Smoking and Epidemic Influenza-Like Illness In Female Military Recruits: A Brief Survey

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Abstract: An outbreak of influenza-like disease caused illness among 48 per cent of 173 female military recruits, 35 per cent of whom smoked cigarettes. The risk of influenza-like illness was greater in smokers (60.0 per cent) than in nonsmokers (41.6 per cent), with a risk ratio of 1.44 (95 per cent CL 1.03-2.01). Among those ill, a significantly greater proportion of smokers visited the clinic than nonsmokers. This could have been due to more severe illness among smokers, or to a greater tendency to visit the physician. The proportion of influenza-like disease attributable to smoking in this population was 13 per cent. (*Am J Public Health* 1981; 71:530–532.)

Introduction

Several studies have shown an association between cigarette smoking and reported or recorded acute respiratory disease in young people (predominantly male),[1-5] while only one report has dealt specifically with young females.[6] A few studies (again mostly in males) have examined the relationship between smoking and epidemic influenza.[7-9] These have tended to show excess influenza morbidity or seroconversion in smokers.

Within the framework of an ongoing influenza surveillance program in the Israel Defense Forces (IDF), a sharp outbreak of influenza-like illness in a female recruit base in February 1979 afforded an opportunity to investigate the smoking-influenza relationship.

Methods

Two to three weeks after induction into the IDF, a unit consisting of 176 female recruits was interviewed in February 1979 using a standard self-administered questionnaire. This particular unit was chosen because a high morbidity of influenza-like disease had been reported and this population had not been immunized against the epidemic strain.

The recruits were asked questions concerning illness with a "flu-like disease" during their brief period of service during which an outbreak had taken place, whether they visited the base clinic and were examined by a physician, and whether they were hospitalized in a sick-room or hospital. Questions relating to their smoking habits were next asked and included present and past smoking status, number of cigarettes smoked per day, and age they began smoking.

Nasal and pharyngeal swabs taken from 14 patients during the outbreak did not yield influenza virus isolations. Paired sera could be obtained from only four subjects due to dispersal of the study population. The acute phase sera were negative (titer < 1:10) against A/USSR/90/77 (H_1N_1) antigen, while titers in the paired convalescent sera were 1:20 in one case and 1:10 in the other three.*

Influenza-like morbidity was classified as present or absent, and as mild (the subject reported flu-like illness but did not visit the doctor), moderate (subject visited doctor but was not hospitalized in the sick-room), and severe (hospitalized). Smoking status was dichotomized into nonsmokers (never and past smokers) and current smokers (occasional and regular smokers).

Significance was tested by Chi-square using Yates correction for continuity for 2 × 2 tables. Confidence limits for the risk ratio were calculated according to Miettinen,[10] and confidence limits for the population attributable risk according to Fleiss.[11]

Results

Of a total of 176 subjects interviewed, smoking data or morbidity data were missing in three cases, leaving 173 valid questionnaires for analysis. The attack rate of reported clinical influenza-like diseases was 48.0 per cent. Of the 83 cases, 24 were classified as mild (29 per cent), 22 as moderate (26 per cent), and 37 as severe (45 per cent). The proportion of smokers in the study population was 35 per cent. Of the 60 smokers, 34 per cent were classified as occasional (less than one cigarette per day), 36 per cent smoked up to 10 cigarettes per day, and 30 per cent smoked more than 10 cigarettes per day. The mean age of the recruits was 18.5 years.

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*During the period of this outbreak, outbreaks of a similar nature occurred in other bases in the IDF. From several of these, A/USSR (H_1N_1) like strains were isolated. No A/H_3N_2 or B influenza viruses were isolated in the IDF during the winter of 1978-1979. We assume that this outbreak was probably due to the A/H_1N_1 influenza subtype, although the evidence is not conclusive. The virological studies were performed at the WHO National Influenza Center, Ministry of Health Central Viral Laboratory, Jaffa, Israel.

TABLE 1—Reported Clinical Influenza-Like Morbidity by Smoking Status

	Smoker[1]		Nonsmoker[2]		Total
	N	%	N	%	N
Influenza-like disease	36	60.0	47	41.6	83
Healthy	24	40.0	66	58.4	90
Total	60	(100)	113	(100)	173

$\chi^2 = 4.61$ (with Yates correction), $p = 0.032$
[1]Smoker = occasional + regular smoker
[2]Nonsmoker = never + past smoker

The risk of contracting (reporting) influenza-like illness in smokers was 60.0 per cent while in nonsmokers was 41.6 per cent (see Table 1). This difference is statistically significant. The risk ratio is 1.44 (the estimated 95 per cent confidence limits lie between 1.03 and 2.01). No association was found between the duration of smoking and influenza-like illness, nor between the number of cigarettes smoked and such illness. However, the numbers involved are too small to detect any but very large differences. When the population was stratified by educational level (years of schooling), the difference in reported influenza morbidity between smokers and nonsmokers was consistent across strata.

When the severity of the flu-like illness, classified as mild, moderate, or severe (see methods), is examined by smoking status (Table 2), it is evident that a significant difference exists. Compared to nonsmokers, more than expected cases in smokers were of moderate severity and less than expected of mild severity. There was no difference in the severe category. When the χ^2 statistic is partitioned into χ^2 for a linear trend and χ^2 for departure from a trend, there is no significant overall trend for increasing severity of illness in smokers when contrasted with nonsmokers. When the cases are dichotomized into those who visited the clinic (moderate and severe categories) and those who did not (mild), visit clinic a significantly greater proportion of smokers reporting a flu-like disease were in the more severe category (i.e., visited the clinic) than nonsmokers ($\chi^2 = 4.40$; $p < 0.05$). Thus it appears that smokers are not only at a greater risk of becoming ill during an influenza-like epidemic, but tend to visit the doctor more frequently if ill than do nonsmokers (i.e., they may either be more severely ill or may utilize medical care more frequently).

TABLE 2—Severity of Influenza-Like Disease by Smoking Status

Severity of Influenza	Smoker		Nonsmoker		Total
	N	%	N	%	N
Mild	6	16.7	18	40.4	24
Moderate	14	38.9	8	14.9	22
Severe	16	44.4	21	44.7	37
Total	36	100.0	47	100.0	83

$\chi^2_{2df} = 6.98$, $p = 0.031$
χ^2_{1df} for a trend = 1.34 (N.S.)
χ^2_{1df} for departure from a trend = 5.663 ($p = 0.02$)

Calculation of the population attributable risk (the proportion of illness in the above population due to smoking) showed that an estimated 13 per cent of influenza-like morbidity could be attributed to smoking in these female recruits. Ninety-five per cent confidence limits lie between −9.9 per cent and 31.5 per cent, encompassing the zero.

Discussion

Information regarding influenza-like illness in the female recruits was self-reported. The validity of the questionnaire relating to clinic visits for flu-like diseases had been tested in male recruits about two months after a proven influenza outbreak.[12] In the earlier study, the sensitivity of the questionnaire, as compared with medical records, in identifying influenza-like illness leading to a physician contact, was 89 per cent and the specificity 95 per cent. The validity of sick room hospitalization reporting (included in the above) was considerably higher than that of ambulatory clinic physician visits that did not terminate in referral to the sick room. This is to be expected. The validity of reported flu-like disease not resulting in a clinic visit should be lower than for reported clinic visits. In the present study the interview was conducted at most two weeks after the event, when memory was still fresh. Therefore, we assume that in these female recruits the validity of the self-reported illness was probably considerably higher than that in the male recruits. The validity of reported clinic and sick room contacts did not differ between smokers and nonsmokers among the male recruits (unpublished data).

Nevertheless, it is possible that smokers both spuriously report more illness and seek medical care more frequently for the same degree of illness than nonsmokers, and that in fact there is no difference either in rates or in severity between smokers and nonsmokers. Either possibility alone cannot explain away the finding of both increased incidence and apparent increased severity in smokers. If smokers simply reported disease more commonly, although the underlying distribution in smokers and nonsmokers may be equal, one would expect the distribution of "severity" to be equal in both groups, or possibly less severe in the smokers because one might expect differences in reporting to be more probable for non clinic visits, i.e., the milder cases of acute respiratory disease. In male recruits the validity of reporting of physician contacts (i.e., the more severe cases) was equal in smokers and nonsmokers. If smokers reported illness equally commonly, but sought medical care more often than nonsmokers for the same degree of severity of condition, then the overall rate of influenza would not be greater than in the nonsmokers; only the "severity" would appear greater. Only both these biases operating together would produce the present finding. We consider this to be improbable, particularly in light of the consistency of this study finding with a larger and more detailed study of male

recruits which showed a similar excess of recorded acute respiratory illness in smokers in a proven A/H_1N_1 influenza outbreak with a similar trend toward increased severity (in preparation). Other reports of an excess influenza morbidity or seroconversion in smokers[7-9] support this finding.

We consider that our data add to the growing body of evidence implicating smoking in young people as an important contributor to acute illness (in addition to the well documented chronic effects) and that even relatively "light" smoking carries a health burden.

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Skin Color and Education Effects on Blood Pressure

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Abstract: This study reports that education effects but not skin color effects were associated with blood pressure and the incidence of hypertension in a cohort of Black females in Charleston, South Carolina, observed over the period 1960-1975. The authors suggest that skin color may be a secondary (non-causal) associate of blood pressure in Blacks. (*Am J Public Health* 1981; 71:532-534.)

Studies trying to elucidate causes of hypertension among Blacks have used the typical epidemiologic strategy of narrowing the focus from broad population groups to specific sub-groups and cultures. Initially, racial differences were identified showing Blacks with a markedly higher prevalence of hypertension than whites [1-3]; skin color has been considered as a possible genetic marker of hypertension.[4-6] More recently, we presented evidence among Black males that skin color effects on the incidence of hypertension were minimal when estimates of socioeconomic status (SES) were considered.[1] We here present further evidence of a similar nature in a population of Black females in Charleston, South Carolina.

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Materials and Methods

The study group was a random sampling of 455 Black females age 35 or older, in 1960. Seventy per cent of the survivors of this sampling were revisited in 1974 and 1975. Complete information on the original sampling has been published previously.[1] Baseline skin pigmentation estimates by light reflectance was measured at the medial aspect of the inner surface of the upper arm, a body area normally shielded from direct sunlight, yet accessible for measurement. The Photoelectric Reflection Meter, Model 610,* using an amber (tristimulus) filter, was used to make all measurements. A scale of 0 to 45 was used: the higher the number, the more reflectance from skin of lighter color (a lightly suntanned Caucasian would have a reflectance value of 40-

*Photovolt Corporation (NYC).