The Association between Tea Consumption and Nasopharyngeal Carcinoma: A Systematic Review and Meta-Analysis

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Abstract

Heated debates have been on-going about tea consumption and the incidence of cancer, especially in head and neck cancer types. This study aimed to review the association between tea consumption habits and nasopharyngeal cancer (NPC). **Methods:** This review was carried out in accordance with the PRISMA-P protocol. Literature search for journal articles that published studies on the relationship between tea consumption and NPC was performed via databases, such as Elsevier, PubMed, Science Direct, Springer Link, Google, and Google Scholar, for 10 years from 2008 to 2018. Relevant studies were obtained by applying the pre-determined keywords, such as nasopharyngeal cancer, tea consumption and NPC, risk factors of NPC and benefits of tea consumption. **Results:** A total of 126 articles was retrieved. These articles were subjected to eligibility assessment. Six articles remained after applying the inclusion criteria. Results suggest that habitual tea consumption reduces NPC. Tea consumption significantly reduces NPC with all the studies having a p-value ≤0.05. Meta-analysis showed statistical association between tea consumption and NPC risk with OR=0.865 at 95% CI (0.806-0.929). **Conclusion:** This study suggests that habitual tea consumption could reduce the risk of NPC development. Additional studies are needed to further clarify the molecular role of tea in NPC risk reduction.

**Keywords:** Nasopharyngeal carcinoma (NPC)- tea consumption- risk factors- benefits of tea consumption

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Selection criteria

Eligibility and relevance of the selected articles were carried out. The inclusion criteria for this systematic review are; all the selected publications must fall within the past 10 years (2008 till 2018), it must be studies that involves only NPC cases, the paper must address the association of tea consumption and NPC risk, and must possess case-control design. The criteria for exclusion are: all publications before 2008, studies involving other types of head and neck cancer (HNC) other than NPC and other cancer types, and studies not addressing the association of tea consumption with NPC risk.

Data extraction

The data extraction were conducted using a standardized data extraction form, extracting information such as the name of first author, the year of publication, study design, sample size, number of cases and control, study size, gender of participants, type of the tea, tea drinking definitions, NPC definitions, its risks, and the OR value with 95% CI (Chen and Long, 2014). The above extraction criteria used were aimed at providing quality evidence and eliminating biases. Guideline and checklist applied in the study criteria is Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P).

Data analysis

The data obtained estimated the OR value in this analysis because of increasing rate of nasopharyngeal cancer. The ORs and 95% CIs of all included studies were obtained using variance-based method with a fixed effect. Descriptive analysis of tea consumption in respect to nasopharyngeal cancer risk, dose response relationships in terms of daily or monthly and lifetime tea consumption were carried out. All the included articles collected their information from either Medical record and/or questionnaire to observe the effect of tea consumption. All the obtained information was tabulated.

Statistical analysis

Meta-analysis was performed for tea consumption using the case-control studies that reported association tea consumption with NPC. Odds ratio for each of the selected studies were individually computed from the cases and controls and summarized with fixed-effect model. Statistical heterogeneity of the included studies was evaluated in the meta-analysis through Q and I². Forest plot for tea consumption was also computed, using comprehensive meta-analysis. Estimation of potential publication bias was estimated using the funnel plot, which plotted standard error of each study against its OR. Asymmetrical plot indicates publication bias. All statistical analyses were carried out using comprehensive meta-analysis Software. A P-value of <0.05 indicates statistically significant.

Results

Effects of tea consumption habit

All the articles included in this study, reported that tea consumption (overall all type of tea) could help in cancer prevention. All the studies were case-control studies (Table 1). It also revealed that, tea consumption habit contributes to the effect of the tea on the patient.

Tea consumption and nasopharyngeal cancer

The overall analysis of all the six studies, including the case control and cohort studies, found that tea drinking was associated with significant reverse in NPC with all having p-value of ≤ 0.05 (Table 2).

Figure 1. Legend?
Tea Consumption and Nasopharyngeal Carcinoma

Table 1. Association between Tea Consumption Frequencies and Nasopharyngeal Carcinoma

<table>
<thead>
<tr>
<th>Sources</th>
<th>Study participant</th>
<th>Data collection method &amp; location</th>
<th>Outcome measured</th>
<th>Adjusted OR estimates (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jia et al., 2010</td>
<td>425 cases and 717 controls, 369 cases, 439 cases, 347 controls</td>
<td>Medical records, China.</td>
<td>Herbal tea habit</td>
<td>Monthly: OR = 0.46 (0.38-0.56)</td>
</tr>
<tr>
<td>Turkoz et al., 2011</td>
<td>10 patients, 37 controls, 149 patients, 130 controls, 24 patients, 16 controls</td>
<td>Questionnaire Interview Turkey</td>
<td>Tea in general</td>
<td>Never: OR = 1.0, &lt;10 glass/day: OR = 5.55 (2.16-14.24), 10 glass/day or more: OR = 1.31 (0.67-2.57)</td>
</tr>
<tr>
<td>Hsu et al., 2012</td>
<td>263 cases, 193 controls</td>
<td>Questionnaire, Taipei city</td>
<td>Black tea</td>
<td>(0 times/week): 1.00 (referent), (0.5 times/week): 0.66 (0.43-1.03), (≥0.5 times/week): 0.69 (0.44-1.08)</td>
</tr>
<tr>
<td>Ruan et al., 2010</td>
<td>903 cases, 1095 controls</td>
<td>Questionnaire, Interview China</td>
<td>Tea in general</td>
<td>(0 times/week): 1.00 (referent), (1-3 times/week): 0.66 (0.44-0.98)</td>
</tr>
</tbody>
</table>

OR, Odds Ratio; CI, Confidence Interval
The meta-analyses results for tea consumption (tea drinkers versus non-tea drinkers) are shown in Figure 2 and 3, respectively. The meta-analysis showed statistical association between tea consumption and NPC risk with OR=0.865; 95% CI=0.806-0.929) and low statistical heterogeneity (I²=49.95%; P<0.00). Meta-regression-analysis was not conducted to investigate potential factors that could influence the odds ratio summary of the NPC risk due to variation in study factors and characteristics. Funnel plot, showed indicates no visual publication bias (Figure 3).

Discussion

This current meta-analysis is limited by disparity in the parameters studied by our data source. The findings of this review is also consistent with a previous study, which reported that green tea consumption can protect against cancers (Sharangi, 2009). This review revealed significant inverse correlations between consumption frequencies of tea and NPC (Table I), with each study having an odds ratio of less than 1 (1 is the reference value). Khan and Mukhtar (2013) reported that tea consumption has dose–response relationships with frequency, duration and concentration (Khan and Mukhtar, 2013). Moreover, they suggested that certain adult dietary patterns might have protective effects against the development of NPC (Koch et al., 2018). This investigation found a contrary association between NPC and tea consumption from previous report by Lin et al (2019), which noted that NPC risk was modestly increased among people who did not consume herbal tea for up to five years. This finding also suggests that tea could significantly inhibit NPC (Table II). Previous studies also discovered that green tea and Oolong tea have protective effects on NPC risk, which is consistent with results published in other studies concerning other types of cancers (Qihua et al., 2008; Tang et al., 2009; Lee et al., 2010; Ogunleye et al., 2010). Habitual consumption of tea could also be associated with reduced NPC risk.

In conclusion, These studied data suggests that habitual tea consumption could reduce the risk of NPC development. Molecular studies on the effect of tea consumption is necessary to further clarify the molecular role of tea in NPC risk reduction.

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Conflict of interest
The authors have no existing conflict of interest.

References


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