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ARTICLE COMMENTARY

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Monitoring Caffeine Intake: The Relevance of Adequate Assessment in the Population

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ABSTRACT

The present letter to editor comments on the manuscript "Bulczak EM, Chmurzyńska AU. Caffeine Consumption in Polish Adults: Development and Validation of a Polish Questionnaire for Assessing Caffeine Intake. J Am Nutr Assoc. 2023 Feb 1:1–7. doi:10.1080/27697061.2023.2172749. Epub ahead of print. PMID: 36725370." regarding adequate monitoring of the consumption of caffeine.

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Monitoring; caffeine; pandemic; stress

Dear Editor,

We have read with great interest the article "Caffeine Consumption in Polish Adults: Development and Validation of a Polish Questionnaire for Assessing Caffeine Intake" by Bulczak and Chmurzyńska, and we found it of relevance with a view to caffeinated beverages consumption (1). This article aims to design and validate an online food frequency questionnaire (FFQ) on caffeine intake and to use it to estimate caffeine consumption in Polish adults.

The authors concluded that the average caffeine consumption among Polish adults slightly exceeds the safe consumption dose established by the European Food Safety Authority.

We find this manuscript of great interest and would like to contribute to the discussion.

The creation of validated questionnaires for a specific population is essential, especially in the evaluation of substances such as caffeine and which are present in various drinks and foods. Coffee is the most common source of caffeine among adults, while young people prefer energy drinks.

The habits of preparing and drinking coffee vary greatly in different countries, and in the European nations, different varieties of preparation are distinguished, for example, espresso coffee, mocha, and the coffee pot, which provides different filtration of the various substances contained in coffee in addition to caffeine (2–4). Furthermore, habits change in different countries, and in the Mediterranean countries, coffee is taken in relation to the meal. To this we must add the habit of integrating the drink with milk and sugar, all confounding factors when one wants to carry out a precise analysis of caffeine intake (5).

Validation of a caffeine intake questionnaire is crucial to ensure that it accurately reflects the individual's consumption and provides reliable data. Furthermore, the questionnaire can also be compared with other methods of assessing caffeine intake, such as biologic markers, to further validate its accuracy.

Chlorogenic acid (CGA) is the major polyphenolic constituents of coffee; it increases the activity of the factor nuclear factor erythroid 2- related factor 2 (Nrf2), inhibits the action of NFκB (directly and indirectly) and activates sirtuin-1 (SIRT-1). Moreover, chlorogenic acid modulates a number of important biochemical pathways involved in inflammation (6).

To date, there are no specific biomarkers that evaluate the activity of coffee on health. However, based on large studies, it seems that coffee may exert some direct effects related to the reduction of inflammatory biomarkers, a phenomenon confirmed in most of the systematic reviews and meta-analyses available. It also seems that one of the main mechanisms of the anti-inflammatory effect of coffee is mediated by the increase in the concentration of adiponectin (7).

Interesting perspectives may be further elucidated from the analysis of coffee metabolites in the microbiota. These metabolites may be used as biomarkers of efficacy and absorption (8, 9).

It is important to note that validated questionnaires should be culturally and linguistically appropriate as well as easily understandable by the intended population.

The study by Bulczak and Chmurzyńska (1) was conducted between 2019 and 2020 and represents the reality in the Polish population just prior to and in the early stages of the COVID-19 pandemic. However, the data collected during the pandemic have highlighted profound changes in eating habits worldwide. This effect has been reported in several studies in which changes in diet and intake of single foods have been largely attributed to a response to stress (10–14). Several studies show that the COVID-19 pandemic has had a disproportionate economic impact for women and lower-income groups; women have suffered greatly from the economic crisis induced by the closure of productive activities and also because they are very active in tourism and in the manufacturing industry (15, 16).

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In our studies performed during the pandemic phase, we found an increase in caffeine consumption attributable in young people to an increase in energy drinks and in adults to an increase in coffee consumption (10, 17, 18).

In a previous manuscript, we analyzed the effects of the pandemic on coffee consumption and caffeine intake in women, noting that there was an increase in coffee consumption that was associated with an increase in smoking (19).

The association between the consumption of coffee and use of cigarettes has been known for some time and the increase of these two substances easily occurs simultaneously (20).

In a very interesting experiment, Papke and coworkers evaluated the influence of coffee on receptor response to nicotine. The experimental model used oocytes that were surgically removed from mature female *Xenopus laevis* frogs (20). Smoking populations with high-sensitivity (HS) forms of α4β2 nAChR receptors are limited in response to high concentrations of nicotine. Upon waking, after the previous day's nicotine has been extensively metabolized, the HS receptors will be primed for the day's first dose of the drug. The delivery of 1-methylpyridinium (n-MP) in breakfast coffee may then tune that response to the first cigarettes of the day, decreasing the response of upregulated HS receptors and perhaps increasing the activity of low-sensitivity receptors that will respond to the full dose of nicotine. These effects on the receptors exert an action on the brain; however, it is not known whether they can also influence the effects of the beneficial substances contained in coffee, in particular the antioxidants such as phenolic compounds (chlorogenic acids, cafestol, kahweol).

The relationship between coffee and smoking is complex and is strongly influenced by the type of coffee that is consumed (as previously mentioned, the method of preparation modifies the composition of the ingredients that filter into the drink) and by the quantity of cigarettes smoked.

More research is needed to understand whether the positive effects associated with coffee consumption are mitigated with cigarette smoking. Several studies have correlated the beneficial effects of coffee consumption on cardiovascular diseases and cardiovascular risk factors (6). A meta-analysis including more than 12,000,000 participants concluded that there was a nonlinear protective association between long-term coffee consumption and cardiovascular events. Specifically, compared to non-habitual coffee drinkers, the relative risk of cardiovascular disease is 0.85 (95% confidence interval, 0.80–0.90) for a median of 3.5 cups consumed per day (21). Similar data have been recently reported in the US population (22)

Cicero and coworkers performed a subanalysis of the Brisighella Heart Study (Italy) and compared central and peripheral blood pressure (BP) values in a subcohort of 720 men (47.9%) and 783 women (52.1%) reporting the drinking of different amounts of coffee each day (21). They found that regular coffee drinking is associated with lower systolic BP, peripheral pulse pressure (PP), aortic BP, and aortic PP, but with similar arterial stiffness (23). It is quite difficult to compare these results with other European cohorts due to the different dietary pattern in Northern Italy compared to that in other countries, including a different method of coffee preparation and consumption and a different amount and biovariability of bioactive peptides and polyphenols included in daily consumed foods (3, 23, 24).

Coffee and caffeine are important dietary components with a strong influence on health. Increasing knowledge about these foods is important for understanding the mechanisms of action and giving more precise indications in personalized prevention. In this view, the article by Bulczak and Chmurzyńska (1) is relevant to increase our knowledge of the habits of different countries to proceed with targeted social awareness campaigns.

Disclosure statement

No potential conflict of interest was reported by the authors.

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