Sugar consumption and breast cancer risk: results from NutriNet-Santé prospective cohort

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ABSTRACT

Objective To prospectively investigate the association between the consumption of sugar and risk of breast cancer.

Design Population based prospective cohort study.

Setting and participants 79,742 female participants aged ≥ 18y (mean age: 41.0±14.0y) from the French NutriNet-Santé cohort (2009-2019) were included. Consumption of sugar were assessed using repeated 24h-dietary records, designed to register participants' usual consumption for more than 3,500 different food and beverages items.

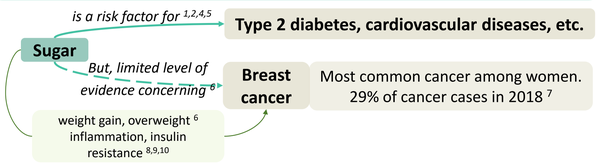
Main outcome measures Prospective associations between sugar consumption and risk of breast (premenopausal, postmenopausal and both) cancer were assessed by multivariable Cox proportional hazard models adjusted for known risk factors.

Results The consumption of sugar was significantly associated with higher breast cancer risk (n=783 cases, $HR_{Q4\ vs.\ Q1}$=1.51, 95% confidence interval 1.14 to 2.00, P for trend=0.0007), so was the consumption of added sugar ($HR_{Q4\ vs.\ Q1}$=1.47, 95% CI 1.12 to 1.91, P=0.02) and more specifically with premenopausal breast cancer (n=459 cases, $HR_{Q4\ vs.\ Q1\ of\ simple\ sugars}$=1.77, 95% CI 1.13 to 2.77, P for trend=0.003). Sugars from sugary drinks, dairy products and milk-based desserts were significantly associated with breast cancer (P for trends were 0.002, 0.01 and 0.02, respectively). Overall consumption of sugars, excluding fruits, or excluding drinks were significantly associated with breast cancer risk (P for trends were 0.0007 and 0.003, respectively). Concerning specific types of sugar, higher sucrose intake was associated with increased risk of breast cancer ($HR_{Q4\ vs.\ Q1}$=1.36, 95% CI 1.04 to 1.78, P=0.01).

CONTEXT

Increasing consumption of sugar

- **France**: 20 to 30% of adults consume more than 100 g/d of total sugars [1]
- **USA**: mean energy intake from sugar > 13% [2], whereas WHO recommends sugar to account for no more than 5 to 10% of energy intake [3]



Recent prospective study within **NutriNet-Santé** cohort found a positive association between **sugary drinks** and cancer risks, in particular **breast cancer** [11] *Independently of weight gain and BMI*

OBJECTIVES

Sugar

- All dietary sugars
- Added sugars
- Sources of sugars
- Specific sugars

?

Breast cancer risk

- Overall
- Premenopausal
- Postmenopausal

MATERIALS & METHODS

NutriNet-Santé cohort

- Largest web-based cohort in the world
- **Population study** 79,742 women including 783 incident breast cancers

Dietary data collection

- **Dietary data:** at least 2 sets of web-based 24h dietary records during the first 2 years of follow-up *(1 set = 3 non-consecutive days within two weeks)*

Sugar intake

- **Food composition database:** >3,500 food items, includes details on sugar composition *(glucose, fructose, sucrose, lactose, galactose, maltose)*
- **Sugary foods clustered in groups:** biscuit/cakes/pastries, sugary products, breakfast cereals, milk-based desserts, sugary drinks, fruits, dairy products

Validation of incident breast cancer cases

- Online self-declaration →Validation by a medical committee, based on medical report + Link with medical/administrative databases and the national mortality registry

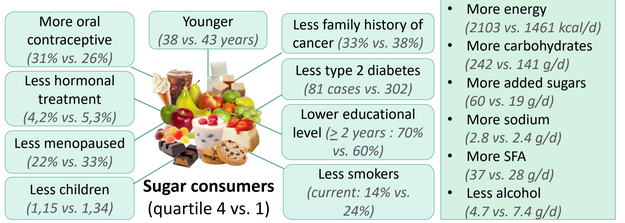
Statistical analysis

- **Quartiles of sugar intakes**
- **Cox proportional hazard models** adjusted for age, BMI, height, physical activity, educational level, smoking status, family history of cancer, number of 24h records, energy intake, alcohol, sodium, SFA, dietary fibers, dietary patterns, cardiometabolic risk factors at inclusion, age at menarche, number of biological children, oral contraceptive, menopausal status, hormonal treatment for menopause *+ sugar from other sources* ***or*** *other types of sugar (when studying sugars from sources* ***or*** *specific sugars)*
- **Sensibility analysis**: further adjustments, stratified analysis, restriction of the study population, etc. → notably to further investigate a mechanism involving weight gain and weight status

RESULTS

Mean (SD) sugar intake (g/d)	Quartiles of sugar intake				All participants (n=79,742)
	1 (n=19,935)	2 (n=19,936)	3 (n=19,936)	4 (n=19,935)	
	54.3 (11.6)	78.2 (5.2)	96.4 (5.7)	130.0 (23.5)	89.7 (30.8)

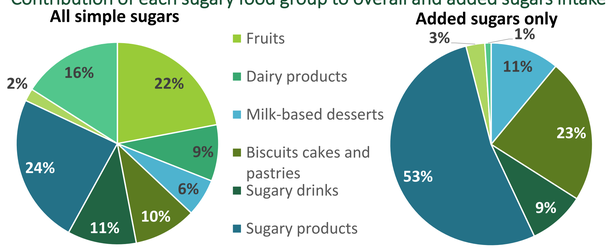
Median follow-up time: **5.8 years**

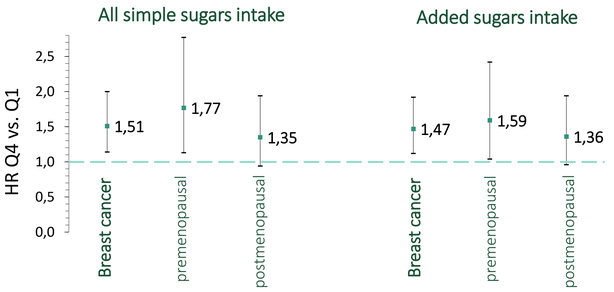


Consume

- More energy *(2103 vs. 1461 kcal/d)*
- More carbohydrates *(242 vs. 141 g/d)*
- More added sugars *(60 vs. 19 g/d)*
- More sodium *(2.8 vs. 2.4 g/d)*
- More SFA *(37 vs. 28 g/d)*
- Less alcohol *(4.7 vs. 7.4 g/d)*

Contribution of each sugary food group to overall and added sugars intake





Sugars from **drinks**, **dairy products**, **milk-based desserts**, **all sugary foods excepts fruits**, **all sugary foods excepts drinks** associated with breast cancer risk

Sucrose associated with breast cancer risk ($HR_{Q4\ vs.\ Q1}$=1.36, 95%CI 1.04 to 1.78, P=0.01)

Sensitivity analysis showed similar results

- With **no adjustment on BMI**, with **BMI as a time dependent variable**, **stratification on BMI** (<25 and ≥25 kg/m²), with **weight gain**
- Other sensitivity analysis

DISCUSSION – CONCLUSION

Higher sugar intake was associated with increased risk of breast cancer

Potential mechanisms

- Weight gain, overweight status
  → *sensitivity analysis suggest that associations were not only explained by BMI status and weight gain*
- Other mechanisms [10]
  - ➢ Higher glycemia
  - ➢ Inflammation
  - ➢ Oxidative stress

Perspectives for primary breast cancer prevention

- Strengthen nutritional recommendations
- Public health policies and taxes

REFERENCES

1. ANSES 2016
2. 2015-2020 Dietary Guidelines - health.gov
3. WHO 2015
4. Howard, Wylie-Rosett. *Circulation* 2002
5. Te Morenga et al. *BMJ* 2012
6. WCRF/AICR 2018
7. IARC/WHO. Global Cancer Observatory 2018
8. Malik et al. *Diabetes care* 2010
9. Barrio-Lopez et al. *Br J Nutr* 2013
10. Makarem et al. *Annu Rev Nutr* 2018
11. Chazelas et al. *BMJ* 2019