

Association between diet and hip fracture risk: comparison between *a priori* (MEDI score) and *a posteriori* derived dietary patterns in elderly people.

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Hip fractures and diet

- Hip fractures : 17% lifetime risk in white women aged 50 years, 6% in white men in Europe.
- Diet and prevention :
 - Adequate intake of calcium and vitamin D recommended.
 - Higher protein intake beneficial in subjects with adequate calcium intake.

Healthy dietary patterns

- **The Mediterranean (MEDI) score (*a priori* score).**
 - Known to be associated with lower risk of developing cardiovascular diseases, cancer, Alzheimer's disease.
 - Diet high in vegetables, fruits, legumes and grains, sparse in red meat and dairy products.
- **Data based scores (*a posteriori* scores)**
 - Scores constructed using statistical procedures without any *a priori* hypothesis, used in a second step to identify foods associated with selected outcomes.

Objectives

- To compare an ***a priori* score (MEDI)** with an ***a posteriori* dietary pattern** on the risk of occurrence of hip fractures in elderly community dwellers.

Methods : sample

- 1482 elderly aged >65 yrs from the 3 City Study in Bordeaux followed every 2 years for 8 years
- Comprehensive dietary survey including a FFQ and a 24H dietary recall
- Self-reported history of fractures since the previous visit recorded at each follow-up

Methods : MEDI score



- One point given if food intake was **higher** than the sex-specific median for a presumed protective component (vegetables, fruits, legumes, cereals, fish, MUFA/SFA ratio) and **lower** than the sex-specific median for a presumed deleterious component (meat and dairy products).
- One point given to mild to moderate alcohol consumers.
- Score ranging from 0 to 9, increasing with adherence to a MeDi, divided into tertiles.

Methods : *a posteriori* score

- A **principal component analysis (PCA)** was used to reduce the numerous nutritional variables of the 24 H recall into a **reduced number of uncorrelated linear combinations** of the observed variables
- PCA was performed on normalized daily dietary intake data of 18 selected nutrients (Ca, K, Mg, P, Fe, Zn, Vit B6, B12, C, D, E, Retinol, Carotene, Folate, Fiber, Protein, Carbohydrate, Fat)



Methods : statistical model

- Estimation of the risk of incident fracture by Cox proportional hazard model
- Controlled for age, gender, total energy intake, marital status, BMI, self-reported osteoporosis, osteoporosis treatment, calcium and/or vitamin D treatment at baseline.
- Principal component scores were energy adjusted (residual method by Willet et Stampfer)

Results : MEDI score

- 1482 subjects, 57 incident hip fracture over 8 years (11 in men, 46 in women)
- MEDI score
 - Mean (sd) : 4.38 (1.68)
 - Low adherence (0-3) : 441 (29.8%)
 - Middle adherence (4-5) : 648 (43.7%)
 - High adherence (6-9) : 393 (26.5%)

Results : MEDI score

- Food group intake (weekly servings, mean, SD)

	Low [0-3]	Middle [4-5]	High [6-9]
Dairy products (yoghurts, milk, cheese)	20.56 (8.12)	18.31 (7.90)	16.06 (6.52)
Meat	5.49 (2.59)	4.77 (2.37)	4.14 (2.16)
Vegetables (raw, cooked)	15.57 (6.35)	19.44 (7.07)	23.12 (6.43)
Fruits	10.51 (6.34)	13.80 (6.55)	16.46 (6.62)
Legumes	0.43 (0.69)	0.61 (0.62)	0.82 (0.63)
Cereals (bread, pasta, rice, cereals)	19.81 (6.52)	22.13 (5.74)	24.40 (5.36)
Sea food (fish, crustaceans)	1.97 (1.42)	2.90 (1.69)	3.79 (1.74)
Ratio MUFA/SFA (g/j)	0.77 (0.26)	0.87 (0.32)	1.00 (0.31)
Alcohol ¹			
Moderate consumption, n (%)	42 (12.35)	150 (22.97)	196 (40.08)
None/low or high consumption, n (%)	298 (87.65)	503 (77.03)	293 (59.92)

Results

Hazard ratios of incident hip fractures
according to MEDl score (n=1435)

	HR (95%CI)	p-value
Score (per unit)	1.16 (0.98 – 1.37)	0.08
[0 – 3]	1 (reference)	
[4 – 5]	1.34 (0.67 – 2.69)	0.41
[6 – 9]	1.57 (0.74 – 3.32)	0.24

Results : Principal Component Analysis

	PC 1 (34%)	PC 2 (10%)	PC 3 (9%)
Proteins	0.79	-0.15	0.34
Carbohydrates	0.66	-0.19	-0.08
Fats	0.58	-0.10	0.41
Fibres	0.66	-0.09	-0.43
Alcohol	0.33	-0.06	0.16
Calcium	0.56	-0.25	0.33
Magnesium	0.87	-0.19	-0.05
Phosphorus	0.83	-0.17	0.36
Potassium	0.84	-0.14	-0.23
Carotene	0.22	0.04	-0.49
Folates	0.67	0.39	-0.34
Iron	0.66	0.24	0.06
Zinc	0.15	0.03	0.02
Retinol	0.21	0.87	0.16
Vitamin B6	0.79	0.06	-0.06
Vitamin B12	0.31	0.83	0.23
Vitamin C	0.38	0.09	-0.56
Vitamin D	0.13	0.03	0.34
Vitamin E	0.42	-0.01	-0.15

Results

Hazard ratios of incident hip fractures according to principal components (n=1433)

	HR (95%CI)	p-value
PC 1	0.90 (0.72 – 1.13)	0.37
PC 2	1.06 (0.87 – 1.30)	0.56
PC 3	0.78 (0.61 – 0.99)	0.04

Discussion

- Third principal component, positively correlated with Ca, P, Vit D and proteins, is associated with lower incidence of hip fractures.
- No beneficial effect of MEDI score on the incidence of hip fractures.
- MEDI score not loaded on dairy products.
- MEDI score cannot be considered as an optimal dietary pattern for hip fracture prevention.