Original article

Low compliance with dietary recommendations for food intake among adults

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SUMMARY

Background & aims: To assess the adherence to the national dietary recommendations and to identify factors contributing to dietary compliance in Switzerland.
Methods: Population-based cross-sectional study in Lausanne, Switzerland (CoLaus study), 2009–2012. Dietary intake was assessed using a validated food frequency questionnaire. Participants were dichotomized according to whether they followed the national recommendations for fruits, vegetables, meat, fish and dairy products.
Results: Data from 4371 participants (54% women, mean age ± SD: 57.6 ± 10.5 years) were analyzed. Compliance with the recommendations was low: only 39.4%, 7.1%, 61.3%, 66.4%, and 8.4% complied with the Swiss recommendations for fruit ($\geq$2/day), vegetables ($\geq$3/day), meat ($\leq$5/week), fish ($\geq$1/week) and dairy products ($\geq$3/day), respectively. In multivariate analyses, gender, age, smoking status, Swiss-born status, education, being on a diet and body mass index were associated with dietary compliance, while no difference was found between women before and after menopause. Factors specifically associated with fruits, vegetables, meat, fish or dairy products recommendations were identified.
Conclusion: The low degree of compliance with dietary recommendations calls for a continued effort to increase the population awareness of the importance of a healthy and balanced diet, especially for vegetables and dairy products. This study identified determinants that should guide this effort.

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1. Introduction

Diet is one of the main determinants of health[1] and food consumption patterns are a major modifiable risk factor for cardiovascular disease, diabetes, and some cancers.[2] Adherence to dietary guidelines is associated with significantly better health outcomes.[3] Thus individuals are encouraged to improve their dietary quality by decreasing the consumption of certain types of foods and to increase the consumption of others such as fruits and vegetables.[4]

Switzerland is a small European country characterized by a high health status.[5] In a previous study, we have shown that, between 1961 and 2007, daily caloric supply did not change, while cereals and fruit availability declined and sugars availability increased.[6] In the 2002 National Interview Survey it was observed that almost one third (31%) of the people living in Switzerland did not consider the quality of their diet as important.[7] Further, data from the 2007 National Health Survey indicated low compliance rates among subjects aged 15–24 years particularly for vegetables and dairy products.[8] Still, little if no information exists regarding dietary compliance for other age groups. Hence, we used data from the CoLaus (Cohorte Lausannoise) follow-up study conducted between 2009 and 2012 to assess the rates of and the factors associated with compliance to the dietary recommendations for the Swiss population.

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2. Methods

2.1. Sampling

The CoLaus Study was designed to assess the prevalence of cardiovascular risk factors (hypertension, diabetes, dyslipidemia, obesity and smoking) and to identify new molecular determinants of these risk factors in the population from Lausanne (Switzerland). The study was approved by the Institutional Ethics Committee of the University of Lausanne and all participants provided written informed consent. The sampling methodology of the CoLaus study has been reported previously.[9] The complete list of the Lausanne inhabitants (total population 126'821 in 2003) aged 35–75 years ($n = 56,694$ in 2003) was provided by the population register of the city and served to sample the participants to the study. Although Geneva and Lausanne are geographically really close and similar with respect to many aspects, Lausanne is smaller than Geneva (136'288 vs. 191'964 inhabitants, respectively, data for 2011) and has a slightly lower percentage of foreigners (40.5 vs. 46.7%, respectively, data for 2011). All subjects living in the city of Lausanne in 2003 for more than 90 days have their name included in this register. A simple, non-stratified random selection of 19,830 subjects, corresponding to 35% of the source population, was drawn, and a letter inviting the addressee to participate in the study was sent to these individuals. Subjects who volunteered to participate were contacted by phone within 14 days by one of the staff members to set up an appointment. Subjects who didn't answer were sent a second invitation letter. If no answer was obtained, they were contacted by phone. Subjects were considered as non-participants if they refused to participate and as nonresponders if contact couldn't be made after two successive letters and three successive phone calls. Individuals who didn't live in Lausanne any longer, who were dead or who didn't meet the age criteria were considered as noneligible. Recruitment began in June 2003 and ended in May 2006. Participation rate was 41%.

In their original consent letter, participants were informed of a potential follow-up study. Approximately 96% gave permission and were re-contacted. Prior to the follow-up interview, participants received the detailed information letter and consent forms. The follow-up visit was performed five years after the baseline study. Similarly to the baseline evaluation, the follow-up investigation included an interview, a physical exam, blood analysis and a set of questionnaires.

2.2. Data collected

Participants were asked to attend the outpatient clinic at the Center Hospitalier Universitaire Vaudois (CHUV) in the morning after an overnight fast. They had to take their medication as usual. Data were collected by trained field interviewers in a single visit lasting about 60 min. Dietary assessment was included in the first questionnaire, which was mailed with the appointment letter and completed by the participant prior to the morning visit. This first questionnaire was then quickly reviewed and a second questionnaire on incidence of cardiovascular events and hormonal status for women was administered prior to clinical measurements and blood collection.

Body weight and height were measured with participants standing without shoes in light indoor clothing. Body weight was measured in kilograms to the nearest 0.1 kg using a Seca™ scale (Seca, Hamburg, Germany). Height was measured to the nearest 5 mm using a Seca™ height gauge (Seca, Hamburg, Germany). Body mass index (BMI) was defined as weight/height.[2] Obesity was defined as BMI $\geq$30 kg/m^2, overweight as BMI $\geq$25 kg/m^2 and <30 kg/m^2 and normal weight as BMI <25 kg/m^2. Smoking status was grouped into never, former and current smoker. Age was categorized into 4 groups: [40–49], [50–59], [60–69] and >70 years old. Educational level was grouped into primary, secondary and university level. Swiss nationality was defined as being born in Switzerland. Menopause was defined as the absence of menstruations, but no information on perimenopause was collected.

2.3. Dietary intake and compliance with dietary recommendations

Dietary intake was assessed with a self-administered semi quantitative food frequency questionnaire which covers the 4 weeks prior to the day of data collection. The questionnaire was developed and validated in the general adult population of Geneva, Switzerland. It includes a list of about 80 food items and three different serving sizes for each item, and food intake data can be converted into daily energy and nutrient intakes.[10] The questionnaire was applied at follow-up. At the time of the analysis, 4602 participants had been followed, of whom 4371 (95%) had adequately completed (<10 unanswered questions) the FFQ questionnaire. A participant was considered as being on a diet if she/he answered positively to any of the items "weight loss diet", "low fat diet" "no sugar/diabetic diet", "no salt diet" or "other diet".

Reported frequencies were transformed into daily consumption frequencies as follows: "never these last 4 weeks" = 0; "once/month" = 1/28; "2–3/month" = 2.5/28; "1–2/week" = 1.5/7; "3–4 times/week" = 3.5/7; "once/day" = 1 and "2+/day" = 2.5. The frequency of consumption of one food category was obtained by summing up all individual consumption frequencies of foods related to that category. For example, daily fruit consumption was obtained by summing up the daily consumptions of fresh fruits (5 items) and fruit juices (fresh and processed without added sugar).

Participants were dichotomized according to whether they followed the dietary recommendations for fruits, vegetables, meat, fish and dairy products from the Swiss Society of Nutrition.[11] The recommendations were the following: $\geq$2 fruit portions/day; $\geq$3 vegetable portions per day; $\leq$5 portions meat per week; $\geq$1 portion fish per week and $\geq$3 portions dairy products per day (Supplementary Table 1). The recommendations for dairy products are similar to those from other countries.[12,13]

2.4. Statistical analysis

Statistical analyses were performed with Stata version 12 (Stata Corporation, College Station, TX, USA). Results were expressed as mean $\pm$ standard deviation (SD) or percentages.

Several factors potentially associated with dietary compliance were selected from the literature[13–17] and included gender, age, BMI categories, smoking status, educational level and being on a diet. Further, as a substantial proportion of Lausanne inhabitants is non-Swiss, it was decided to assess compliance according to Swiss and non-Swiss nationality. Indeed, it was supposed that Swiss nationals might be more aware of their national guidelines than foreigners.

Bivariate analyses were performed using Student's *t*-test for continuous data and chi-square test for categorical data. All factors significantly associated with dietary recommendations were included in a multivariate analysis using logistic regression and the results were expressed as odds-ratio (OR) and 95% confidence interval. Statistical significance was considered for $p < 0.05$.

3. Results

3.1. Participant characteristics

Data from 4371 participants (54% women) aged between 40 and 82 years at follow-up (mean $\pm$ SD: 57.6 $\pm$ 10.5 years) were analyzed.