**High-temperature tea and esophageal cancer**

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Billions of people start their day by drinking hot beverages, such as tea, coffee, and maté (a commonly used infusion in South America), and many enjoy drinking them throughout the day.

Drinking very hot beverages, however, might not be entirely safe, as earlier studies suggested that it might increase the risk of esophageal cancer. [Reminder: the esophagus is a tube-shaped organ connecting the throat and stomach]. The previous evidence was limited though, as it was largely based on self-reported perception of tea drinking temperature (for example, described as cold, hot, or very hot by study participants). This perception may vary across individuals and populations and could not be objectively verified. No studies did measure actual beverage drinking temperature in the general population and assessed the future risk of esophageal cancer in those people in the years to come. This is called a prospective design because risk factor measurement is done prior to disease occurrence.

It is important to collect data prospectively to appropriately examine the association between hot beverages and esophageal cancer. Many esophageal cancer patients have difficulty swallowing for some time ––commonly followed by changes in dietary habits–– before their disease is diagnosed. If the disease could change esophageal cancer patients’ drinking temperature preference, measuring tea temperature after disease occurrence may lead to misleading results.

To overcome the limitation of previous studies, we examined the association of tea drinking temperature, measured both objectively and subjectively at study baseline, with future risk of esophageal squamous cell carcinoma (ESCC) in a prospective study of over 50,000 individuals residing in Golestan Province, northeast Iran. ESCC is the most common histological subtype of esophageal cancer in more than 90% of countries and second most common (after esophageal adenocarcinoma) in other countries, mostly in north America and northern Europe. Almost 9 out of 10 esophageal cancers globally are ESCC.

Our trained study staff collected information on a wide range of personal characteristics and potential risk factors of ESCC in face to face interviews. We asked those who drank tea about the amount of tea consumed and the interval (in minutes) between tea being poured and drunk, and whether they usually drank tea warm/lukewarm, hot, or very hot.

Furthermore, we measured tea drinking temperature using a method that had shown good reliability in our earlier assessments: two fresh cups of tea were prepared at the time of interview, one for the participant and the other for the interviewer to measure the temperature using a digital thermometer.

Then, study participants were followed-up for a median duration of 10 years.

Some factors ––known as confounding factors–– could cause spurious associations in epidemiological studies by influencing both the risk factor and disease being evaluated. In a population, for example, if smoking is more common among alcohol drinkers than non-drinkers, simple analysis might show an increased risk of lung cancer associated with alcohol drinking, which may only be related to higher smoking rates among alcohol drinkers rather than the effects of alcohol per se [here, smoking is a confounding factor for the association between alcohol drinking and lung cancer]. We used statistical techniques to control for multiple potential confounding factors, including sex, urban/rural residence, ethnicity, education, wealth, cigarette smoking, alcohol consumption, opium use, and fresh fruit and vegetable consumption (the only dietary factor with a well-studied association with ESCC; low consumption increases the risk). [Note: excess body weight is a risk factor for esophageal cancer but only for esophageal adenocarcinoma.]

All measures of higher tea temperature considered in this analysis (higher measured temperature, reported preference for very hot tea drinking, and reported shorter time from pouring tea to drinking) were associated with ESCC risk. In analysis of the combined effects of measured temperature and amount, drinking 700 ml/day tea or more at ≥60°C [≥140°F] (compared to less than 700 ml/day at <60°C) was associated with about 90% higher risk of ESCC. The results were comparable in additional analyses by sex and among those who never smoked and never drank alcohol, further supporting that the observed associations were independent from smoking and alcohol drinking.

Our results provide strong evidence for an association between drinking beverages at very high temperatures and ESCC. However, people could still enjoy their favorite beverages without increasing their cancer risk by drinking them colder at <60°C, which does not appear to increase the risk. More studies are needed on mechanisms of this association and the effects of drinking tea at lower temperatures.