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« FRUIT AND VEGETABLES CONSUMPTION AND CIGARETTE SMOKING »

Editorial

Only connect, E M Forster's dictum on the complexities of life, applies equally well to public health. Fruit and vegetables bring benefits when part of a balanced diet, a balanced diet is heavily determined by the exercise we take and any health improvements will be severely undermined if we don't also avoid tobacco, treat alcohol with caution and embrace safer sexual practices. And yet all too often we hunker down in our disciplinary silos – nutrition, tobacco control, sexual health - ignoring these obvious linkages.

This month's Newsletter escapes this trap with three insightful papers on the numerous connections between smoking and F&V consumption. Giovino presents a longitudinal study showing that higher levels of fruit and vegetable consumption among smokers predicts quitting. He goes on to posit some fascinating biological explanations for this.

Dauchet and Poisson remind us of the well-established links between smoking and diet, but, despite initial success, were unable to establish a causative link between F&V consumption and quitting smoking. Intriguingly though, they raise a broader explanation for the links that have been established, suggesting that both F&V consumption and quitting cigarettes may be driven by a general inclination towards healthy behaviour.

Finally Gibault uses data from Thailand to show that the story is dynamic: not only is smoking cessation linked to healthier diets, and indeed other healthy behaviour, but this becomes more marked over time. The longer someone is quit for, the healthier their other behaviours become.

Between them, the three papers confirm the interconnectivity of our work. In doing so, they remind us that in the final analysis public health is not about behaviours, it's about people.

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Fruit and vegetable consumption might influence cigarette smoking cessation

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Background

Cross-sectional studies consistently demonstrate that people who smoke cigarettes ("current smokers") eat less nutritious diets than do people who used to smoke regularly and quit ("former smokers") and persons who never became established smokers ("never smokers")[1,2]. More specifically, fruit and vegetable consumption (FVC) is consistently lower among current smokers than among former and never smokers. This behavioral pattern might simply indicate a stronger health orientation among non-smokers than among current smokers. The relationship might also be biological. Data from cross-sectional studies do not allow us to determine the direction of the relationship between FVC and cigarette smoking. For example, smokers who quit might switch to eating more fruits and vegetables after they quit compared to those who continue smoking. Alternatively, smokers who eat more fruits and vegetables might be more likely to quit. To better understand the nature of the known cross-sectional relationship, we conducted a longitudinal study to determine if FVC actually predicts cessation among a cohort of 751 current smokers[2].

The longitudinal study

We surveyed (by telephone) 1,000 current smokers throughout the United States who were at least 25 years old and asked them about their smoking habits, levels of nicotine dependence, frequency of consumption of fruits and vegetables (using the questions from the 2003 Behavioral Risk Factor Surveillance System), and other important health behaviors (such as how much they exercised, whether they drank alcohol excessively, and whether they used illicit drugs). We also asked them to tell us their age, gender, race/ethnicity, educational attainment, and household income. We looked at fruit consumption, vegetable consumption, and total FVC, dividing each of these measures into quartiles. We re-contacted 751 of our 1,000 baseline respondents (75.1% response rate) 14 months later to determine if they were abstinent from cigarettes and all other tobacco product for at least 30 days.

Fruit and vegetable consumption and nicotine dependence

Indicators of nicotine dependence included smoking at least 20 cigarettes each day, smoking the first cigarette of the day within 30 minutes of awakening, and a score of at least nine on a modified version of the Nicotine Dependence Syndrome Scale. Those in the highest three quartiles of fruit consumption were less likely to exhibit all three indicators of nicotine dependence than those in the lowest quartile. Those in the highest quartile of vegetable consumption were less likely to exhibit any indicator of dependence than those in the lowest quartile. And those in the highest two quartiles of FVC scored lower on all three indicators of dependence than those in the lowest quartile of FVC.

Fruits and vegetable consumption and quitting smoking

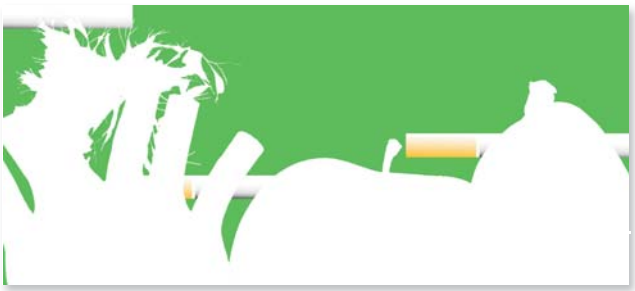
We assessed the probability of quitting smoking in a multivariable analysis that statistically controlled for age, gender, race/ethnicity, education, income, heavy drinking, street drug use, and exercise. Smokers who at baseline ate the most fruits and vegetables (Quartile 4) were more likely to be abstinent from cigarettes and all other tobacco products than were those who ate the fewest servings of fruits and vegetables (Quartile 1). The adjusted odds ratio was 3.05 ($p < 0.01$).

Possible explanations

Several biological mechanisms might explain our findings. One is palatability. Previous research indicates that high FVC may worsen the perceived taste of cigarettes[3]. Another is via reward systems in the brain. Fruit sugars may stimulate dopamine levels and thus reduce the perceived need for a cigarette (nicotine also stimulates dopamine). A third potential mechanism is that high levels of FVC might reduce levels of depression, which has been associated with relapse to smoking among persons attempting to quit. A fourth possible explanation involves satiety. Feelings of hunger for food may be confused with cigarette cravings. Since FVC is a major determinant of satiety, higher levels of satiety might reduce cigarette cravings. Finally, high FVC (and water) reduce constipation, which is a withdrawal symptom for some people trying to quit smoking.

Future work

Additional cohort studies are needed to determine if these findings replicate. They should incorporate other food groups as well. In addition, experimental studies are needed to rule out the possibility of unmeasured factors influencing our observational findings.



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Fruit and vegetable consumption and smoking cessation

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Smoking cessation: a confounding factor insufficiently taken into account?

It is very difficult, even impossible, to conduct randomised trials on just one food or a group of foods such as fruits and vegetables (F&V). The evidence in humans is based primarily on observational cohort studies[1] and these studies have shown decreased cardiovascular risks in association with the consumption of F&V[2,3,4]. But these statistical associations are not proof of a causal link (do F&V really protect from cardiovascular risks?). Nutrition is linked to numerous characteristics (confounding factors) in individuals (socio-economic level, alcohol consumption, smoking, physical activity, etc). Certain confounding factors are probably ignored or insufficiently accounted for in data analysis. Smoking represents an important confounding factor since it is strongly linked to cardiovascular risk. Smoking cessation is associated with a rapid return to normal risk levels. Among the 31 studies we evaluated, 29 adjusted for smoking/non-smoking status[5], but the smoking levels are often assessed only upon inclusion whereas follow-up continued over several years. Only two cohorts from the same team[6,7] were reassessed for smoking levels at different times during follow-up.

F&V and coronary artery diseases: a different relationship in smokers and non-smokers?

In the PRIME cohort (étude PRospective de l'Infarctus du MyocardE - Prospective Epidemiological Study of Myocardial Infarction), we observed a decreased risk of acute coronary artery diseases in smokers but not in non smokers[8]. These results could be explained by the lack of adjustment for smoking status evolution. It is possible that smokers who ate more F&V upon study inclusion were also the most health conscious among the smokers and thus more willing to stop smoking to reduce their cardiovascular risk.

F&V consumption associated with a greater chance of smoking cessation: the PRIME study.

To test this hypothesis, we evaluated whether consumption of F&V in smokers measured upon study inclusion, would be associated with smoking cessation after 10 years of follow-up[5]. This information could be obtained only in Lille and Belfast.

The PRIME study began in 1991 in populations from four WHO-MONICA centers in Belfast (Northern Ireland), Lille (Northern France), Strasbourg (Eastern France) and Toulouse (South-Western France). The goal was to recruit 2,500 men aged 50–59 years to study cardiovascular risk factors. F&V consumption was measured upon study inclusion using a food frequency questionnaire. Smoking status was determined upon inclusion based on the responses to questions concerning present and past habits. A participant's smoking habits were investigated by means of a questionnaire sent by post after a 10-year follow-up period (in 2001). Quitters were defined as non-smokers in the last questionnaire.

Among the PRIME subjects, we analysed data from 1,056 smokers upon inclusion (580 in Lille and 476 in Belfast). After 10 years 70.7% of the smoker had quit in Lille and 37.8% in Belfast.

After adjusting for centre, consumption of F&V was associated with quitting (odds ratio (OR) for high versus low F&V intake: 1.73; 95% confidence interval (CI): (1.22–2.45); P-trend =0.002). After adjustment for socio-demographic factors, body mass index and medical diet, the association was still statistically significant (OR: 1.59; 95% CI (1.12–2.27); P-trend=0.01). In a model fully adjusted for age, smoking intensity, alcohol consumption and physical activity, the association was no longer significant (OR: 1.36; 95% CI (0.94–1.97); P=0.14).

Direct protective effect from F&V or "overall healthy behaviour"?

These studies suggest that smoking cessation may at least partially explain the observed reduction in the average size of red blood cells measured as MCV (Mean Corpuscular Volume) in F&V consumers in cohort studies, thus complicating the causal interpretation of the association.

Although the association between F&V consumption and smoking cessation is not significant after full statistical adjustment, these results illustrate the difficulties in distinguishing between the direct effect of F&V consumption and those of "healthy behaviours" - including smoking cessation – often adopted by F&V consumers.

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Influence of smoking cessation duration on health-related behaviours in former Thai smokers: NHES IV study data

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Numerous studies have shown that smokers have less healthy behaviours than ex or non- smokers. Thus, regular smokers eat fewer fruits and vegetables and tend to skip breakfast. On the other hand, ex and non-smokers drink less alcohol, exercise more, feel better about their health and have fewer chronic diseases.

However, ex-smokers require more medical care than non-smokers. It is possible that smoking cessation duration influences health-related behaviours in ex-smokers. Since this has never been investigated, a team of Thai researchers has analysed the relationship between the duration of smoking cessation and health-related behaviours.

Almost 20,000 subjects analyzed

The authors used a sample from the fourth National Health Examination Surveys (NHES) that are conducted in Thailand every five years. The NHES IV study was conducted between 2008 and 2009 and included 19,371 subjects from 15 to 98 years of age. Their diet was analysed using a frequency questionnaire, as well as meal composition, the eventual use of dietary supplements, alcohol consumption, physical activity, smoking history and any tobacco-related diseases.

Subjects were divided into four age groups (15-30 years, 31-45 years, 46-60 years, over 60 years). They were further divided into "non-smokers", "ex-smokers" (arbitrarily separated into three groups according to the duration of smoking cessation: less than one year, 1 to 10 years and more than 10 years) and "regular smokers".

More fruits and breakfast in ex-smokers for over 10 years

In this Thai population, the prevalence of "regular", ex" and "non-smokers" were 22.3% (42.3% (men) vs. 4.3% (women)), 12% and 67.7%, respectively. Approximately 60% of the current smokers had attempted to quit and failed. The study showed that 96.6% of smokers who succeeded in their withdrawal did so without any medication or medical advice.

Regardless of their smoking status, at least 50% of all subjects ate more than three servings of vegetables, legumes and meat daily. Less than one-third ate more than two servings of fruit daily. The consumption of dairy products, soy drinks and whole grain cereals was low, particularly in smokers and ex smokers.

However, there was a continuous and statistically significant trend in favour of fruits, dairy products, soy drinks, whole grains, dietary supplements, breakfast and regularly three meals per day in non smokers and ex-smokers for over 10 years.

A clear relationship between the duration of smoking cessation and health-related behaviours

This study, in accordance with other investigations, confirms that ex-smokers have better health-related behaviours than smokers. Our study has revealed a relationship between the duration of smoking cessation and the consumption of fruits, legumes, meat, dairy products, soy drinks and whole grain cereals. Minimal differences were observed for vegetables. This could be explained by the fact that in Thailand, vegetables are already integrated into daily culinary habits; they are not expensive and easily available. Finally, the lower alcohol consumption in non smokers versus smokers reflects the close relationships between alcohol and tobacco consumption.

This study is one of the first to explore the relationships between the duration of smoking cessation and the evolution of health-related behaviours: longer smoking cessation (> 10 years) is associated with improved health-related behaviours in ex-smokers.

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