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Lessons learned? Changes in dietary behavior after a coronary event.

Running title: Changes in diet after a coronary event

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ABSTRACT

Background and aims: a healthy diet is recommended for the prevention of coronary artery disease (CAD), but whereas patients with CAD adhere to a healthy diet is unclear. We aimed to assess the impact of a CAD event on dietary intake.

Methods: prospective, population-based, observational study conducted between 2009 and 2017. Dietary intake was assessed using a validated food frequency questionnaire. Three comparisons were performed: 1) between participants with history of CAD and gender- and age-matched controls; 2) before and after the occurrence of a CAD event, and 3) between participants with an incident CAD event and gender- and age-matched controls.

Results: in analysis 1), after multivariable adjustment, participants with history of CAD had a lower total energy intake than controls (adjusted mean±standard error: 1833±36 vs. 1940±26 kcal/day, p=0.022), while no difference was found for all other dietary markers. In analysis 2) (n=87) total energy intake increased (1927±593 vs. 2100±700 kcal/day before and after the event, respectively, p=0.029) and prevalence of low fat diet decreased (35.6% vs. 21.8%, p=0.036), while no difference was found for all other dietary markers. In analysis 3), participants with incident CAD had higher vegetable protein intake (adjusted mean±standard error 4.8±0.1 vs. 4.5±0.1% of total energy intake, p=0.028), AHEI score (34±1 vs. 31±1, p=0.032), and complied more frequently with vegetables guidelines [odds ratio and 95% confidence interval; 7.64 (1.06-55.2)] than controls, while no differences were found for all other dietary markers

Conclusions: in Switzerland, secondary prevention of CAD by diet is seldom implemented.

Abstract word count: 247

Keywords: prospective study; secondary prevention; coronary artery disease; diet; dietary guidelines.

Introduction

Patients who present with nonfatal cardiovascular disease (CVD)(i.e. coronary artery disease (CAD) or stroke) are urged to adopt healthy lifestyles to prevent recurrence of disease [1]. Such lifestyles include the absence of smoking, a healthy diet [2] and increasing physical activity [3, 4]. Adequate rehabilitation after a CHD event reduces mortality and recurrent events [5-7], however, the reduction in mortality appears to be restricted to before-after studies [8]. Guidelines regarding the secondary prevention of CAD [9] and stroke [10] have been issued. Still, it has been estimated that less than one third of patients with CVD does not benefit from rehabilitation interventions [11], and Switzerland is not an exception [12].

Studies assessing changes in dietary behavior after a CVD event and their effect are relatively scarce [13]. In the EUROASPIRE study, a large study encompassing 24 European countries, most (>70%) coronary patients reported trying to change their diet by reducing their consumption of salt, fat and sugar, and by increasing their consumption of fruits and fish [14], a finding also reported elsewhere [15, 16]. Still, in the EUROASPIRE study, almost half of obese patients had not followed dietary recommendations since their coronary event and the smoking rate remained high [14]. Further, no significant improvement in smoking and a 7% increase in obesity levels was found between 1999 and 2013 [17]. Noteworthy, no information on dietary intake was available.

Thus, we aimed to compare the dietary intake between subjects who presented with a non-fatal CAD event and gender- and age-matched controls using data from the CoLaus study. Our hypothesis was that, despite a serious and life-threatening event, no changes in dietary intake would occur.

MATERIALS AND METHODS

Participants

The CoLaus study is a population-based study assessing the clinical, biological and genetic determinants of cardiovascular disease in the city of Lausanne, Switzerland. Its aims and sampling strategy have been reported previously [18].

Recruitment began in June 2003 and ended in May 2006, enrolling 6733 total participants who underwent an interview, a physical exam, and a blood analysis. The first follow-up was performed between April 2009 and September 2012, 5.6 years on average after the collection of baseline data; the second follow-up was performed between May 2014 and April 2017, 10.9 years on average after the collection of baseline data. The information collected was similar to that collected in the baseline examination, except that dietary assessment was also performed. Hence, for this study, only data from the follow-up examinations was used.

Dietary intake

Dietary intake of the previous 4 weeks was assessed using a validated, self-administered, semi-quantitative FFQ that also included portion size [19]. This FFQ consists of 97 different food items that account for more than 90% of the intake of calories, proteins, fat, carbohydrates, alcohol, cholesterol, vitamin D and retinol, and 85% of fibre, carotene and iron. For each item, consumption frequencies ranging from "less than once during the last 4 weeks" to "2 or more times per day" were provided, and the participants indicated the average serving size (smaller, equal or bigger) compared to a reference size. Each participant brought along her/his filled-in FFQ, which was checked for completion by trained interviewers the day of the visit.

Three dietary scores were computed, two based on the Mediterranean diet, the third on a modification of the alternative healthy eating index (AHEI). The first Mediterranean dietary score (hereby designated as "Mediterranean score 1") was derived from Trichopoulou et al. [20], the score ranges between zero and eight. The second Mediterranean dietary score (hereby designated as

"Mediterranean score 2") is adapted to the Swiss population and was computed according to Vormund et al. [21]. Contrary to the score from Trichopoulou et al, dairy products are considered as beneficial. The score thus ranges between zero and nine. The AHEI was adapted from McCullough et al. [22]. In our study, the amount of *trans* fat could not be assessed, and we considered all participants taking multivitamins as taking them for a duration ≥5 years. Thus, the modified AHEI score ranged between 2.5 and 77.5 instead of 2.5 and 87.5 for the original AHEI score [22]. For all three scores, higher values represented a healthier diet.

Naïve dietary patterns were derived using principal components analysis (PCA) based on food consumption frequencies. Three dietary patterns were identified: "Meat & fries", "Fruits & Vegetables" and "Fatty & sugary". Detailed description of assessment and characteristics of the dietary patterns is provided elsewhere [23].

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 [24]. The recommendations were ≥2 fruit portions/day; ≥3 vegetable portions/day; ≤5 meat portions/week; ≥1 fish portion/week and ≥3 dairy products portions/day. As the FFQ queried about fresh and fried fish, two categories were considered: one included and one excluded fried fish. Participants were further dichotomized if they complied with at least three recommendations or not; two categories of compliance to at least three recommendations were created, depending on the type of fish consumed (all or fresh only).

Presence of an on-going diet was assessed by questionnaire. Diets a) to reduce; b) low in fat; c) low in sugar / for diabetes, and d) low in salt were considered.

Coronary artery disease

Prevalent and incident coronary artery events were recorded through a stepwise process. Firstly, relevant medical records were collected in participants who declared, during the baseline and/or follow-up examinations, to have presented a CVD and/or CVD-related procedure during their lifetime, including MI, angina pectoris, stroke, arrhythmia, cardiomyopathy, coronarography and/or percutaneous transluminal coronary angioplasty (PCA) and/or coronary stenting, and coronary artery bypass grafting (CABG). The records were collected from general practitioners, cardiologists, neurologists and/or hospitals (as appropriate), and encompassed medical and/or surgical notes, laboratory, radiological, echocardiographic and electrocardiographic reports. If necessary, the original coronarography (angiogram) and brain CT/MRI exams were collected. Secondly, to retrieve events that may not have been mentioned during interviews, we searched the central medical database of the University Hospital of Lausanne, which corresponds to the main community hospital in the catchment area of the study. Participants with hospital records were identified cross-checking with administrative data and events of interest were detected using the following ICD-10 (International Classification of diseases, Tenth Edition) codes: I20.0, I21.-, I22.-, I24.-, I25.1-, I25.2-, I25.5, I25.6, I25.8, I25.9, I61.-, I62.-, I63.-, I64, I69.1, I69.2, I69.3, I69.4, I69.8, and G45.-. Thirdly, death was established using the population register of the city where the participant was living in case of returned mail, absence of response when calling and/or indication from a relative. Information on its cause was in order and selectively collected from: 1) general practitioners; 2) medical database of the hospital where the death occurred (either in Switzerland or abroad); 3) database of the pre-hospital emergency care unit of the City of Lausanne; 4) database of the University Centre of Legal Medicine of Lausanne and Geneva; 5) official death certificates from the Swiss governmental agency providing death statistics; 6) verbal autopsy with a relative of the dead participant, if all previous steps failed.

Non-fatal MI and other coronary artery disease (CAD) were adjudicated by two cardiologists based mainly upon an international expert consensus document [25]. Unstable angina (UA) was included into MI category in order to correspond with the clinical ‘acute coronary syndrome’ entity. Diagnosis of UA was based upon the record of a consultation (either outpatient or inpatient) for worsening symptoms and resulting in a change in antianginal medication, unless troponin values were positive. CAD corresponded to subjects who presented typical symptoms (stable angina) and underwent either percutaneous (PCA ± stenting) or surgical (CABG) revascularizations, unless these procedures were directly related to a MI.

History of coronary artery disease at first follow-up was defined as incident cases of CAD between baseline and follow-up and previous history of CAD. Incident cases were defined as an event that occurred between the first and the second follow-up.

Covariates

Smoking status (never smokers, ex-smokers, current smokers) was self-reported. Marital status was categorized as living alone (i.e. being single, divorced and widowed) or in couple (i.e. married or cohabiting). Educational level was categorized as high (university), middle (high school) and low (apprenticeship and mandatory). Participants indicated which medicines they were currently taking, and the following dichotomous categories were created: antihypertensives, hypolipidemics and antidiabetics.

Body weight and height were measured with participants barefoot and in light indoor clothes. Body weight was measured in kilograms to the nearest 100 g using a Seca® scale (Hamburg, Germany). Height was measured to the nearest 5 mm using a Seca® (Hamburg, Germany) height gauge. Body mass index (BMI) was computed and categorized into normal (<25 kg/m^2), overweight (25-29.9 kg/m^2) and obese (≥ 30 kg/m^2).

Matching

Matching was performed on gender and age using the **rangejoin** command of Stata. A first matching was performed using a ±1 year constraint. If no controls could be found, the constraint was relaxed to ±2 years.

Statistical analysis

Three analyses were performed. The first analysis compared dietary intake at first follow-up between participants with history of CAD and gender- and age-matched controls. The second analysis compared dietary intake at second follow-up between participants who presented with an incident CAD event between the first and the second follow-up and gender- and age-matched controls devoid of history of CAD. The third analysis compared dietary markers at first and second follow-up among participants who presented with an incident CAD event.

Statistical analyses were performed using Stata version 15.1 for windows (Stata Corp, College Station, Texas, USA). Descriptive results were expressed as number of participants (percentage) for categorical variables or as average standard deviation for continuous variables. For the first and second analyses, bivariate comparisons between cases and controls were performed using chi-square or Fisher's exact test for qualitative variables and Student's t-test for continuous variables. Multivariate analyses were performed using conditional logistic regression for categorical variables and the results were expressed as Odds ratio (OR) and 95% confidence interval (CI); for continuous variables, multivariable analyses were performed using a mixed model were the matching group was included in the random part of the model; variable to adjust for were selected based on previous literature and univariate analyses. Multivariable models were adjusted for living in couple (yes, no), educational level (high, middle, low), body mass index (normal, overweight, obese), smoking (never, former, current), and antihypertensive, hypolipidemic and antidiabetic drug treatments.

For the third analyses, exact Mc Nemar's test for categorical variables and paired student's t-test for continuous variables were used. Due to the number of tests performed, statistical significance was assessed for a two-sided test with $p<0.005$.

Exclusion criteria

For the first analysis, participants were excluded if they 1) lacked dietary information; 2) had a total energy intake (TEI) <850 or >4500 kcal/day; 3) lacked any covariate and 4) could not be matched (for participants with CAD). For the second analysis, participants were excluded if they 1) had no follow-up; 2) lacked dietary information; 3) had a total energy intake (TEI) <850 or >4500 kcal/day; 4) lacked any covariate and 5) had a previous history of CAD (for participants without incident CAD). For the third analysis, participants were excluded if they 1) lacked dietary information; 2) had a total energy intake (TEI) <850 or >4500 kcal/day at first or second follow-ups.

Ethical statement

The institutional Ethics Committee of the University of Lausanne, which afterwards became the Ethics Commission of Canton Vaud (www.cer-vd.ch) approved the baseline CoLaus study (reference 16/03, decisions of 13th January and 10th February 2003); the approval was renewed for the first (reference 33/09, decision of 23rd February 2009) and the second (reference 26/14, decision of 11th March 2014) follow-up. All participants gave their signed informed consent before entering the study.

RESULTS

Characteristics of participants

The selection procedure of the participants for the first and the second analyses is provided in **supplementary figures 1 and 2**. The socio-demographic and clinical characteristics of cases and controls for the first analysis is provided in **table 1** and for second analysis in **supplementary table 1**. For the first analysis, cases tended to be slightly older, had a lower educational level, a higher BMI, a higher prevalence of former smokers, and a higher prevalence of antihypertensive, hypolipidemic and antidiabetic drugs than controls (**Table 1**). For the second analysis, cases had a higher prevalence of antihypertensive and hypolipidemic drugs than controls, while no differences were found for all other variables studied (**Supplementary table 1**).

	Controls	Cases	P-value
Sample size	661	356	
Women (%)	277 (41.9)	148 (41.6)	0.918
Age (years)	65.0 ± 9.3	66.2 ± 9.2	0.052
Living in couple (%)	418 (63.2)	210 (59.0)	0.184
Educational level (%)			<0.001
High	117 (17.7)	43 (12.1)	
Middle	206 (31.2)	78 (21.9)	
Low	338 (51.1)	235 (66.0)	
Body mass index	26.1 ± 4.2	27.7 ± 4.8	<0.001
Body mass index categories (%)			<0.001
Normal	275 (41.6)	103 (28.9)	
Overweight	288 (43.6)	160 (44.9)	
Obese	98 (14.8)	93 (26.1)	
Smoking status (%)			0.001
Never	286 (43.3)	112 (31.5)	
Former	264 (39.9)	183 (51.4)	
Current	111 (16.8)	61 (17.1)	
Treatments (%)			
Antihypertensive	223 (33.7)	249 (69.9)	<0.001
Hypolipidemic	146 (22.1)	211 (59.3)	<0.001
Antidiabetic	50 (7.6)	53 (14.9)	<0.001

Table 1: socio-demographic and clinical characteristics of participants with history of coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland.

Results are expressed as number (percentage) for categorical variables or as average ± standard deviation for continuous variables. Between-group comparisons were performed using chi-square for categorical variables and student's t-test for continuous variables.

Dietary intake among participants with history of coronary artery disease

Dietary intake among participants with history of CAD and gender- and age-matched controls is summarized in **tables 2** (bivariate) and **3** (multivariable). On bivariate analysis, cases had a lower total energy intake and lower levels of the Mediterranean dietary score, the AHEI and the “Fruits & Vegetables” dietary pattern than controls; conversely, cases had a higher prevalence of low fat and low sugar/diabetic diets and scored less than controls in the “Pastries & fat” dietary pattern (**Table 2**). After multivariable analysis, cases had a lower total energy intake than controls, while no difference was found for all other dietary markers (**Table 3**).

	Controls	Cases	P-value
Sample size	N=661	N=356	
Total energy intake (kcalories/day)	1946 ± 643	1821 ± 634	0.003
Macronutrients (% TEI)			
Total protein	15.0 ± 2.9	15.0 ± 2.9	0.663
Vegetable protein	4.7 ± 1.2	4.8 ± 1.3	0.812
Animal protein	10.2 ± 3.3	10.3 ± 3.3	0.765
Total carbohydrates	46.6 ± 8.9	47.1 ± 9.6	0.407
Monosaccharides	22.9 ± 8.0	23.2 ± 9.1	0.633
Polysaccharides	23.5 ± 7.7	23.8 ± 8.8	0.627
Total fat	33.9 ± 6.8	33.1 ± 7.0	0.080
Saturated	12.7 ± 3.5	12.3 ± 3.6	0.055
Monounsaturated	13.4 ± 3.5	13.0 ± 3.5	0.159
Polyunsaturated	4.8 ± 1.6	4.9 ± 1.6	0.719
Dietary scores			
Mediterranean §	4.1 ± 1.5	4.1 ± 1.5	0.515
Mediterranean §§	4.8 ± 1.8	4.5 ± 2.0	0.019
AHEI	33 ± 10	31 ± 10	0.011
Dietary patterns	N=630	N=327	
Meat & Chips	-0.07 ± 1.09	-0.06 ± 1.16	0.866
Fruits & Vegetables	0.07 ± 1.61	-0.18 ± 1.56	0.022
Pastries & Fat	0.19 ± 1.42	-0.06 ± 1.37	0.009
Compliance to dietary guidelines	N=661	N=356	
Fruits	323 (48.9)	160 (44.9)	0.232
Vegetables	50 (7.6)	27 (7.6)	0.991
Meat	413 (62.5)	230 (64.6)	0.503
Fish	435 (65.8)	245 (68.8)	0.331
Fish §	264 (39.9)	127 (35.7)	0.182
Dairy	62 (9.4)	24 (6.7)	0.149
At least three	184 (27.8)	94 (26.4)	0.625
At least three §	133 (20.1)	63 (17.7)	0.350
Presence of a diet			
To reduce	42 (6.4)	18 (5.1)	0.402

Low fat	144 (21.8)	117 (32.9)	<0.001
Low sugar / for diabetes	52 (7.9)	55 (15.5)	<0.001
Low salt	34 (5.1)	28 (7.9)	0.084

Table 2: bivariate analysis of dietary intake between participants with history of coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland

TEI, total energy intake. §, excluding fried fish. Results are expressed as number (percentage) for categorical variables or as average ± standard deviation for continuous variables. Between-group comparisons were performed using chi-square for categorical variables and student's t-test for continuous variables.

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	Controls	Cases	P-value
Sample size	N=661	N=356	
Total energy intake (kcalories/day)	1940 ± 26	1833 ± 36	0.022
Macronutrients (% TEI)			
Total protein	14.9 ± 0.1	15.1 ± 0.2	0.337
Vegetable protein	4.7 ± 0.1	4.8 ± 0.1	0.341
Animal protein	10.2 ± 0.1	10.3 ± 0.2	0.624
Total carbohydrates	46.5 ± 0.4	47.2 ± 0.5	0.284
Monosaccharides	22.9 ± 0.4	23.3 ± 0.5	0.464
Polysaccharides	23.5 ± 0.3	23.8 ± 0.5	0.600
Total fat	33.7 ± 0.3	33.4 ± 0.4	0.513
Saturated	12.7 ± 0.1	12.4 ± 0.2	0.259
Monounsaturated	13.3 ± 0.1	13.2 ± 0.2	0.654
Polyunsaturated	4.8 ± 0.1	4.8 ± 0.1	0.982
Dietary scores			
Mediterranean §	4.1 ± 0.1	4.1 ± 0.1	0.738
Mediterranean §§	4.8 ± 0.1	4.6 ± 0.1	0.127
AHEI	32 ± 1	32 ± 1	0.285
Dietary patterns	N=630	N=327	
Meat & Chips	-0.06 ± 0.05	-0.08 ± 0.07	0.818
Fruits & Vegetables	0.03 ± 0.07	-0.08 ± 0.09	0.349
Pastries & Fat	0.17 ± 0.06	-0.01 ± 0.08	0.095
Compliance to dietary guidelines	N=661	N=356	
Fruits	1 (ref.)	0.99 (0.72 - 1.37)	0.948
Vegetables	1 (ref.)	0.84 (0.46 - 1.54)	0.581
Meat	1 (ref.)	1.02 (0.73 - 1.41)	0.923
Fish	1 (ref.)	1.31 (0.93 - 1.86)	0.121
Fish §	1 (ref.)	0.93 (0.66 - 1.30)	0.654
Dairy	1 (ref.)	0.88 (0.50 - 1.54)	0.647
At least three	1 (ref.)	1.14 (0.77 - 1.67)	0.519
At least three §	1 (ref.)	0.98 (0.65 - 1.49)	0.941
Presence of a diet			
To reduce	1 (ref.)	0.59 (0.26 - 1.32)	0.196

Low fat	1 (ref.)	1.19 (0.83 - 1.70)	0.337
Low sugar / for diabetes	1 (ref.)	1.86 (0.82 - 4.19)	0.135
Low salt	1 (ref.)	1.45 (0.77 - 2.75)	0.251

Table 3: multivariable analysis of dietary intake between participants with history of coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland.

TEI, total energy intake. §, excluding fried fish. Results are expressed as multivariable adjusted odds ratio and (95% confidence interval) for categorical variables and as multivariable adjusted mean±standard error. Between-group comparisons were performed using conditional logistic regression for categorical variables and a mixed model for continuous variables. All models were adjusted for living in couple (yes, no), educational level (high, middle, low), body mass index (normal, overweight, obese), smoking (never, former, current), and antihypertensive, hypolipidemic and antidiabetic drug treatments.

Dietary intake among participants with incident coronary artery disease

Eighty-seven participants developed a CAD event between the first and the second follow-up. Their dietary intake before and after the occurrence of the event is summarized in **table 4**. Total energy intake increased slightly and prevalence of low fat diet decreased, while no difference was found for all other dietary markers.

	Before	After	P-value
Total energy intake (kcalories/day)	1927 ± 593	2100 ± 700	0.029
Macronutrients (% TEI)			
Total protein	14.8 ± 2.6	15.2 ± 3.8	0.390
Vegetable protein	4.8 ± 1.2	4.8 ± 1.3	0.977
Animal protein	10.1 ± 2.9	10.4 ± 4.3	0.461
Total carbohydrates	45.8 ± 9.2	46.1 ± 10.6	0.780
Monosaccharides	21.7 ± 7.5	22.2 ± 9.9	0.599
Polysaccharides	24.0 ± 7.8	23.8 ± 8.7	0.804
Total fat	34.0 ± 6.4	34.2 ± 7.9	0.753
Saturated	12.9 ± 3.4	12.9 ± 4.1	0.952
Monounsaturated	13.3 ± 3.3	13.6 ± 4.2	0.502
Polyunsaturated	4.9 ± 1.4	4.8 ± 1.5	0.356
Dietary scores			
Mediterranean § (N=79)	4.2 ± 1.5	4.0 ± 1.6	0.504
Mediterranean §§ (N=60)	5.0 ± 2.0	4.9 ± 2.0	0.715
AHEI (N=80)	32 ± 11	34 ± 9	0.198
Compliance to dietary guidelines			
Fruits	40.5 (29.9 - 51.7)	52.4 (41.2 - 63.4)	0.064
Vegetables	9.5 (4.2 - 17.9)	15.5 (8.5 - 25.0)	0.227
Meat	59.5 (48.3 - 70.1)	50.0 (38.9 - 61.1)	0.185
Fish	68.2 (57.2 - 77.9)	75.3 (64.7 - 84.0)	0.345
Fish §	36.5 (26.3 - 47.6)	43.5 (32.8 - 54.7)	0.286
Dairy	4.8 (1.3 - 11.9)	12.0 (5.9 - 21.0)	0.146
At least three	24.1 (15.4 - 34.7)	28.9 (19.5 - 39.9)	0.481
At least three §	19.3 (11.4 - 29.4)	22.9 (14.4 - 33.4)	0.549
Presence of a diet			
To reduce	5.7 (1.9 - 12.9)	6.9 (2.6 - 14.4)	1.000
Low fat	35.6 (25.6 - 46.6)	21.8 (13.7 - 32.0)	0.036
Low sugar / for diabetes	13.8 (7.3 - 22.9)	8.0 (3.3 - 15.9)	0.267
Low salt	6.9 (2.6 - 14.4)	5.7 (1.9 - 12.9)	1.000

Table 4: paired analysis of the dietary intake of participants who developed coronary heart disease between first and second follow-up, CoLaus study, Lausanne, Switzerland (n=87).

Results are expressed as percentage (95% confidence interval) for categorical variables or as average ± standard deviation for continuous variables. Between-group comparisons were performed using exact Mc Nemar's test for categorical variables and paired student's t-test for continuous variables.

Changes in dietary intake among participants with incident coronary artery disease

Dietary intake at second follow-up among participants with incident CAD and gender- and age-matched controls is summarized in **supplementary tables 2** (bivariate) and **3** (multivariable). On bivariate analysis, participants with incident CAD had higher vegetable protein intake, a higher AHEI score, complied more frequently with vegetables guidelines and reported more frequently a diet to reduce or a low-fat diet than controls (**supplementary table 2**). Those differences remained after multivariable adjustment except for diet, for which the multivariable models did not converge (**supplementary table 3**).

DISCUSSION

In agreement with our initial hypothesis, the results indicate that, despite a serious and life-threatening event such as CAD, no substantial changes in dietary intake occur after a coronary event. Our findings add further evidence to the lack of adequate dietary prevention of subsequent cardiovascular events.

Dietary intake among participants with history of coronary artery disease

Participants with history of CAD did not differ from participants devoid of CAD regarding all dietary markers. The sole exception was a reduced total energy intake, which remained statistically significant after multivariable analysis. Still, the absolute difference was small (approximately 100 kcal/day) and could be accounted for by a reporting bias. As participants with history of CAD were more frequently obese, it is possible that they have (un)voluntarily underreported their true dietary intake. A possible explanation for the lack of difference regarding dietary intake between participants with history of CAD and participants devoid of CAD could be the difficulty for the first to put into practice the dietary information received during rehabilitation [26].

Dietary intake among participants with incident coronary artery disease

In a previous study, we have shown that participants reporting a low-fat diet have a healthier dietary intake than the general population [27]. Hence, it is likely that higher prevalence of a low-fat diet among participants with incident CAD would explain the higher intake of vegetables, vegetable proteins and the higher AHEI score in this group relative to gender- and age-matched controls. Still, dietary intake of participants with incident CAD differed little from controls, suggesting that the changes were modest and likely insufficient to adequately prevent CAD recurrence. Although the compliance to dietary guidelines was relatively low, still it was comparable or event better than reported by an Italian study conducted in patients with acute myocardial infarction [28]: 7.6% vs. 7.7% for vegetables and 68.8% vs. 18.5% for fish. Still, our results show that dietary intake of subjects with CAD is suboptimal and could be improved.

Changes in dietary intake among participants with incident coronary artery disease

There are few studies assessing dietary intake before and after a CAD event. In this study, almost no changes in dietary intake were found after the occurrence of a CAD event. Although the sample size was small (n=87) and might have reduced statistical power, still the changes observed were extremely small and clinically meaningless. For instance, the small increase in total energy intake (+173 kcal/day) after the CAD event could have been due to a better knowledge of the FFQ by the participants, making them report more accurately their dietary intake. Similarly, although the compliance regarding most foods tended to increase, still less than one third of participants complied with at least three recommendations after the event.

The prevalence of diets aimed at reducing cardiovascular risk factors was considerably lower than reported in other studies such as EUROASPIRE [14]: 6.9% vs. 63.3% to reduce weight, 21.8% vs.

78.9% to reduce fat, 8.0% vs. 66.1% to reduce sugar and 5.7% vs. 71.8% (and 29.6% in a French study [29]) to reduce salt. More worryingly, the prevalence of a low-fat diet decreased after the event, suggesting a possible shift towards lipid-lowering drug therapies. Again, our results show that the occurrence of a CAD does not lead to an improvement in dietary intake. Future studies focusing on a larger sample size and a larger panel of questions should identify the reasons for this failure.

Suggestions for clinical practice and public health

Several interventions to promote dietary prevention of CAD could be implemented. Firstly, increased training in dietary counselling could be provided during medical training [30], as a previous study showed that most medical residents in the university hospital of Lausanne lacked training in dietary information and guidelines [31]. Secondly, dietary management of CAD could be implemented during cardiovascular rehabilitation; although dietary counselling is already included in most if not all rehabilitation programs in Switzerland [32], specific methods such as the Health Action Process Approach [33] have been shown to induce persistent improvements in dietary intake and could be tested. Given the underuse of cardiac rehabilitation programs in the French-speaking part of Switzerland [12], a simple increase in the number of patients admitted into rehabilitation might already be of interest. Thirdly, programs aiming at maintaining a healthy lifestyle could be implemented among CAD patients, as many CAD patients fail to translate the dietary information received during rehabilitation into practice after discharge [26]. For instance, nurse-led [34] or community health-worker [35] based interventions have been shown to be effective in changing dietary intake, although for the first study no long-term results (>1 year) were reported. Finally, general campaigns promoting healthy eating would improve dietary intake in the general population and *ipso facto* among CAD patients.

Study limitations

Several limitations should be acknowledged. First, the small sample evaluated challenged the statistical power. Still, the non-significant differences between cases and controls were small and clinically meaningless. More importantly, it was the low rate of compliance with guidelines and the low prevalence of diets among cases that was of concern. Second, the FFQ focused on a limited number of food items (97); hence, some specific foods such as grains and pulses were not evaluated. Still, as the FFQ was applied in both cases and controls, we expect that the magnitude of this reporting bias is the same for both groups. Third, there was little information socio-economic status, a major determinant of a healthy diet. Indeed, healthy diets tend to be more expensive [36], although this statement has been challenged [37, 38]. Interestingly, previous studies have shown that, in Switzerland, the influence of socioeconomic factors on nutrient intake varies according to gender [39] and that people with a low socio-economic status (i.e. migrants from Southern Europe) score higher for both healthy (Fruits and vegetables) and unhealthy (Meat and fries) dietary patterns than people of higher socio-economic status [23]. In this study, we used educational level and marital status as proxies for socio-economic status and included them in the multivariable analyses. Still, further studies should rely on stronger socio-economic markers such as personal or family income to better assess this issue. Finally, no information regarding rehabilitation post CAD was collected, and it has been suggested that rehabilitation improves dietary intake [40], although this statement has been challenged [26]. Further, use of cardiac rehabilitation programs in the French-speaking part of Switzerland is rather low [12]; hence, their impact on diet might be also low. Finally, the results were obtained from participants living in the city of Lausanne, and its generalizability to other Swiss cantons or other countries might be questionable. Still, in the absence of other studies conducted in Switzerland, our findings represent a first step in the evaluation of lifestyle management of CAD in Switzerland. Our findings also suggest that the actual lifestyle management of CAD in the general population might be worse than previously reported [14].

We conclude that in Switzerland, adequate improvements in diet for secondary prevention of CAD is suboptimal and require further attention. Supporting patients to improve their dietary intake via behaviour changing therapy is recommended.

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STATEMENT OF AUTHORSHIP

PMV made part of the statistical analyses and wrote most of the article; ASQF, DFF, TV, IG and OF revised the article for important intellectual content. PMV had full access to the data and is the guarantor of the study.

CONFLICT OF INTEREST

The authors report no conflict of interest.

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REFERENCES

[1] M.F. Piepoli, U. Corra, P. Dendale, I. Frederix, E. Prescott, J.P. Schmid, et al. Challenges in secondary prevention after acute myocardial infarction: A call for action. *Eur J Prev Cardiol* **23**, 2016, 1994-2006.

[2] S. Lacroix, J. Cantin, A. Nigam. Contemporary issues regarding nutrition in cardiovascular rehabilitation. *Ann Phys Rehabil Med* **60**, 2017, 36-42.

[3] European Association of Cardiovascular Prevention, Rehabilitation Committee for Science Guidelines, Eacpr, U. Corra, M.F. Piepoli, F. Carre, et al. Secondary prevention through cardiac rehabilitation: physical activity counselling and exercise training: key components of the position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation. *Eur Heart J* **31**, 2010, 1967-1974.

[4] M.F. Piepoli, U. Corra, S. Adamopoulos, W. Benzer, B. Bjarnason-Wehrens, M. Cupples, et al. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: a policy statement

from the cardiac rehabilitation section of the European Association for Cardiovascular Prevention & Rehabilitation. Endorsed by the Committee for Practice Guidelines of the European Society of Cardiology. *Eur J Prev Cardiol* **21**, 2014, 664-681.

[5] A.M. Clark, L. Hartling, B. Vandermeer, F.A. McAlister. Meta-analysis: secondary prevention programs for patients with coronary artery disease. *Ann Intern Med* **143**, 2005, 659-672.

[6] P.R. Lawler, K.B. Filion, M.J. Eisenberg. Efficacy of exercise-based cardiac rehabilitation post-myocardial infarction: a systematic review and meta-analysis of randomized controlled trials. *Am Heart J* **162**, 2011, 571-584 e572.

[7] B.S. Heran, J.M. Chen, S. Ebrahim, T. Moxham, N. Oldridge, K. Rees, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev*, 2011, CD001800.

[8] R. Auer, J. Gaume, N. Rodondi, J. Cornuz, W.A. Ghali. Efficacy of in-hospital multidimensional interventions of secondary prevention after acute coronary syndrome: a systematic review and meta-analysis. *Circulation* **117**, 2008, 3109-3117.

[9] S.C. Smith, Jr., E.J. Benjamin, R.O. Bonow, L.T. Braun, M.A. Creager, B.A. Franklin, et al. AHA/ACCF Secondary Prevention and Risk Reduction Therapy for Patients with Coronary and other Atherosclerotic Vascular Disease: 2011 update: a guideline from the American Heart Association and American College of Cardiology Foundation. *Circulation* **124**, 2011, 2458-2473.

[10] W.N. Kernan, B. Ovbiagele, H.R. Black, D.M. Bravata, M.I. Chimowitz, M.D. Ezekowitz, et al. Guidelines for the prevention of stroke in patients with stroke and transient ischemic attack: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* **45**, 2014, 2160-2236.

[11] M.F. Piepoli, U. Corra, A. Abreu, M. Cupples, C. Davos, P. Doherty, et al. Challenges in secondary prevention of cardiovascular diseases: a review of the current practice. *Int J Cardiol* **180**, 2015, 114-119.

[12] J. Welker, C.A. Nacht, M. Savcic, P. Marques-Vidal, J. Cornuz, P. Vogt, et al. [Cardiac rehabilitation, a proven intervention underutilized in the French-speaking part of Switzerland]. *Rev Med Suisse* **10**, 2014, 545-548.

[13] D.B. Panagiotakos, V. Notara, M. Kouvari, C. Pitsavos. The Mediterranean and other Dietary Patterns in Secondary Cardiovascular Disease Prevention: A Review. *Current Vascular Pharmacology* **14**, 2016, 442-451.

[14] K. Kotseva, D. Wood, D. De Bacquer, G. De Backer, L. Ryden, C. Jennings, et al. EUROASPIRE IV: A European Society of Cardiology survey on the lifestyle, risk factor and therapeutic management of coronary patients from 24 European countries. *Eur J Prev Cardiol* **23**, 2016, 636-648.

[15] D.A. Wood, K. Kotseva, S. Connolly, C. Jennings, A. Mead, J. Jones, et al. Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster-randomised controlled trial. *Lancet* **371**, 2008, 1999-2012.

[16] R. Griffo, M. Ambrosetti, R. Tramarin, F. Fattirolli, P.L. Temporelli, A.R. Vestri, et al. Effective secondary prevention through cardiac rehabilitation after coronary revascularization and predictors of poor adherence to lifestyle modification and medication. Results of the ICAROS Survey. *Int J Cardiol* **167**, 2013, 1390-1395.

[17] K. Kotseva, E. Investigators. The EUROASPIRE surveys: lessons learned in cardiovascular disease prevention. *Cardiovasc Diagn Ther* **7**, 2017, 633-639.

[18] M. Firmann, V. Mayor, P.M. Vidal, M. Bochud, A. Pecoud, D. Hayoz, et al. The CoLaus study: a population-based study to investigate the epidemiology and genetic determinants of cardiovascular risk factors and metabolic syndrome. *BMC Cardiovasc Disord* **8**, 2008, 6.

[19] L. Bernstein, I. Huot, A. Morabia. Amélioration des performances d'un questionnaire alimentaire semi-quantitatif comparé à un rappel des 24 heures. *Santé Publique* **7**, 1995, 403-413.

[20] A. Trichopoulou, T. Costacou, C. Bamia, D. Trichopoulos. Adherence to a Mediterranean Diet and Survival in a Greek Population Antonia. *N Engl J Med* **348**, 2003, 2599-2608.

[21] K. Vormund, J. Braun, S. Rohrmann, M. Bopp, P. Ballmer, D. Faeh. Mediterranean diet and mortality in Switzerland: an alpine paradox? *Eur J Nutr* **54**, 2015, 139-148.

[22] M.L. McCullough, D. Feskanich, M.J. Stampfer, E.L. Giovannucci, E.B. Rimm, F.B. Hu, et al. Diet quality and major chronic disease risk in men and women: Moving toward improved dietary guidance. *Am J Clin Nutr* **76**, 2002, 1261-1271.

[23] P. Marques-Vidal, G. Waeber, P. Vollenweider, I. Guessous. Socio-demographic and lifestyle determinants of dietary patterns in French-speaking Switzerland, 2009-2012. *BMC Public Health* **18**, 2018, 131.

[24] Société Suisse de nutrition [Swiss nutrition society]. Pyramide alimentaire suisse. Bern, Switzerland2017.

[25] K. Thygesen, J.S. Alpert, H.D. White, Joint ESC/ACCF/AHA/WHF Task Force for the Redefinition of Myocardial Infarction, A.S. Jaffe, F.S. Apple, et al. Universal definition of myocardial infarction. *Circulation* **116**, 2007, 2634-2653.

[26] C.J. Scotto, D.J. Waechter, J. Rosneck. Adherence to prescribed exercise and diet regimens two months post-cardiac rehabilitation. *Can J Cardiovasc Nurs* **21**, 2011, 11-17.

[27] P. Marques-Vidal, P. Vollenweider, M. Grange, I. Guessous, G. Waeber. Patients with dyslipidemia on a self-reported diet have a healthier dietary intake than the general population. The CoLaus study. *Clinical nutrition ESPEN* **11**, 2016, e33-e39.

[28] F. Sofi, A. Fabbri, R. Marcucci, A.M. Gori, D. Balzi, A. Barchielli, et al. Lifestyle modifications after acute coronary syndromes in a subset of the AMI-Florence 2 Registry. *Acta Cardiol* **66**, 2011, 791-796.

[29] A.S. Lensel, P. Lermusiaux, C. Boileau, P. Feugier, A. Serusclat, Y. Zerbib, et al. [Is a patient's knowledge of cardiovascular risk factors better after the occurrence of a major ischemic event? Survey of 135 cases and 260 controls]. *J Mal Vasc* **38**, 2013, 360-366.

[30] K.E. Aspry, L. Van Horn, J.A.S. Carson, J. Wylie-Rosett, R.F. Kushner, A.H. Lichtenstein, et al. Medical nutrition education, training, and competencies to advance guideline-based diet

counseling by physicians: a science advisory from the American Heart Association. *Circulation* **137**, 2018, e821-e841.

[31] S. Han, R. Auer, J. Cornuz, P. Marques-Vidal. Clinical nutrition in primary care: An evaluation of resident physicians' attitudes and self-perceived proficiency. *Clinical Nutrition ESPEN* **15**, 2016, 69-74.

[32] H. Saner. [The Swiss approach for cardiac rehabilitation]. *Herz* **37**, 2012, 38-43.

[33] P. Steca, L. Pancani, A. Greco, M. D'Addario, M.E. Magrin, M. Miglioretti, et al. Changes in dietary behavior among coronary and hypertensive patients: a longitudinal investigation using the health action process approach. *Appl Psychol Health Wellbeing* **7**, 2015, 316-339.

[34] V.K. Mok, J.W. Sit, A.S. Tsang, S.Y. Chair, T.L. Cheng, C.S. Chiang. A controlled trial of a nurse follow-up dietary intervention on maintaining a heart-healthy dietary pattern among patients after myocardial infarction. *J Cardiovasc Nurs* **28**, 2013, 256-266.

[35] D. Xavier, R. Gupta, D. Kamath, A. Sigamani, P.J. Devereaux, N. George, et al. Community health worker-based intervention for adherence to drugs and lifestyle change after acute coronary syndrome: a multicentre, open, randomised controlled trial. *Lancet Diabetes Endocrinol* **4**, 2016, 244-253.

[36] N. Darmon, A. Drewnowski. Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutr Rev* **73**, 2015, 643-660.

[37] S. Khalatbari-Soltani, P. Marques-Vidal. Not as bad as you think: a comparison of the nutrient content of best price and brand name food products in Switzerland. *Prev Med Rep* **3**, 2016, 222-228.

[38] W.E. Waterlander, M. van Kouwen, I.H.M. Steenhuis. Are diets healthier when then contain branded foods? *Br Food J* **116**, 2014, 1522-1532.

[39] C. de Mestral, P. Marques-Vidal, J.M. Gaspoz, J.M. Theler, I. Guessous. Independent association between socioeconomic indicators and macro- and micro-nutrient intake in Switzerland. *PloS one* **12**, 2017, e0174578.

[40] C. Froger-Bompas, B. Laviolle, P. Guillo, C. Letellier, K. Ligier, J.C. Daubert, et al. Sustained positive impact of a coronary rehabilitation programme on adherence to dietary recommendations. *Arch Cardiovasc Dis* **102**, 2009, 97-104.

FIGURE LEGENDS

Supplementary figure 1: selection procedure of the cases and gender- and age-matched controls for the first analysis, CoLaus study, Lausanne, Switzerland.

Supplementary figure 2: selection procedure of the cases and gender- and age-matched controls for the second analysis, CoLaus study, Lausanne, Switzerland.

SUPPLEMENTARY FILES

Supplementary table 1: socio-demographic and clinical characteristics of participants with incident coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland.

	Controls	**Cases**	**P-value**
Sample size	181	92	
Women (%)	46 (25.4)	23 (25.0)	0.941
Age (years)	64.4 ± 9.3	65.5 ± 9.2	0.340
Living in couple (%)	121 (66.9)	57 (62.0)	0.422
Educational level (%)			0.894
High	37 (20.4)	18 (19.6)	
Middle	53 (29.3)	25 (27.2)	
Low	91 (50.3)	49 (53.3)	
Body mass index	26.0 ± 3.7	26.8 ± 3.8	0.103
Body mass index categories (%)			0.152
Normal	81 (44.8)	30 (32.6)	
Overweight	76 (42.0)	48 (52.2)	
Obese	24 (13.3)	14 (15.2)	
Smoking status (%)			0.313
Never	68 (37.6)	33 (35.9)	
Former	85 (47.0)	38 (41.3)	
Current	28 (15.5)	21 (22.8)	
Treatments (%)			
Antihypertensive	58 (32.0)	48 (52.2)	<0.001
Hypolipidemic	36 (19.9)	46 (50.0)	<0.001
Antidiabetic	17 (9.4)	11 (12.0)	0.509

Results are expressed as number (percentage) for categorical variables or as average ± standard deviation for continuous variables. Between-group comparisons were performed using chi-square for categorical variables and student's t-test for continuous variables.

Supplementary table 2: bivariate analysis of dietary intake between participants with incident coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland

	Controls	**Cases**	**P-value**
Sample size	181	92	
Total energy intake (kcalories/day)	2047 ± 660	2037 ± 697	0.911
Macronutrients (% TEI)			
Total protein	15.4 ± 2.7	15.3 ± 3.9	0.794
Vegetable protein	4.5 ± 1.1	4.8 ± 1.2	0.050
Animal protein	11 ± 3.1	10.6 ± 4.5	0.393
Total carbohydrates	44.9 ± 8.4	46.2 ± 10.6	0.248
Monosaccharides	21.9 ± 8	22.0 ± 9.7	0.885
Polysaccharides	22.9 ± 7.8	24.1 ± 8.7	0.234
Total fat	34.9 ± 6.7	33.9 ± 7.8	0.250
Saturated	13.4 ± 3.4	12.6 ± 3.9	0.080
Monounsaturated	13.9 ± 3.6	13.6 ± 4.2	0.507
Polyunsaturated	4.6 ± 1.3	4.8 ± 1.5	0.416
Dietary scores			
Mediterranean §	3.9 ± 1.5	4.0 ± 1.6	0.701
Mediterranean §§	4.8 ± 2.2	4.9 ± 2.0	0.863
AHEI	31 ± 9	34 ± 9	0.040
Compliance to dietary guidelines			
Fruits	86 (48.3)	44 (49.4)	0.865
Vegetables	14 (7.9)	14 (15.7)	0.048
Meat	83 (46.9)	45 (50.6)	0.572
Fish	130 (73.0)	66 (73.3)	0.958
Fish §	86 (48.3)	40 (44.4)	0.549
Dairy	20 (11.3)	11 (12.5)	0.775
At least three	48 (27.1)	24 (27.3)	0.979
At least three §	37 (20.9)	18 (20.5)	0.932
Presence of a diet			
To reduce	4 (2.2)	7 (7.6)	0.048 †
Low fat	12 (6.6)	23 (25.0)	<0.001 †
Low sugar / for diabetes	8 (4.4)	8 (8.7)	0.177 †
Low salt	4 (2.2)	5 (5.4)	0.170 †

TEI, total energy intake. §, excluding fried fish. Results are expressed as number (percentage) for categorical variables or as average ± standard deviation for continuous variables. Between-group comparisons were performed using chi-square or Fisher's exact test (†) for categorical variables and student's t-test for continuous variables.

Supplementary table 3: multivariable analysis of dietary intake between participants with incident coronary heart disease and gender- and age-matched controls, CoLaus study, Lausanne, Switzerland.

	Controls	**Cases**	**P-value**
Sample size	181	92	
Total energy intake (kcalories/day)	2027 ± 52	2078 ± 72	0.559
Macronutrients (% TEI)			
Total protein	15.5 ± 0.2	15.2 ± 0.3	0.426
Vegetable protein	4.5 ± 0.1	4.8 ± 0.1	0.028
Animal protein	11.1 ± 0.3	10.4 ± 0.4	0.170
Total carbohydrates	44.8 ± 0.7	46.3 ± 1	0.212
Monosaccharides	22 ± 0.7	21.8 ± 0.9	0.848
Polysaccharides	22.7 ± 0.6	24.4 ± 0.9	0.095
Total fat	34.7 ± 0.5	34.3 ± 0.8	0.677
Saturated	13.3 ± 0.3	12.9 ± 0.4	0.356
Monounsaturated	13.9 ± 0.3	13.7 ± 0.4	0.813
Polyunsaturated	4.6 ± 0.1	4.8 ± 0.1	0.275
Dietary scores			
Mediterranean §	3.8 ± 0.1	4.1 ± 0.2	0.249
Mediterranean §§	4.8 ± 0.2	4.9 ± 0.3	0.675
AHEI	31 ± 1	34 ± 1	0.032
Compliance to dietary guidelines			
Fruits	1 (ref.)	1.23 (0.65 - 2.33)	0.516
Vegetables	1 (ref.)	7.64 (1.06 - 55.2)	0.044
Meat	1 (ref.)	1.49 (0.81 - 2.77)	0.202
Fish	1 (ref.)	1.06 (0.55 - 2.04)	0.873
Fish §	1 (ref.)	0.76 (0.41 - 1.43)	0.399
Dairy	1 (ref.)	1.53 (0.57 - 4.08)	0.398
At least three	1 (ref.)	1.26 (0.61 - 2.62)	0.536
At least three §	1 (ref.)	1.13 (0.51 - 2.48)	0.767

TEI, total energy intake. §, excluding fried fish. Results are expressed as multivariable adjusted odds ratio and (95% confidence interval) for categorical variables and as multivariable adjusted mean±standard error. Between-group comparisons were performed using conditional logistic regression for categorical variables and a mixed model for continuous variables. All models were adjusted for living in couple (yes, no), educational level (high, middle, low), body mass index (normal, overweight, obese), smoking (never, former, current), and antihypertensive, hypolipidemic and antidiabetic drug treatments. For diets, the model did not converge and results are not presented.