

The Global Fruit & Veg Newsletter



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Fruit and vegetables: still surprising!

Most people are aware of the recommendations for fruit and vegetable consumption, but few apply them and even fewer know why! And yet the list of benefits is long. Their consumption is associated with a lower prevalence of obesity, diabetes, cardiovascular diseases, cerebrovascular accidents, hypertension, cancer, age-related cognitive decline and age-related macular degeneration.

Fruit and vegetables have plenty of surprises in store! Surprising benefits have come to light. People who consume large amounts of fruit and vegetables are less likely to smoke. If they smoke, they are less dependent on cigarettes, if they consume more fruit and vegetables, and are more inclined to quit smoking. Depression rates are lower: but more research is needed to understand the mechanisms.

Likewise, in older subjects, particularly women, those who consume fewer fruit and vegetables (≤ 1 portion/day) are at increased risk of femoral neck fractures compared to those who consume > 3 to ≤ 5 portions/day. Bones benefit in many ways: vitamins C and K, polyphenols, etc. and a better lifestyle must not be overlooked either (physical activity, overall nutrition, etc.).

Finally, the new geriatric concept of frailty is dramatically reduced in those who consume lots of fruit and vegetables. Is this a marker or a contributing factor? We have found, for example, that elderly people who eat more fruit and vegetables eat more of everything! So many benefits. So many benefits!

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Acknowledgement to
250 contributors since 2006

January 2014 : T. Gibault; SN. Bleich; SA. Kim; L. Ball (Health food consumption and strategies for practitioners)

February 2014 : C. Soussin; C. Hartmann; A. Flego; M. Caraher (Cooking skills: a tool for a healthy diet)

March 2014: DA. Greenaway L. Kim; MA. Chiasson & colleagues; DY. Chen, JA. Gazmararian (WIC: Latest advances)

April 2014: R. Varraso & CA. Camargo Jr ; P. Ellwood & I. Asher; J. Protudjer and collaborators; LG Wood (Update on Diet and Asthma)

May 2014: J. Breda; M. Leenders, B. Bueno-de-Mesquita & colleagues; A. Bellavia; Z. Kabir (F&V consumption and life expectancy in Europe)

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Implications of F&V intake on depression and cigarette smoking

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Knowledge continues to expand on the benefits of fruit and vegetables (F&V) intake for health. There is longstanding evidence that a diet high in F&V is protective against chronic disease, mental illness, and promotes overall physical and mental health^{1,2}. As we discuss in this article, several recent studies suggest that F&V might influence tobacco and drug use prevention. We further outline possible neurobiological and psychological mechanisms of explanation.

F&Vs, depression, and cigarette smoking

Through background literature review in the study this article is based on, we present a history of research finding inverse associations between F&V and cigarette smoking, F&V and depression, as well as depression and smoking cessation. For example, F&V intake has been associated with depressive symptom reduction³, smoking cessation⁴, and persons with a depression history have been found to have a lower odds of quitting smoking than persons without a depression history⁵.

F&V moderates the depressive symptom and smoking association

In our recent study, we found that among smokers with higher F&V intake, there was no association between depressive symptoms and smoking frequency, nor with smoking cessation over time. However, among smokers with lower F&V there was a positive association between depressive symptoms and smoking frequency and an inverse association with smoking cessation. That is, among smokers with lower F&V intake, those with higher depressive symptoms smoked more and had a lower likelihood of quitting smoking over time. These associations persisted after adjustment for other health-related behaviors and common demographics.

The cut-off for the moderation effect with smoking frequency, in cross-sectional analyses, was further aligned with general recommendations for F&V intake at 4.9 times per day. This could correlate coincidentally or scientifically with the general 5 servings or cups per day recommendation for F&V intake. The longitudinal threshold was very low at F&V 1.2 times per day in association with smoking cessation. This aligns with our earlier study among a different national sample where we observed a longitudinal low threshold for effect (F&V 1.9 times per day) for an association with smoking cessation⁴. We also observed in the prior study that F&V was inversely associated with 3 different measures of nicotine dependence (higher F&V, lower dependence on nicotine). Nicotine dependence is further associated with depression.

These longitudinal findings and nicotine dependence associations may explain the cross-sectional findings. There might be fewer smokers with high F&V intake if depressive symptoms are being removed as an

impediment to cessation. The low threshold also suggests that only a small change may be needed to facilitate smoking cessation with F&Vs, warranting further experimental research to test these hypotheses. The most clear and tangible explanation for our findings exist in the neurobiology of food intake, drug use, mood, and mental health.

Neurobiology behind the F&V, depression, and smoking association

Both smoking and consumption of sweet tasting foods such as fruit promote dopamine release and feelings of pleasure or positive affect and reduce negative affect, promoting or inhibiting some depressive symptoms. Either behavior could reduce the desire to consume the other such as has been observed where eating fruit can reduce perceived enjoyment of a subsequent cigarette (e.g., make the cigarette taste worse). Chemicals in fruit such as vitamin C also interact with the dopaminergic system. Serotonin is further known to mediate the effect of dopamine and moderate mood and feelings of negative affect. Both F&V and smoking have been found to be monoamine oxidase inhibitors, which increase levels of dopamine and serotonin by inhibiting the action of monoamine oxidase. Higher F&V intake could be hypothesized to act as an alternative MAO inhibitor to smoking, thereby attenuating or possibly eliminating the smoking-depression association. The references and mechanisms described in this paragraph are presented and discussed in further detail in the publication this article is based on.

Conclusions and recommendations

Given our findings in the context of the underlying neurobiology, high F&V consumption may reduce the influence of depression or depressive symptoms, which impede smoking cessation. The neurobiological mechanisms collectively suggest that smokers with higher F&V intake may be less likely to reach for a cigarette for reasons of greater positive affect and lower negative affect. A best next step in research would be to conduct an experimental study to test whether increasing F&V intake might help smokers quit. This would be especially relevant among a sample of persons with a history of depression or intense withdrawal symptoms. Given the various health benefits of F&V, we further recommend that smokers increase F&V intake themselves at healthy levels to see if it helps to improve mood and makes it easier for them to quit, in consultation with their doctor or dietician as appropriate. For example, reach for fruit or vegetables instead of cigarettes and eat fruit or vegetables at every meal. In considering these associations between F&V, depression, and smoking as well as the underlying neurobiology, similar protective associations may exist among F&V and other mental illnesses and addictions.

Based on: Haibach JP, Homish GG, Collins RL, Ambrosone CB, Giovino GA. Fruit and vegetable consumption as a moderator of the association between depressive symptoms and cigarette smoking. *Substance Abuse*. 2016;37(4):571-578.

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Fruit and Vegetable Intake and Hip Fracture Risk: The CHANCES Project*

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Hip fractures constitute a major and growing public health problem among older adults worldwide. Hip fractures are associated with considerable disability and reduced survival and, although they represent less than 20% of all osteoporotic fractures, they account for the majority of fracture-related health care expenditure and mortality in men and women over the age of fifty¹. Among environmental factors amenable to change, diet may play an important role in hip fracture prevention.

Fruit and vegetable intake and hip fracture risk

High fruit and vegetable (F&V) intake has been associated with increased bone mineral density, decreased bone loss and reduced bone turnover, as well as, reduced incidence of hip fractures and fractures in other sites²⁻⁴. These associations are based on observational studies, mostly not prospective in design, conducted among community-dwelling elderly populations and post-menopausal women. In order to explore further the role of F&V intake in hip fracture risk, we have tested the hypothesis that high intake of F&V may be associated with reduced incidence of hip fracture in a large sample of older men and women from Europe and the United States (US) who were followed-up prospectively until the diagnosis of hip fracture.

Study design

The Consortium on Health and Ageing: Network of Cohorts in Europe and the United States (CHANCES) provided a unique opportunity to investigate the specific hypothesis using harmonized, defined within the consortium, data⁵. CHANCES is a collaborative, large scale, integrating project funded by the European Commission within the Seventh Framework Programme and coordinated by Hellenic Health Foundation in Greece (<http://www.chancesfp7.eu>). A total of 142,018 individuals (among which 116,509 women), aged ≥ 60 years old, from five prospective cohorts with relevant data participating in CHANCES: European Prospective Investigation into cancer and Nutrition (EPIC)-Elderly Greece and EPIC-Elderly Umea from Sweden, the Swedish Mammography Cohort (SMC) and the Cohort Of Swedish Men (COSM) studies and the Nurses' Health Study (NHS) from US were included in the study. F&V intake was assessed by validated, cohort-specific, food-frequency questionnaires. During follow-up a total of 5,552 incident hip fractures were recorded. Hip fractures were further ascertained through national patient registers or telephone interviews/questionnaires. For the purpose of this analysis F&V intake was expressed in servings/day. The size of the serving was set to 80 grams in the Greek and Swedish

cohorts, whereas in NHS, servings ranged in grams according to the specific F&V. Adjusted hazard ratios (HR) derived by Cox proportional-hazards regression were estimated for each cohort and subsequently pooled using random-effects meta-analysis.

Low F&V intake is associated with increased hip fracture incidence in comparison to moderate intakes

We found that individuals with low daily intake of F&V equivalent to one or less servings had a 39% higher risk of hip fracture in comparison to individuals with moderate daily intakes ranging from more than three to five servings [pooled adjusted HR:1.39, 95% Confidence Intervals (CIs): 1.20, 1.58]. Intakes of more than five servings/day were not associated with lower hip fracture risk. With respect to daily intake of vegetables alone, intake of one serving or less was associated with a 12% higher hip fracture risk in comparison to intake of more than one to three servings/day (pooled adjusted HR:1.12, 95% CIs: 1.03 to 1.21), whereas intake of similar servings of fruit was not associated with hip fracture risk. These findings derived after controlling for important potential confounders such as physical activity, body mass index, alcohol and energy intake, smoking and parameters of socio-economic status, were consistent across the cohorts and were more evident among women.

Several underlying biological mechanisms have been proposed in order to explain the potential beneficial effects of F&V in hip fracture prevention. Components abundant in these foods with antioxidant (e.g. vitamins A, C, E, K, carotenoids) and anti-inflammatory properties (e.g. flavonoids) seem to be involved in the bone remodeling sequence or in body's inflammatory response. Both oxidative stress and inflammation have been implicated in the pathogenesis of bone loss⁶⁻⁸. Furthermore, the beneficial effects of F&V on health in general, seem to be attributed to the synergies of their bioactive components and their interaction with whole foods, as well as to the specific amounts consumed and not to the intake of individual nutrients as shown in clinical trials evaluating the health effects of specific dietary supplements⁹.

Conclusions

Based on the findings of this study daily consumption of moderate amounts of F&V may prevent hip fractures in older adults. Also, older adults that consume one or less servings of F&V per day may benefit from raising their intakes to moderate amounts in order to reduce their hip fracture risk.

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Based on: Benetou V, Orfanos P, Feskanich D, Michaëlsson K, Pettersson-Kymmer U, Eriksson S, Grodstein F, Wolk A, Bellavia A, Ahmed LA, Boffeta P, Trichopoulos A (2016). Fruit and Vegetable Intake and Hip Fracture Incidence in Older Men and Women: The CHANCES Project. *J Bone Miner Res*, 31(9):1743-52.

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Consumption of fruit and vegetables and risk of frailty: a dose-response analysis of three prospective cohorts of community-dwelling older adults

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Consumption of fruit and vegetables during adulthood has been associated with a decreased risk of several chronic diseases (i.e. heart disease, stroke or cancer) and a decreased mortality risk. However, very few studies have evaluated the potential health benefits of consuming these foods among older adults. In this context, our study aimed to evaluate the potential dose-response association between fruit and vegetables consumption and risk of frailty among community-dwelling older adults.

3 independent cohorts of community-dwelling older adults

We used data from 3 independent European cohorts:

- the Seniors-ENRICA cohort (n = 1872),
- the Three-City (3C) Bordeaux cohort(n = 581), and
- the Integrated Multidisciplinary Approach (AMI) cohort (n = 473),

and meta-analyzed their results using random-effect models. At baseline, information on fruit and vegetable consumption was assessed with a validated computerized diet history in the Seniors-ENRICA cohort, and with a semi-quantitative food-frequency questionnaire in the 3C Bordeaux and AMI cohorts.

A portion of fruit was defined as 120g and a portion of vegetables as 150g.

Incident frailty was defined as the presence of at least three of five Fried criteria:

- exhaustion,
- low physical activity,
- muscle weakness,
- slowness and
- unintentional weight loss.

Lower risk of frailty with 3 portions of fruit/day and 2 portions of vegetables/ day

Our results showed an inverse dose-response relation between fruit and vegetables intake and risk of frailty. Although decreased risks were observed starting at three portions of fruit and vegetables per day, the strongest association was obtained with at least five portions (three portions of fruit/day and two portions of vegetables/ day). We also observed that fruit intake was inversely associated with risk of exhaustion, low physical activity and slow walking speed; while vegetable intake was inversely associated with risk of exhaustion and unintentional weight loss.



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Consumption of FV is associated with lower risk of frailty, and most benefit is obtained with three portions of fruit/day and two portions of vegetables/day. Public health messages should inform older adults to consume at least three portions of fruit and vegetables per day



**"3 portions of fruit/day
and 2 portions of vegetables/day"**

Reference

García-Esquinas E, Rahi B, Peres K, Colpo M, Dartigues JF, Bandinelli S, Feart C, Rodríguez-Artalejo F. Consumption of fruit and vegetables and risk of frailty: a dose-response analysis of 3 prospective cohorts of community-dwelling older adults. *Am J Clin Nutr.* 2016 Jul;104(1):132-42.