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***FTO* genotype, dietary intakes and anthropometric measures in European adults: The Food4Me Study**

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**Ethical Approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

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**Trial registration** – Clinicaltrials.gov NCT01530139 (<http://clinicaltrials.gov/show/NCT01530139>)

**Key Words** – Fat mass and obesity-associated gene, *FTO*, BMI, fried food, dietary intakes

**Table 1 Estimation of Mediterranean diet score based on PREDIMED criteriaa**

|  |  |  |  |
| --- | --- | --- | --- |
| No | PREDIMED Dietary component | PREDIMED Recommendation | Food4Me study equivalent component and recommendation |
| 1 | Olive oil preference | Consume more olive oil than other culinary fat | Higher olive oil intake than butter or other vegetable oils (>0g/day) |
| 2 | Olive oil intake |  ≥4 tbsp/day | Olive oil (≥59.2g/day) |
| 3 | Vegetables | ≥2 servings/day | Vegetables (≥160g/day) |
| 4 | Fresh fruits (including natural fruit juice) |  ≥3 servings/day | Fresh fruit and juice (≥240g/day; juice was capped at 150g/day) |
| 5 | Red and processed meats |  <1 serving/day | Red and processed meat (<150gday) |
| 6 | Spread fats |  <1 serving/day | Fats and spreads (<12g/day) |
| 7 | Soda drinks |  <1 drink/day | Fizzy soft drinks (<250g/day) |
| 8 | Wine with meals (optionally, only for habitual drinkers) | ≥7 glasses/wk | Wine (≥175ml/day) |
| 9 | Legumes |  ≥3 servings/wk | Legumes (≥64.3g/day) |
| 10 | Fish (especially fatty fish), seafood |  ≥3 servings/wk | Oily, non-oily, smoked and fish products (≥64.3g/day) |
| 11 | Commercial bakery goods, sweets, and pastries |  <3 servings/wk | Sweets and snacks (<25.7g/day) |
| 12 | Tree nuts and peanuts |  ≥3 servings/wk | Nuts and seeds (≥12.9g/day) |
| 13 | Meat preference | Consume white meat Instead of red meat | Higher intake of white meat than red meat (>0g/day) |
| 14 | Sofrito (tomato and onion sauce, with leek, or garlic, simmered with olive oil) | ≥2 servings/wk | Tomato-based sauce (≥90g/day) |

a, A score of 1 was given when individuals met the target and 0 when they did not (range 0-14) ([1](#_ENREF_1))

**Table 2** **Total energy and macronutrient intakes of participants by BMI category**

|  |  |  |
| --- | --- | --- |
|  | **BMI category** | **Pa** |
| **Normal** | **Overweight** | **Obese** |
| Total (n)  |  |  |  |  |
| Total energy intake (kJ) | 10404 (4179) | 10647 (4297) | 11986 (5434) | **<0.001** |
| Fat (% energy) | 35.5 (5.8) | 36.2 (6.0) | 37.0 (5.6) | **<0.001** |
| Saturated fat (% energy) | 14.0 (3.1) | 14.2 (3.1) | 14.5 (3.1) | **0.005** |
| Trans fat (% energy) | 0.5 (0.2) | 0.5 (0.2) | 0.5 (0.2) | **<0.001** |
| Mono-unsaturated fat (% energy) | 13.4 (3.0) | 14.0 (3.3) | 14.3 (2.9) | **<0.001** |
| Poly-unsaturated fat (% energy) | 5.8 (1.6) | 5.6 (1.3) | 5.9 (1.4) | 0.566 |
| Omega 3 (% energy) | 0.7 (0.2) | 0.7 (0.3) | 0.7 (0.4) | 0.685 |
| Carbohydrates (% energy) | 46.8 (7.5) | 44.8 (7.5) | 44.8 (7.3) | **0.001** |
| Sugar (% energy) | 21.6 (5.8) | 20.6 (5.9) | 19.6 (5.9) | **<0.001** |
| Protein (% energy) | 16.7 (3.5) | 17.6 (4.0) | 17.5 (3.7) | **<0.001** |
| Alcohol (% energy) | 3.1 (3.3) | 3.8 (4.2) | 3.1 (3.9) | 0.148 |
| Salt (g/day) | 7.1 (3.4) | 7.2 (3.3) | 8.7 (4.7) | **<0.001** |
| Contribution from sweets and snacks |  |  |  |
| Total energy | 14.5 (9.1) | 15.1 (9.7) | 16.8 (11.2) | **0.001** |
| % energy from fat  | 18.1 (11.3) | 17.6 (11.5) | 19.1 (12.8) | 0.152 |
| % energy from saturated fat | 20.0 (13.0) | 20.1 (13.6) | 21.7 (14.3) | **0.039** |
| % energy from sugars | 22.5 (14.6) | 25.4 (15.6) | 28.4 (16.4) | **<0.001** |
| % energy from salt | 7.6 (5.7) | 8.1 (6.4) | 9.1 (7.6) | **0.001** |

Values represent means and SDs; a, Multiple linear regression was used to test for significant differences across BMI categories. Analyses were adjusted for age, sex, physical activity, country and smoking

**Table 3 Dietary intakes by BMI category**

|  |  |  |
| --- | --- | --- |
|  | **BMI category** | **Pa** |
| **Normal** | **Overweight** | **Obese** |
| Foods (g/day) |  |  |  |  |
| Fruit | 288 (254) | 258 (223) | 260 (238) | 0.072 |
| Vegetables | 217 (151) | 214 (134) | 212 (115) | 0.737 |
| Fruit Juice | 108 (160) | 102 (145) | 90 (150) | **0.023** |
| Legumes | 35 (47) | 38 (39) | 36 (32) | 0.604 |
| Wholegrain | 182 (181) | 134 (139) | 142 (142) | **<0.001** |
| Non-wholegrain | 159 (129) | 179 (155) | 217 (217) | **<0.001** |
| Eggs | 30 (42) | 32 (39) | 34 (37) | 0.064 |
| Red, processed meat | 70 (72) | 90 (67) | 119 (110) | **<0.001** |
| Chicken, grilled or roast | 23 (30) | 27 (27) | 34 (30) | **<0.001** |
| Oily fish | 22 (29) | 22 (26) | 19 (22) | 0.071 |
| White fish | 15 (19) | 18 (21) | 15 (18) | 0.674 |
| Fish products | 13 (23) | 16 (20) | 15 (20) | 0.346 |
| Butter | 5 (11) | 6 (12) | 7 (18) | 0.248 |
| Low fat spreads | 1 (5) | 1 (4) | 2 (7) | 0.331 |
| Low fat dairy | 243 (261) | 235 (226) | 215 (223) | 0.686 |
| High fat dairy | 74 (130) | 64 (116) | 76 (175) | 0.423 |
| Sugar sweetened beverages | 28 (104) | 29 (70) | 50 (245) | **0.016** |
| Low calorie soft drinks | 44 (144) | 66 (199) | 125 (286) | **<0.001** |
| Added sugar | 4 (10) | 5 (12) | 5 (14) | 0.054 |
| Chocolate and sweets | 19 (28) | 20 (33) | 22 (27) | 0.117 |
| Cakes | 22 (28) | 24 (30) | 23 (26) | 0.440 |
| Biscuits | 23 (45) | 29 (47) | 44 (110) | **<0.001** |
| Ice-cream  | 6 (11) | 7 (19) | 8 (15) | **0.005** |
| Pastries | 12 (15) | 14 (40) | 17 (39) | **0.006** |
| Crisps | 4 (7) | 3 (6) | 7 (13) | **<0.001** |
| Chips and pizza | 27 (28) | 33 (40) | 33 (34) | **<0.001** |
| Fried foods | 40.5 (42.3) | 48.9 (53.4) | 52.2 (49.7) | **<0.001** |
| Dietary scores2 |
| Healthy eating index-2010b | 50.3 (9.3) | 49.2 (9.9) | 47.4 (9.9) | **<0.001** |
| Mediterranean diet scoreb | 5.2 (1.7) | 5.1 (1.7) | 4.8 (1.7) | **<0.001** |
| Dietary habits |  |  |  |  |
| Add salt while cooking |  |  |  |  |
| High | 53.6 | 58.2 | 65.2 | 0.695 |
| Medium | 15.3 | 15.3 | 8.6 | 0.085 |
| Low | 31.2 | 26.5 | 26.3 | 0.167 |
| Add salt at the table |  |  |  |  |
| High | 10.1 | 12.7 | 14.4 | 0.131 |
| Medium | 15.0 | 15.9 | 22.0 | 0.096 |
| Low | 75.0 | 71.4 | 63.6 | **0.015** |
| Consume fried foods |  |  |  |  |
| High | 5.2 | 5.0 | 2.9 | 0.387 |
| Medium | 38.0 | 46.3 | 53.6 | **<0.001** |
| Low | 56.8 | 48.7 | 43.5 | **<0.001** |
| Consume visible fat on meat |  |  |  |  |
| High | 10.4 | 5.8 | 2.4 | **<0.001** |
| Medium | 60.0 | 55.0 | 58.9 | 0.967 |
| Low | 29.6 | 39.2 | 38.8 | **0.029** |

Values represent means and SDs; a, Multinomial logistic regression and multiple linear regression were used to test for significant differences across BMI categories; Analyses were adjusted for age, sex, physical activity, country and smoking; b, Healthy Eating Index and Mediterranean diet score were calculated based on an established criteria ([1](#_ENREF_1), [2](#_ENREF_2))

**Fig 1 Dietary intake by BMI category and *FTO* risk allele**

Values represent least squares means and SE adjusted for age, sex, country, physical activity and smoking; Normal: BMI 18.5-24.9kg/m2; Overweight: BMI 25-29.9kg/m2; Obese: BMI >30kg/m2. No significant P values for trends or interactions were observed

**References**

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