suggest that smokeless tobacco has the potential for producing dependence, as do cigarettes. Further evidence of the dependence producing potential of smokeless tobacco are the signs and symptoms of withdrawal observed from smokeless tobacco (Hatsukami et al. 1987). Since nicotine is the common drug in both tobacco products, it is possible that nicotine replacement therapy will be beneficial in the treatment of smokeless tobacco users.

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