Smoking Cessation in a Prospective Study of Healthy Adult Males: Effects of Age, Time Period, And Amount Smoked

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Abstract: The present study examined effects on smoking cessation of three variables—chronological age, time period, and amount smoked—in 637 healthy male smokers aged 22–69 at baseline. Subjects were followed from 1962–1975 using life table procedures. Age was not significantly related to quitting rates ($p = .150$). The amount smoked effect approached significance ($p = .096$) with rates of quitting progressively lower at higher consumption levels. Powerful time-period effects were found ($p = .008$). Incidence rates of quitting increased from 1962–1970, after which a marked decline occurred. (*Am J Public Health* 1983; 73:446–450.)

Introduction

The reasons why some individuals have stopped smoking while others cannot stop are not well understood.[1–7] Differences between quitters and continuing smokers have been reported on some demographic, psychosocial, and behavioral variables, but these have been very small.[1,8–10] In addition, prospective studies which might elucidate relationships have been scarce.[1] We used data available from an ongoing prospective study of aging to clarify effects on quitting of three potentially important confounding variables: chronological age, time period, and amount smoked.

Findings have been equivocal with regard to age effects on quitting. Five prospective studies have found older subjects more likely to quit,[6,10–13] three found no age differences,[5,14,15] and one found younger subjects more likely to quit.[16] Only one prospective study of time period effects on quitting rates could be found, that of Gordon, *et al,*[10] who followed smokers from 1948–1970. With regard to amount smoked, there is increasing evidence that greater consumption is related to difficulty in quitting,[1,3,5,10,11,14,16–21] but this is not a universal finding,[12,22–26] and only three long-term studies have been available.[10,11,16] Our study will: 1) examine age effects on quitting; 2) partially replicate as well as extend the findings of Gordon, *et al,*[10] concerning time period effects by following subjects to the mid-1970s; 3) provide additional prospective data on amount smoked and quitting; and 4) examine interactive effects of predictor variables.

Materials and Methods

Subjects were from the Normative Aging Study (NAS), a longitudinal study of the Veterans Administration in Boston.[27,28] The 2,280 members of the NAS were selected from 6,000 applicants. All subjects had to pass a physical examination before entry and most are veterans. Subjects represent a middle-class sample of greater Boston males, with educational levels as follows: 14 per cent less than high school, 25 per cent high school graduates, 35 per cent some college training, and 26 per cent college graduates. Subjects entered the NAS from 1962–1970, with 99.3 per cent admitted by 1968. Participants have reported every 3–5 years for examinations during which some smoking information was recorded; supplementary smoking questionnaires were mailed in January 1973 and January 1976.

A total of 637 cigarette smokers at baseline (ages 22–69 years, median = 39.0) were considered in the present study. Continuing smokers were defined as those who smoked throughout their follow-up periods; quitters had to stop for at least one year and not resume smoking; recidivists ($n = 67$) were excluded. Subjects were followed while healthy. Sickness was defined as the onset of cancer ($n = 6$), heart disease ($n = 29$), chronic bronchitis ($n = 48$), or emphysema ($n = 9$) diagnosed from history or findings by an NAS physician. After exclusions for recidivism and illness, 524 subjects were followed for complete or partial periods of time in the analysis. Quitting dates were calculated from the 1973 (for quit events prior to 1973) or 1976 (for quit events between 1973 and 1976) smoking questionnaires. (Earlier assessments of smoking status did not record quitting dates.) Questionnaire assessments of smoking habits have been found quite reliable, especially as part of ongoing medical studies.[29]

Subjects were stratified by age and amount smoked and followed each month after entry using life table proce-

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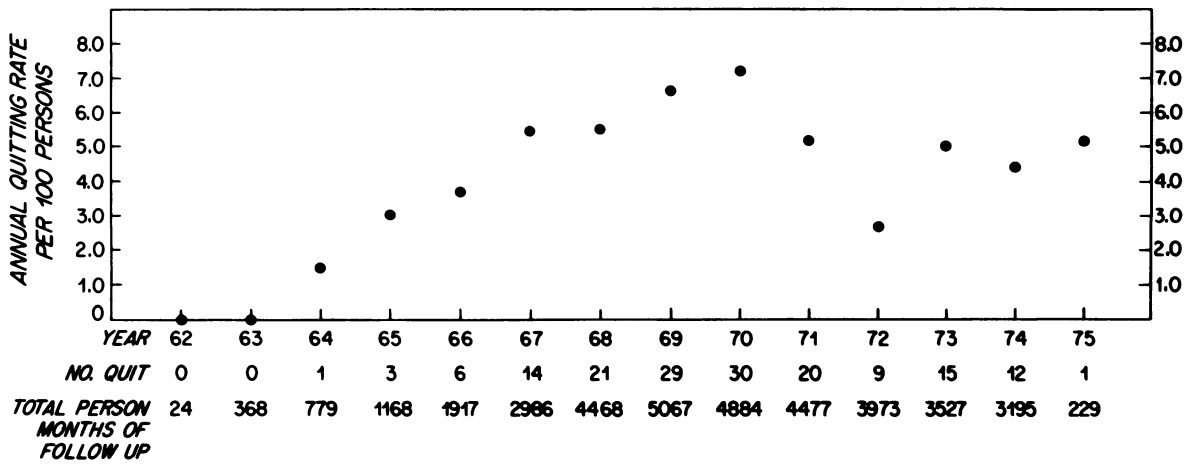

FIGURE 1—Annual Incidence Rates of Smoking Cessation, 1962–1975. Each yearly quitting rate was obtained by using the algorithm $100 \times [1 - (1 - p_i)^{12}]$, where p_i is the pooled average monthly quitting rate within a given year. p_i was obtained by dividing the number of quitters in a given year by the total person months of follow-up in that year.

dures.[30,31] Each subject was reclassified when either his age or smoking consumption changed enough to place him in a different classification. Thus age and smoking consumption were treated as dynamic variables. Significance testing was performed using the logrank procedure.[30–32]

Results

Annual rates of smoking cessation are shown in Figure 1. We tested the hypothesis that quitting rates were higher in the late 1960s and found time period effects highly significant (p = .008) as shown in Table 1. The effects of age on the probability of stopping smoking are also shown in Table 1. While those in the 40+ age group were more likely to quit, age effects did not reach significance (p = .150). Also not significant were interactive effects of age and time period (p = .208) (Table 1). We also divided subjects into three age groups: 20–39, 40–49, and 50+ years and found average annual quitting rates per 100 persons of 4.36, 5.45, and 5.64, respectively, but again these were not significantly different ($P_{\text{linear trend}} = .151$).

Baseline distributions of amounts smoked are presented in Table 2 and smoking cessation rates by amount smoked in Table 3. While lighter smokers had somewhat higher quitting rates, these were not significant (p = .123). Interactive effects of amount smoked and time period were also not significant (p = .494) (Table 3), nor were interactive effects of amount smoked and age group (p = .934) (Table 4). We also divided subjects into four consumption categories (Ta-

TABLE 1—Average Annual Rates of Smoking Cessation by Age Group and Time Period

	Age Group								
	20–39			40+			Totals		
Time Period	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons[1]	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons
1962–1966	6	2360	3.01	3	1753	2.03	9	4113	2.59
1967–1970	33	7341	5.26	60	9922	7.02	93	17263	6.28
1971–1975	12	4037	3.51	45	11248	4.70	57	15285	4.38
Totals	51	13738	4.36	108	22923	5.51	159	36661	5.08

[1]Each average annual quitting rate was obtained by using the algorithm $100 \times [1 - (1 - p_i)^{12}]$, where p_i is the pooled average monthly quitting rate within a time period-age group category. p_i was obtained by dividing the number of quitters in a given time period-age group category by the total person months of follow-up in that time period-age group category.

(A) Test of significance of Age Group Effects controlling for Time Period and Amount Smoked using the conditional logrank test for group heterogeneity:[31,32] $\lambda = 2.0706 \sim \chi_1^2$, p = .150

(B) Test of significance of Time Period Effects controlling for Age Group and Amount Smoked using the conditional logrank test for group heterogeneity: $\lambda = 9.7585 \sim \chi_2^2$, p = .008

(C) Test of significance for Interaction Effects of Age Group and Time Period controlling for Amount Smoked using a linear contrasts procedure:[31,32] $\lambda = 1.2582 \sim N(0,1)$, p = .208

TABLE 2—Baseline Distributions of Amounts Smoked per Day by Light and Heavy Cigarette Smokers

Light Smokers (≤1 pack/day)				Heavy Smokers (>1 pack/day)			
Amount Smoked (to the nearest tenth of a pack)	No. of Smokers	Per Cent	Cumulative Per Cent	Amount Smoked (to the nearest tenth of a pack)	No. of Smokers	Per Cent	Cumulative Per Cent
<0.1	1	0.2	0.2	1.2	1	0.2	60.1
0.1	9	1.7	1.9	1.3	11	2.1	62.2
0.2	6	1.2	3.1	1.5	103	19.9	82.1
0.3	14	2.7	5.8	1.7	1	0.2	82.3
0.4	2	0.4	6.2	1.8	4	0.8	83.0
0.5	41	7.9	14.1	2.0	67	12.9	96.0
0.6	1	0.2	14.3	2.5	15	2.9	98.8
0.7	10	1.9	16.2	3.0	6	1.2	100.0
0.8	23	4.4	20.6				
1.0	204	39.3	59.9				

TABLE 3—Average Annual Rates of Smoking Cessation by Amount Smoked and Time Period

	Amount Smoked								
	Light (≤1 pack/day)			Heavy (>1 pack/day)			Totals		
Time Period	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons[1]	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons
1962–1966	6	2309	3.07	3	1804	1.98	9	4113	2.59
1967–1970	63	10279	7.11	30	6984	5.03	93	17263	6.28
1971–1975	30	7565	4.66	27	7720	4.12	57	15285	4.38
Totals	99	20153	5.74	60	16508	4.28	159	36661	5.08

[1]Each average annual quitting rate was obtained using the algorithm $100\times[1-(1-p_j)^{12}]$, where p_j is the pooled average monthly quitting rate within an amount smoked-time period category. p_j was obtained by dividing the number of quitters in a given amount smoked-time period category by the total person months of follow-up in that amount smoked-time period category.

(A) Test of significance of Amount Smoked Effects controlling for Age Group and Time Period using the conditional logrank test for group heterogeneity: $\lambda = 2.3828 \sim \chi_1^2$, $p = .123$

(B) Test of significance for Interaction Effects of Amount Smoked and Time Period controlling for Age Group using a linear contrasts procedure: $\lambda = 0.6832 \sim N(0,1)$, $p = .494$

ble 5) and found the relationship between consumption level and quitting slightly stronger ($p = .096$) compared to dichotomizing consumption (Table 3).

Discussion

This prospective study found marked time period differences in smoking cessation, with rates of quitting rising in the late 1960s, followed by a significant decline in quitting rates during the period 1971–1975. There was also a trend for heavier cigarette consumption to be related to difficulty in quitting. The chronological age of a subject was not an important predictor of smoking cessation in our healthy population.

The highly significant time-period effects from our data are similar to those reported in cross-sectional surveys of the United States population[1] which found the decline in prevalence of smoking most significant during the period 1965–1970. Smaller declines in prevalence were observed nationally in the period 1971–1974. Our findings regarding smoking cessation rates in the 1960s are also similar to those found in the Framingham Study.[10] A smoking-status update to be completed by the NAS in 1983–84 will allow us to determine if smokers in the present study remained relatively resistant to quitting or followed the US population trend of greater quitting rates in the late 1970s.[1]

Our trend toward significance of amount smoked is consonant with results from longitudinal studies cited earlier.[10,11,16] In a study which used nearly the same consumption categories as ours,[10] quitting rates over an 18-year period ranged between 58 per cent for those who smoked 1–10 cigarettes/day and 36 per cent for those who consumed 40+ cigarettes/day. Our results showed a similar trend.

Since illness is related both to age and smoking cessation,[15,24,33–35] we hypothesized that perhaps a reason for the finding from other long-term studies[10,11] of greater quitting rates among older smokers might be because a greater proportion of these older smokers became sick, and that in the absence of illness quitting rates might not differ by age.

TABLE 4—Average Annual Rates of Smoking Cessation by Age Group and Amount Smoked

	Amount Smoked								
	Light (≤1 pack/day)			Heavy (>1 pack/day)			Totals		
Age	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons[1]	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons
20–39	34	7599	5.24	17	6139	3.27	51	13738	4.36
40+	65	12554	6.04	43	10369	4.86	108	22923	5.51
Totals	99	20153	5.74	60	16508	4.28	159	36661	5.08

[1]Each average annual quitting rate was obtained using the algorithm $100\times[1-(1-p_j)^{12}]$, where p_j is the pooled average monthly quitting rate within an age group-amount smoked category. p_j was obtained by dividing the number of quitters in a given age group-amount smoked category by the total person months of follow-up in that age group-amount smoked category.

(A) Test of significance for the Interaction Effects of Amount Smoked and Age Group controlling for Time Period using a linear contrasts procedure: $\lambda = -0.0831 \sim N(0,1)$, $p = .934$

TABLE 5—Average Annual Rates of Smoking Cessation in Four Smoking Consumption Categories

Smoking Consumption Category (Cigarettes/day)	No. Quit	Total Person Months of Follow-up	Average Annual Quitting Rate per 100 Persons[1]
1–10	23	4410	6.08
11–20	76	15743	5.64
21–30	35	9279	4.43
31+	25	7229	4.07

[1]Each average annual quitting rate was obtained using the algorithm $100\times[1-(1-p_j)^{12}]$, where p_j is the pooled average monthly quitting rate within a smoking consumption category. p_j was obtained by dividing the number of quitters in a given smoking consumption category by the total person months of follow-up in that smoking consumption category.

(A) Test of significance for trend[31] controlling for Age Group and Time Period: $\chi_1^2 = 2.7786$, $p = .096$

Support for this hypothesis emerged from our data on healthy individuals. An even better test would involve examination of age effects in a large general population within subgroups of healthy and sick subjects. This should reveal whether the inclusion of sick people (who are generally older) increases quitting rates in the older age groups.

ACKNOWLEDGMENTS

Support for this research was provided by the Medical Research Service of the Veterans Administration, by grant 455D from the Council for Tobacco Research, USA, and by PHS Grant Number R18 CA 29479 awarded by the National Cancer Institute, DHHS. The authors would like to thank their colleagues at the Normative Aging Study—Gary A. Borkan, PhD, David J. Ekerdt, PhD, Jerilyn W. Heinold, MPH, Jeremiah E. Silbert, MD, and David Sparrow, MS—for their helpful comments and suggestions on earlier drafts of this manuscript. An earlier version of this paper was presented at the Annual Scientific Meeting of the Gerontological Society of America, Toronto, Ontario, November 1981.

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Quantitative Relationships of *Candida albicans* Infections and Dressing Patterns in Nigerian Women

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Abstract: *Candida albicans* colony counts were far higher in patients with vaginitis wearing tight fitting clothing than in patients wearing loose fitting clothing. In Ile-Ife, Nigeria, tight fitting dresses, woolen and corduroy jeans, coupled with nylon underwear, appear to create an environment favorable to *Candida albicans* colonization. (*Am J Public Health* 1983; 73:450–452.)

Introduction

The increased prevalence and incidence of candidiasis has led to the need in clinical laboratory for searching for predisposing factors that are responsible for such widespread and increased incidence.

The incidence of candidiasis among both symptomatic and asymptomatic carriers has been reported to be between 20 per cent and 60 per cent.[1–5] For this reason, non-quantitative positive cultures are of questionable significance in the diagnosis of candidiasis. The present study was undertaken as a follow-up of our preliminary study on dressing patterns and incidence of candidiasis.[1] In this work we quantified positive cultures of *Candida albicans* in relationship to subjects' mode of dressing.

Materials and Methods

Three hundred and sixty-five patients complaining of soreness and vulvovaginitis were seen by us at the weekly clinics on sexually transmissible diseases in Ile-Ife, Nigeria, between February and November 1981.

The criteria for selection of patients into the study were as follows:

1) Patients should have regularly worn either tight or loose fitting clothing (see below) for 80 per cent of the time over a period of at least four weeks prior to the time of contact;

2) Patients should be wearing either silk, nylon, or cotton underwear at the time of the investigation;

3) Patients should manifest symptoms of vulvovaginitis including past or current vaginal discharge.

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