Original Investigation

Tobacco Use Among Southwestern Alaska Native People

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Abstract

Introduction: We examined the characteristics, attitudes, beliefs, and exposure to tobacco products in a cohort of rural dwelling Alaska Native (AN) people.

Methods: We conducted a study of 400 of AN adult tobacco users and nonusers living in Southwestern Alaska. Questionnaires covered variables such as demographics, tobacco-use history, current tobacco use and dependence scales, general health status, attitudes and beliefs about tobacco, and quitting history.

Results: The study population smoked 7.8 cigarettes per day compared with 16.8 on average for the U.S. population: a significant proportion of the population engaged in dual use of cigarettes and smokeless tobacco products. Over one third (40.9%), first tried tobacco at age 11 or younger. The mean measures of tobacco addiction (e.g., Fagerstrom Test for Nicotine Dependence, Severson Scale of Smokeless Tobacco Dependence) scores were lower compared with other U.S. populations.

Conclusions: Very high tobacco-use prevalence, dual product use, and early tobacco use are observed in Southwestern AN people. Unexpectedly these did not appear to be correlated with heavier individual tobacco use or higher levels of addiction in this population.

Introduction

Although tobacco-use prevalence has decreased markedly among the overall U.S. population since the 1960s, substantial disparities persist by race/ethnicity, poverty, and educational status (Fagan, Moolchan, Lawrence, Fernander, & Ponder, 2007;

U.S. Department of Health and Human Services (U.S. DHSS), 1998). Tobacco-use rates reported for American Indian/Alaska Native (AN) youth and adults are substantially higher than those of any other racial/ethnic group (Centers for Disease Control and Prevention (CDC), 2004; CDC, 2006). Twice as many AN people are smokers compared with Alaska non-Natives or with the United States in general (41% vs. 20% vs. 21%) and smoking prevalence among AN adults has remained constant since the early 1990s (Alaska Native Epidemiology Center (ANEC, ANTHC), 2009; CDC, 2010).

Likewise while large regional differences exist among AN people in the use of smokeless tobacco (ST, from 3% to 34%), the statewide use rate among all AN adults is almost three times that of Alaska non-Native adults and the general U.S. adults rate (11% vs. 4% vs. 3.2%; ANEC, ANTHC, 2009; U.S. DHSS, 2008). In addition to the more conventional types of ST, AN people combine the ashes from a fungus (*Phellinus igniarius*, locally called punk or buluq) or from bushes or drift wood, with fire cured or air cured full leaf or twist tobacco, to make a homemade mixture known as iqmik. The ash increases the pH of the mixture, resulting in higher nicotine bioavailability and speed of absorption (Renner et al., 2005). Both commercial and homemade STs are used throughout Alaska; however, Eskimo people most commonly use iqmik (Alaska Department of Health and Social Services (AK DHSS), 2009; Hurt et al., 2005; Renner et al., 2004; Renner et al., 2005). The homemade ST, iqmik, was believed to be most commonly used by AN people in the southwest region of Alaska; however, the regional differences in prevalence were not revealed until after this study was launched. Behavioral Risk Factor Surveillance System (BRFSS) data now reveals that iqmik use is almost unique to the region just north of Bristol Bay (AK DHSS, 2009).

Unlike other Native Americans from the contiguous United States, tobacco has never been grown in Alaska, and AN people

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do not have a history of using tobacco products in religious or ceremonial ways (Renner, Patten, Day, Hurt, & Lanier, 2005).

The goal of this research effort, entitled “Nicotine Exposure and Metabolism (NEAM)” study was to (a) investigate the tobacco-use patterns; (b) describe exposure to nicotine- and tobacco-related carcinogens in AN adults who smoke cigarettes, use commercial ST, use iqmik, or use a combination of products (dual use); (c) characterize the rate of nicotine metabolism by measuring plasma or saliva 3'-hydroxycotinine: cotinine ratio and by assessing genes related to nicotine metabolism; and (d) quantify the nicotine- and tobacco-specific carcinogen content in cigarettes and commercial chew and iqmik. Here, we address the first goal.

Methods

Subject Recruitment

Participants ($N = 400$) were recruited from the Bristol Bay region, which encompasses 45,714 square miles and has 34 villages, many of which were accessed by small aircraft as they are not accessible by road. Ancestors of the native residents, Aleut, Athabascan, and Yupik people have resided in the area for centuries. Outreach performed through public radio announcements, communications from the Bristol Bay area Health Corporation (BBAHC) to communities, flyers posted in gathering areas, and VHF radio communications in the villages.

Participant Screening and Data Collection

Potential participants were screened to verify eligibility. Eligibility criteria: (a) Alaska Native with at least two grandparents who were AN; (b) age 19 or older; (c) self-report of good health; and (d) able to speak English or Yupik. Exclusion criteria: (a) currently taking medications used to treat seizure disorders, tuberculosis, or cancer; (b) currently involved in a tobacco cessation program or using nicotine replacement therapy; (c) pregnant; (d) used marijuana in the last 7 days; (e) consumed alcohol on the day of the study; or (f) used street drugs in the last 30 days. Current tobacco users needed to have used tobacco in the past 24 hr and regularly in the previous 30 days.

Subjects were recruited into the following mutually exclusive categories:

- Cigarette user: regular user of only manufactured cigarettes
- Commercial ST user: regular user of only commercial ST without ash/buluq
- Iqmik user: regular user of iqmik
- Dual tobacco users: regular user of both cigarettes and ST and/or iqmik
- Nonusers of tobacco: never user (<100 times), former user (≥ 100 times and no use in last year).

The questionnaire and consent form was designed with extensive input from BBAHC staff including, for example, characterizing physical activity questions to accurately represent those performed in a rural subsistence lifestyle.

Statistical Analysis

Comparisons between the tobacco groups for categorical questions were carried out using chi-square or Fisher's exact test. The one-way Analysis of Variance or the nonparametric Wilcoxon rank-sum test was used for continuous or ordered variables. All statistical analysis was performed using SAS version 9.2. A p -value < 0.05 indicated statistical significance.

Results

We recruited 163 cigarette users, 76 ST users, 20 iqmik users, 31 dual users (24 used cigarettes and ST, 3 used cigarettes and iqmik, and 4 used cigarettes, ST and iqmik), and 110 nonusers (28 never users and 82 former users). Demographic and work history data are shown in Table 1. About 90% of the participants were Yupik; ethnicity was defined by self-report, with information collected on the ethnic group of the grandparents.

The mean number of cigarettes smoked per day was lower among dual users (5.7) compared to exclusive cigarette smokers (7.8; $p = 0.004$). ST and iqmik users used >1 tin per week on average (Table 1). The mean duration of tobacco use for current users of any product was 17.3 years; about 40% of the study participants first tried tobacco at 11 years of age or younger and 50.7% tried tobacco between ages 12 and 17. The majority (53.6%) cigarette and ST users began regular use (at least five times per day) between ages 12 and 17. Dual users were more likely to both initiate (58.1%) and begin regular use (32.3%) at age 11 or younger. The mean Fagerstrom cigarette dependence scores were 2.6 among cigarette users and 1.9 among dual users, whereas the mean Severson ST dependence scores ranged from 0.7 to 5.5 among ST, iqmik, and dual users. The most popular brand of cigarettes smoked was Marlboro. Few people smoked “light” cigarettes (17%) or menthol cigarettes (5%).

Over 60% of cigarette smokers, ST users, and dual users had in the past made a quit attempt for at least 24 hr. The percentage of cigarette and ST users that indicated they had at some time, gone a year or more without tobacco use, was 20.2% and 17.1%, respectively. Fewer iqmik users reported having achieved this duration of abstinence (10.0%).

Almost all participants indicated that they had smoking bans at home (96.0%, Table 2), with no smoking exposure at home (93.2%) or work (97.3%) reported in the past week. The majority (91.3%) of the participants believed that no tobacco product is completely safe to use. Most (82.3%) believed that all tobacco products are equally harmful. When asked which tobacco product is safest to use during pregnancy, 85.8% indicated that no tobacco product is safe and all are equally dangerous; 8.0% indicated they did not know. Tables 1 and 2 describe other characteristics of this population.

Discussion

This study provides several novel findings about tobacco use among AN people of Southwestern Alaska, with the majority of the study population being Yupik. Although it was known that there is a high prevalence of multiple product use and an early age of tobacco use initiation among AN people (Renner et al.

Table 1. Demographics and Tobacco Use History and Type of Tobacco Use

Variables, mean (SD) or %	Cigarette user (n = 163)	Smokeless user (n = 76)	Iqmik user (n = 20)	Dual user (n = 31)	Nonuser (n = 110)	Total (n = 400)
Age (years)	36.0 (14.4)	39.2 (12.8)	42.9 (17.0)	28.8 (10.4)	45.0 (14.5)	38.9 (14.7)
Gender (female)	56.4	54.0	70.0	48.4	52.7	55.0
Education						
<High school	35.0	13.2	45.0	12.9	15.5	24.3
High school	47.9	73.7	50.0	71.0	44.5	53.8
>More than high school	17.2	13.2	5.0	16.1	40.0	22.0
Unemployed	50.3	42.1	50.0	41.9	33.6	43.5
Cultural ID as Yupik	86.5	96.1	100.0	96.8	87.3	90.0
AN grandparents (≥3)	95.7	98.7	100.0	93.5	95.5	96.3
Amount of use (cigs/day)	7.8 (5.2)			5.7 (3.0)		
Amount of use (tins/week)		1.6 (1.5)	1.2 (1.3)	1.3 (1.0) ^a 0.5 (0.0) ^b		
Age of tobacco initiation ^d						
≤11 years old	38.7	36.8	45.0	58.1	41.6	
12–17 years old	52.8	55.3	40.0	38.7	49.4	
≥18 years old	8.6	7.9	15.0	3.2	9.0	
Age of regular use initiation						
≤11 years old	10.4	10.5	20.0	32.3	8.9	
12–17 years old	58.9	57.9	45.0	45.2	59.5	
≥18 years old	30.7	31.6	35.0	19.4 ^e	31.6	
Duration of use (years)	17.9 (12.9)	17.7 (11.7)	13.8 (14.2)	12.8 (9.2) ^c 9.5 (9.3) ^a		
FTND total score	2.6 (2.1)			1.9 (1.9)		
First cigarette in morning ≤30 min	44.2			25.8		
Severson ST dependence total score		4.0 (3.3)	5.5 (3.3)	3.0 (4.1) ^a		
First ST use ≤30 min		11.8	25.0	0.7 (1.2) ^b 3.2		
Past use of cigarettes every day or almost every day	100.0	42.1	50.0	100.0	76.8*	
Past use of ST every day or almost every day ^f	27.0	100.0	50.0	93.6	47.6*	
Past use of iqmik every day or almost everyday	4.3	7.9	100.0	12.9	4.9*	
Type of cigarettes ^{g,h}						
Brand Camel	14.7			17.6		
Brand Marlboro	82.1			64.7		
Brand Other	4.2 ⁱ			17.6		
Lights (all brands)	19.0			5.9		
Mentholated (all brands)	2.1			23.5		
Type of smokeless tobacco						
Copenhagen		72.4		28.6		
Skoal		18.4		50.0		
Other		9.2		21.4		

Note. ^aSmokeless.

^bIqmik.

^cCigarettes.

^dFirst tried tobacco.

^e1 subject responded do not know.

^fDoes not include Iqmik.

^gSubject numbers are 95 for cigarette users and 17 for dual users.

^hSubject numbers are 76 for ST users and 28 for dual users.

ⁱOne cigarette-only user reported two different brands.

*Includes only the former users from the current nonusers.

2005), a significant portion of participants tried using tobacco at a very young age (11 years and younger). Early age of onset of smoking has been associated with heavy smoking, higher nicotine dependence, less interest in quitting, and greater risk of disease as an adult (Lando et al., 1999). However, in this

study population, the amount of tobacco consumed per day and dependence scores were relatively low. Among daily smokers, the mean number of cigarettes smoked was 7.8 compared with 16.8 for the U.S. population as a whole (CDC, 2005); similar lower levels of smoking among AN people and American Indians have

Table 2. Second Hand Smoke Exposure, Quit Attempts, Health Behaviors and Body Weight

Variables, %	Cigarette user (<i>n</i> = 163)	ST user (<i>n</i> = 76)	Iqmik user (<i>n</i> = 20)	Dual user (<i>n</i> = 31)	Nonuser (<i>n</i> = 110)	Total (<i>n</i> = 400)
Smoking ban at home	94.5	100.0	94.7	90.3	97.3	
No exposure to secondhand at work in past week if employed	97.5	97.7	100.0	88.9	98.6	
No smoke exposure at home or steambath in past week	89.6	98.7	89.5	90.3	96.4	
Ever quit cigs for 24 hr	74.8			67.7		
≥1 year without cigs	20.2			16.1		
Considering quitting cigs in next 30 days	27.6			35.5		
Ever quit ST for 24 hr		65.8		64.3		
≥1 year without ST		17.1		25.0		
Considering quitting ST in next 30 days		18.4		46.4		
Ever quit iqmik for 24 hr			55.0	14.3		
>1 year without iqmik			10.0	14.3		
Considering quitting iqmik in next 30 days			45.0	42.9		
What prompted quitting cigs						
Price	21.5			7.7		
Personal health problems	27.2			23.1		
Learned of risks	22.1			7.7		
What prompted quitting ST or Iqmik ^a						
Price		22.8	15.4	10.5		
Personal health problems		22.8	15.4	15.8		
Learned of risks		21.1	15.4	10.5		
Health provider asked about tobacco use in past year	77.8	73.7	60.0	61.3	84.2 ^b	
Told to quit by health provider in past year	38.9	32.9	40.0	35.5	1.2 ^b	
Alcohol						
0 days in the past 30 days	65.0	80.3	85.0	64.5	82.7	73.8
0 days in the past year	27.6	50.7	70.0	12.9	61.8	42.4
Self-reported health status						
Excellent	17.2	19.7	15.0	16.1	21.8	18.8
Good	65.0	64.5	60.0	48.4	54.6	60.5
Fair	17.2	15.8	25.0	35.5	21.8	20.0
Poor	0.6	0.0	0.0	0.0	1.8	0.8
Meets physical activity guidelines	64.2	72.4	65.0	76.7	70.9	68.6
BMI (<i>SD</i>)	28.5 (6.4)	30.0 (7.0)	28.9 (5.7)	28.4 (6.2)	31.0 (5.6)	29.5 (6.3)
BMI 25 to 29.9	31.1	32.9	26.3	32.3	28.4	30.6
BMI 30 or more	39.1	45.7	52.6	35.5	56.9	45.6

Note. ^aOnly two Iqmik users in the Dual group responded. They were excluded from the table.

^bIncludes only the former users from the current nonusers.

been reported (Eichner et al., 2005; U.S. DHHS, 1998). Mean Fagerström Test for Nicotine Dependence scores were 2.6 among cigarette users in this study, which represents a relatively low level of dependence.

Multiple product use was common in our subjects. A substantial proportion of ST and/or iqmik users also had smoked cigarettes daily or almost daily, and a substantial number of current and former cigarette smokers reported having had daily ST use at some point. Although our small sample of current dual users was more likely to experiment with, and begin regular use of, tobacco at an earlier age, current dual users showed lower dependence scores than users of cigarettes or ST alone. Other studies suggest that people who use both cigarettes and ST demonstrate higher nicotine exposure levels and find cessation even more difficult to achieve than those who use only ST or only smoke (Hatsukami & Severson, 1999; Spangler, Michielutte, Bell, Knick, Dignan, & Summerson, 2001; Wetter et al., 2002). In addition, some studies find that ST use is associated with the use of other tobacco

products. In particular, adolescents who use ST are more likely to progress to cigarette smoking (Angstman, 2007). Contributors to this dual use may be the high prevalence of ST use in general (even among women), varying high price of cigarettes sometimes as high as \$10 per pack, depending on the village, and the common practice of disallowing smoking indoors at work or at home.

The preferred choice of cigarette brands used by participants (Marlboro and Camel) matched national trends (McClave, Whitney, Thorne, Mariolis, Dube, & Engstrom, 2010; Substance Abuse and Mental Health Services Administration (SAMHSA), 2007). However, the prevalence of "light" (17%) and menthol (5%) cigarette use was substantially lower compared with the general population: 58% "lights" (Borland et al., 2004) and 34% menthol (SAMHSA, 2009). It is unclear whether this pattern reflects differences in taste preferences or is a result of product availability in rural Alaska; in the 16 villages where recruitment took place stores carried light and menthol products, with similar pricing compared with other products.

A notable number of tobacco users stated they wanted to quit tobacco use in the next 30 days: 28.9% of cigarette and dual users, 26.0% of ST and dual users, and 44.4% of iqmik and dual users. Most of the reasons for quitting focused on concern for the personal health or health of others, the pressure from family and friends, and the price of tobacco.

Overall awareness of the health risks associated with tobacco use and exposure was high among NEAM participants; almost all participants acknowledged that no tobacco products are completely safe and tobacco products are all equally dangerous to use during pregnancy. The majority of the participants did not perceive differences in harm across products, although fewer ST/iqmik tobacco users endorsed ST as safer. About 15% and 20% of ST and iqmik users, respectively, used these products rather than cigarettes because they believed they were safer. Indoor smoking bans at home and work were wide spread. Interestingly, 17% to 25% used ST or iqmik to prevent smoke exposure to children. These findings point out the importance of continuing to educate the population about the hazards of tobacco use on health. Using findings derived from local participants might prove particularly poignant to the community.

Limitations

There are various limitations to our study. We only studied AN people who volunteered from one region of southwest Alaska in Bristol Bay. Therefore, the results from this regional study may not be representative of the general population of AN people. Those who enrolled were principally Yupik, and there are many Alaska Native people in other areas of Alaska, who come from different tribes and ethnic backgrounds. Yupik people primarily inhabit the west coast of Alaska and make up over 30% of the Alaska Native population (Census 2010, http://www2.census.gov/geo/maps/special/AIANWall2010/AIAN_AK_2010.pdf). They are the largest Alaska Native tribal grouping, either alone or in combination with other races (34,000). Yupik also had the greatest number of people who identified with one tribal grouping and no other race (29,000; Census 2010, <http://2010.census.gov/news/releases/operations/cb12-cn06.html>). Even though the number of participants was relatively small, our paper provides new findings about these unique rural dwellers. There are no other published data on age of first exposure, risk perception, types of tobacco used including dual use, or nicotine dependence scores. Iqmik users were difficult to recruit because there are fewer numbers of AN who use this product in the recruitment villages; however, Yupik people in other regions have iqmik prevalence rates as high as 22% among adults and 18.3% of Alaska Native women reported prenatal ST or iqmik use during 2008 (AK DHSS, 2009; ANEC, ANTHC, 2009). Another limitation is the small sample sizes in certain categories of tobacco users, so statistical comparisons may not be informative due to limited power. Furthermore, participants enrolled in this study may not be generalizable to different subgroups of tobacco users and only reflect the characteristics of subjects interested in participating in a study. Dependence scores were assessed using scales developed for heavier smokers. It may be that the lower scores reflect a general low level of tobacco use, but not of low levels of dependence.

In summary, multiple product use and early onset did not appear correlated with heavier tobacco use or high levels of

addiction (using available dependence scales) in this population. As suggested, patterns of disparities in tobacco product use, exposure, and associated disease are complex and involve interactions among a range of factors (Fagan et al., 2007). Biological samples collected will provide further understanding of differences in exposure to nicotine and toxicants. The results from these analyses will further our understanding of product content and the impact of patterns of consumption and individual differences in rates of metabolism on levels of exposure. Our study will also help guide future studies and programs of tobacco cessation interventions among AN people.

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Declaration of Interests

Dorothy K. Hatsukami, Ph.D., of the University of Minnesota, was funded for by Nabi Biopharmaceuticals and NIDA to be a site for a multi-site clinical trial for a nicotine vaccine.

Dr. Rachel F. Tyndale owns shares and participates in Nicogen Research Inc., a company focused on novel smoking cessation treatment approaches. No Nicogen funds were used in this work and no other Nicogen participants reviewed the data. Dr. Tyndale has also consulted for one day for Novartis and McNeil. Dr. Neal L. Benowitz serves as a consultant to Pfizer Pharmaceuticals, Inc. and has been a paid expert witness in litigation against tobacco companies. This research was not supported by industry funds.

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