Atherosclerosis 286 (2019) 181–183

Contents lists available at ScienceDirect

Atherosclerosis

journal homepage: www.elsevier.com/locate/atherosclerosis

Correspondence

Seasonal variations of lipid profiles in a French cohort

ARTICLE INFO

Keywords:
Lipids profile
Hypercholesterolemia
Seasonal variability
Regional variability
Population study

To the Editor,

We read with interest the article by Vedel-Krogh et al. [1] showing that celebrating the Danish "hygge" is associated with higher concentrations of total (TC) and low-density lipoprotein cholesterol (LDL-C) among 25,764 individuals from the Copenhagen General Population Study. They concluded to not screen and/or diagnose for a possible hypercholesterolemia around Christmas period. They stress the need for re-testing patients later and certainly prior to initiating a cholesterol-lowering therapy. They also pointed out that these results may not be applied to other European populations, which do not celebrate the Danish "hygge". Therefore, we tested this hypothesis among participants from Constances, the largest French population-based study [2] and extended the analyses to triglycerides (TGs) and according to sex.

The Constance study has obtained the authorizations of "*la Commission Nationale Informatique et Libertés (CNIL)*", and "*Conseil National de l'Ordre des Médecins et du Comité Consultatif National d'Éthique pour les Sciences de la Vie et de la Santé*". Written informed consent was signed by all participants. We included 34,317 participants attending one of the 24 Health Prevention Centers all around France with available TC, HDL cholesterol (HDL-C) and TGs measurements from March 2012 to June 2017. Pregnant women, non-fasting people, participants whose parents were born out of France, those with cardiomyopathy and/or coronary diseases, taking diuretics, beta blockers, angiotensin-converting enzyme inhibitors, or hypolipidemic drugs were excluded. TC, HDL-C and TGs were measured by similar laboratory tests as those reported by Vedel-Krogh et al., and LDL-C was calculated according to the Friedewald formula. The inter-laboratory coefficients of variation were less than 3% for TC, 10% for LDL-C, and 5% for TG. A logistic regression model adjusted with age, sex, smoking, alcohol consumption, body mass index (BMI), geographical origin and dwelling place was used to assess the risk of dyslipidemia in January *versus* the rest of the year.

The 34,317 participants were on average 46.4 years old, 45.1% were women, 18% were smokers, 54% reported high alcohol consumption, and 9% had a BMI > 30 kg/m^2. The mean concentrations (standard deviation) of TC, LDL-C and TGs were 5.49 (1.02), 3.43 (0.90) and 1.06 (0.51) mmol/L, respectively. Fig. 1 shows the variations of the moving averages of the three biomarkers as a function of time of year: a clear seasonal variation was observed for TC and LDL-C, not for TGs. Concentrations of TC and LDL-C were the highest in July and August and the lowest from November to January, in all participants and whatever the sex, the concentrations being the highest in men. The differences between the highest and the lowest concentrations were respectively 6.4% (0.35 mmol/L) for TC, 8.7% (0.30 mmol/L) for LDL-C and 9.9% (0.10 mmol/L) for TGs. Using the same thresholds as those retained by Vedel-Krohn et al., Table 1 shows the proportions of participants having concentrations above the thresholds according to the period of the year. The proportions are higher in France than in Denmark. The variations observed confirmed those of the moving averages for TC and LDL-C in all participants and whatever the sex. No clear variation was observed for TGs. Furthermore, for participants attending the Constances study the first week of January, adjusted Odds Ratio (OR [95% Confidence Interval]) of hypercholesterolemia defined by TC higher than 5 mmol/L or LDL-C higher than 3 mmol/L were 1.58 [1.26–1.99] and 1.35 [1.08–1.69], respectively. ORs were lower in women than in men and not statistically significant for LDL-C (data not shown).

Our results seem to be in line with the conclusions of the paper by Vedel-Krogh et al. saying that their results may not apply to other European populations. In the French population, we observed the highest concentrations in TC and LDL-C in winter, from November to January, and the lowest in July and August, differently from the Danish study. For TC and LDL-C, the proportions of men with values above the thresholds were higher than those of women for all months. For TGs, a continuous increase from April to December was observed for males only. We include TGs in our study because they are often associated with low HDL-C and high level of small dense LDL particles, and have been shown to be an independent risk factor for cardiovascular diseases in meta-analyses [3]. TGs concentration is known as largely dependent on diet during the days preceding blood sampling, and sensitive to the intake of a diet rich in fats and alcohol drinking, which are usual in France during the feast period.

As in the Danish study, our results show a seasonal phenomenon

DOI of original article: https://doi.org/10.1016/j.atherosclerosis.2018.12.011

https://doi.org/10.1016/j.atherosclerosis.2019.04.220
Received 2 April 2019; Accepted 12 April 2019
Available online 18 April 2019
0021-9150/

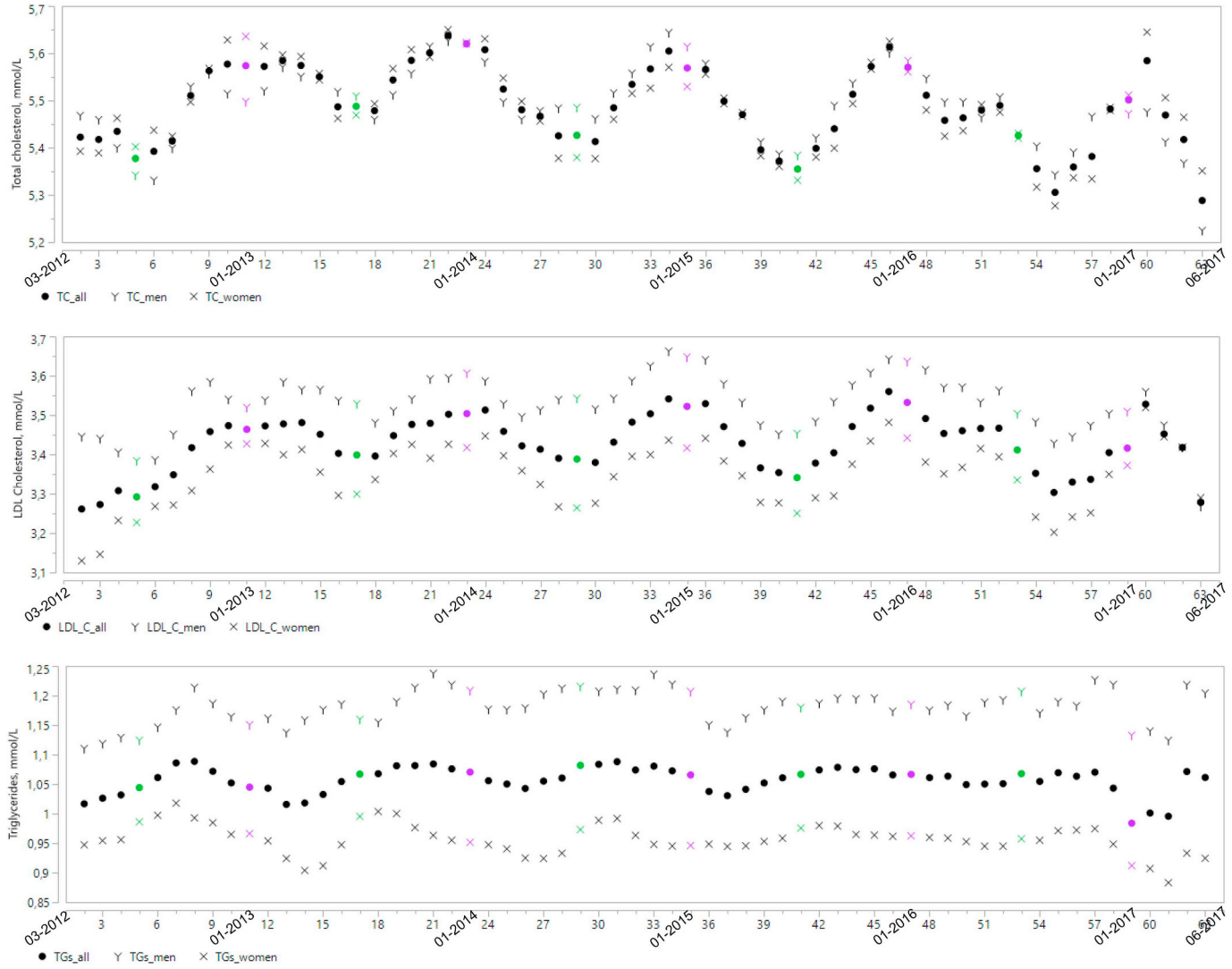

Fig. 1. Moving averages for total cholesterol (TC), LDL cholesterol (LDL-C) and triglycerides (TGs) expressed as mmol/L from March 2012 to June 2017 in all participants and according to sex.
Dots represent moving averages values as the average for the month before and the month following each average. Circle dots, Y dots and X dots represent moving averages in all participants, men and women, respectively. Red dots represent the months of January, and green dots the months of July.

Table 1
Proportions of total cholesterol (TC), LDL cholesterol (LDL-C) and triglycerides values above empirically thresholds (respectively 5.0 mmol/L, 3.0 mmol/L, and 1.7 mmol/L for TC, LDL-C and TGs respectively) according to the period of the year in all participants, and according to sex. Data from the Danish study are included in the table [1]. TGs values are not available for the Danish study.

		January, February, March	April, May, June	July, August, September	October, November, December	First week of January
TC > 5 mmol/L (%)	Denmark, all	62	53	54	60	89
	French, all	70	65	63	68	74
	French men	71	67	65	70	78
	French women	67	63	63	67	71
LDL-C > 3 mmol/L (%)	Denmark, all	54	45	46	55	77
	French, all	69	65	64	68	72
	French men	75	70	69	74	80
	French women	64	61	60	64	66
TGs > 1.7 mmol/L (%)	Denmark	–	–	–	–	–
	French, all	9.7	10.1	10.8	11.3	11.2
	French men	14.7	15.6	15.7	17.3	17.2
	French women	5.6	5.5	6.9	6.3	5.8

constant over years. However, the period during which TC and LDL-C concentrations are the highest went beyond the feast period, which, in France, is generally concentrated on the last week of December and the first of January. On the other hand, the values of TGs are the highest in December and the lowest in March/April. Another difference is the amplitude of variations observed in France (F) which is two times lower than those observed in Denmark (DK): respectively 8.7% (F) *vs.* 20% (DK) for LDL-C, and 6.4% (F) *vs* 15% (DK) for TC. One hypothesis could

be that the blood lipids increase in winter is also due to a change in feeding behavior when the outside temperature drops. We also found a difference between sex for LDL-C and TGs. The Danish authors recommend avoiding screening or diagnosis hyperlipidemia around the Christmas period. We believe that these conclusions should be extended to a wider period for a French population.

These two studies raise three questions: (i) which period of the year should be chosen for a screening/diagnosis or a therapeutic follow-up? (ii) Should the thresholds take into account seasonal variations? (iii) As a biomarker is a continuum, can we reasonably compare measurements at different times of the year if seasonal variations are great? Given the relatively small amplitude of variations observed on the lipid profile in a French population, the risk of misclassification is lower than in Denmark. However, this should be kept in mind when interpreting a lipid profile.

Conflict of interest

The authors declared they do not have anything to disclose regarding conflict of interest with respect to this manuscript.

References

[1] S. Vedel-Krogh, et al., The Christmas period holidays are immediately followed by a period of hypercholesterolemia, Atherosclerosis 281 (2019) 121–127.
[2] M. Zins, et al., The French CONSTANCES population-based cohort: design, inclusion and follow-up, Eur. J. Epidemiol. 30 (2015) 1317–1328.
[3] A.L. Catapano, et al., ESC/EAS Guidelines for the management of dyslipidaemias, Eur. Heart J. 39 (2016) 2999–3058.

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