Journal of Taibah University Medical Sciences (2025) 20(3), 288–297

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com

Review Article

Differences in dental caries experience between super-tasters and non-tasters: A systematic review and meta-analysis

Heba Ashi, BDS, PhD

Department of Dental Public Health, Dentistry, King Abdul Aziz University, Jeddah, KSA

Received 21 January 2025; revised 22 March 2025; accepted 24 April 2025; Available online 19 May 2025

Abstract

Introduction: The investigation into the interplay between taste perception and caries experience is not only relevant from a clinical standpoint but also holds implications for public health interventions and personalized oral health care. This systematic review comprehensively examined and synthesized the existing body of literature on the differences in caries experience in super- and non-tasters of PROP (6-n-propylthiouracil).

Methods: An electronic literature search was conducted on PubMED, EMBASE, OVID, Google Scholar, CENTRAL, and ISI Web of Knowledge. The keywords/medical subject headings (MeSH) were: (dental caries) AND ((taste) OR (non-taster) OR (super-taster) OR (taste sensitivity) OR (taste buds) OR (gustation)) AND ((6-n-propylthiouracil) OR (PROP)). Only prospective clinical studies that had distinct groups of super-tasters and non-tasters were included. Meta-analysis of the standardized mean differences of Decayed, Missing, and Filled Surfaces (DMFS) and Decayed, Missing, and Filled Teeth (DMFT) indices was carried out as well as a risk of bias assessment using the JBI tool.

Results: Nine cross-sectional studies were included. In the majority of studies, non-tasters had a higher rate of dental caries, which was also evident in the results of the meta-analysis. However, four studies had a high level of bias.

Conclusion: Within the limitations of this review, it may be concluded that non-tasters have a higher risk of dental caries. However, future studies should adjust for variables such as age, oral hygiene, fluoride intake, and salivary flow to improve the generalizability of these observations.

الملخص

المقدمة: إن دراسة العلاقة بين إدراك الطعم وتجربة تسوس الأسنان ليست ذات أهمية من الناحية السريرية فحسب، بل تحمل أيضًا تأثيرات كبيرة على التدخلات الصحية العامة والرعاية الصحية الفموية المخصصة. تهدف هذه المراجعة المنهجية إلى فحص وتلخيص الأدبيات الحالية المتعلقة بالاختلافات في تجربة تسوس الأسنان بين المتذوقين المفرطين وغير المتذوقين لمادة PROP (6-n-propylthiouracil).

الطرق: تم إجراء بحث إلكتروني في قواعد البيانات PubMED، CENTRAL، Google Scholar، OVID، EMBASE، وISI Web of Knowledge. تضمنت الكلمات المفتاحية/عناوين الموضوعات الطبية (MeSH): [(تسوس الأسنان) AND ((الطعم) OR (غير المتذوق) OR (المتذوق المفرط) OR (حساسية الطعم) OR (براعم التذوق) OR (الإحساس بالطعم)) AND ((6-n-propylthiouracil) OR (PROP))]. تم تضمين الدراسات السريرية المستقبلية فقط التي تميزت بوجود مجموعتين واضحتين من المتذوقين المفرطين وغير المتذوقين. وتم إجراء تحليل تلوي للفروق المعيارية في مؤشري DMFS وDMFT بالإضافة إلى تقييم خطر التحيز باستخدام أداة JBI.

النتائج: تم تضمين 9 دراسات مقطعية. في معظم الدراسات، كان لدى غير المتذوقين معدل أعلى من تسوس الأسنان، وهو ما كان واضحًا أيضًا في نتائج التحليل التلوي. ومع ذلك، كانت أربع دراسات تعاني من مستوى عالٍ من التحيز.

الخلاصة: في حدود القيود التي واجهتها هذه المراجعة، يمكن الاستنتاج أن غير المتذوقين لديهم خطر أعلى للإصابة بتسوس الأسنان. ومع ذلك، يجب على الدراسات المستقبلية ضبط المتغيرات مثل العمر، نظافة الفم، تناول الفلورايد، وتدفق اللعاب لتحسين إمكانية تعميم هذه الملاحظات.

الكلمات المفتاحية: إدراك الطعم؛ الطعم الحلو؛ تسوس الأسنان؛ مراجعة منهجية;

E-mail: hmashi@kau.edu.sa

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

 https://doi.org/10.1016/j.jtumed.2025.04.004

Keywords: Dental caries; Sweet taste; Systematic review; Taste perception

Introduction

Dental caries, a multifactorial and prevalent oral health concern, continues to exert a substantial impact on global public health.[1,2] Despite advancements in preventive strategies and oral healthcare, the prevalence of caries remains a significant challenge.[2] Several factors contribute to the etiology of dental caries. At the forefront is the presence of bacteria, particularly *Streptococcus mutans*, in the oral environment.[3] These bacteria metabolize sugars from the diet, producing acids that can erode tooth enamel and initiate cavity formation. Dietary habits play a crucial role, as a diet high in sugar and carbohydrates provides a favorable environment for bacterial activity.[4] Poor oral hygiene practices such as infrequent brushing and flossing allow plaque to accumulate on teeth, contributing to bacterial colonization on the tooth surface.[5] Saliva, with its role in neutralizing acids and remineralizing enamel, is essential for oral health, making factors affecting saliva quality and flow significant contributors to caries.[6] Fluoride, a key element in enamel remineralization, plays a preventive role, and inadequate exposure can heighten susceptibility.[7] Genetics,[8] age,[9] and systemic health[10] are additional factors influencing the risk of dental caries. To mitigate this risk, maintaining good oral hygiene, adopting a balanced diet, limiting sugary food intake, and regular dental check-ups are crucial practices in preventive dental care.

The DMFS index, which stands for "Decayed, Missing, and Filled Surfaces," serves as a crucial tool in dentistry for assessing the extent and severity of dental caries in both individuals and populations.[11] This index involves the enumeration of three components: decayed (D), missing (M), and filled (F) tooth surfaces. The 'D' component represents untreated caries, requiring visual inspection or diagnostic tools to identify cavities. 'M' accounts for missing surfaces, encompassing teeth lost due to caries or other reasons. The 'F' component denotes filled surfaces, indicating areas where dental interventions have addressed caries. The cumulative DMFS score, derived by summing these three components, offers a numerical representation of the overall burden of dental caries. Higher DMFS scores indicate a greater prevalence and severity of caries. This index is particularly valuable in epidemiological studies, enabling the monitoring of oral health trends, planning of interventions, and evaluation of treatment success. By utilizing DMFS, dental professionals and public health officials can gain insights into the oral health status of populations, identify areas of concern, and implement targeted strategies for improvement.

As mentioned above, sugar intake plays an important role in the development of dental caries. Recent studies have indicated that individuals with a high sense of sweet taste may have a lower rate of dental caries because of a higher perception and lower threshold of sweet taste than a person with a lower sense of sweet taste when consuming the same amount of sugar.[12] The human ability to perceive taste is a complex interplay of genetic, environmental, and physiological factors. Notably, individuals can be classified into distinct taste categories, including super sweet tasters, medium tasters, and non-tasters, based on their responsiveness to intense sweetness stimuli.[13] 6-n-propylthiouracil (PROP) is a chemical compound commonly employed in taste perception studies to categorize individuals based on their sensitivity to bitter tastes.[14] This categorization results in three groups: super-tasters, medium tasters, and non-tasters. Super-tasters exhibit heightened sensitivity to bitterness, often due to a higher density of taste buds, particularly on the fungiform papillae of the tongue.[15] Consequently, super-tasters find foods with bitter components, such as certain vegetables, to be more intense and unpleasant. Medium tasters fall between super-tasters and non-tasters in terms of sensitivity, with a moderate density of taste buds. Non-tasters, on the other hand, have lower sensitivity to bitter tastes, perceiving the bitterness of PROP less intensely than super-tasters.[16] The PROP test involves administering a small amount of PROP to assess an individual's response to the taste. Genetic factors heavily influence PROP sensitivity, and the inheritance of specific taste receptor genes plays a crucial role in determining whether an individual falls into the super-taster, medium taster, or non-taster category.[17]

The investigation into the interplay between taste perception and caries experience is not only relevant from a clinical standpoint but also holds implications for public health interventions and personalized oral health care. This systematic review comprehensively examined and synthesized the existing body of literature on the differences in caries experience, as measured by Decayed, Missing, and Filled Surfaces (DMFS), between super sweet tasters and non-tasters. By elucidating the potential associations between taste perception and caries susceptibility, this review contributes valuable insights to the broader understanding of individualized risk factors for dental caries and informs targeted preventive strategies.

Materials and Methods

Focused question and protocol registration

Following the Participants, Intervention, Control, and Outcome principal reported in the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines,[18] the following focused question was constructed: 'Do super-tasters and non-tasters of PROP have similar severity of dental caries, as measured by DMFS scores?' A protocol was developed using the PRISMA-Protocol (PRISMA-P)[19] guidelines and was registered on PROSPERO (Registration No. CRD42023466821).

Literature search methodology

An electronic search was conducted by a medical information specialist library on the following databases: EMBASE, OVID, Google Scholar, International Clinical Trial Registry Platform, Cochrane CENTRAL, and ISI Web of Knowledge. The keywords/medical subject headings (MeSH) were: (dental caries) AND ((taste) OR (non-taster) OR (super-taster) OR (taste sensitivity) OR (taste buds) OR (gustation)) AND ((6-n-propylthiouracil) OR (PROP)). Since this review aimed to compare the DMFS scores in super-tasters and non-tasters, only prospective clinical studies that had to distinct groups of super-tasters and non-tasters were included. Methodology was restricted to use of the PROP test and measuring caries severity by mean DMFS scores. There was no language restriction. Reviews, conference abstracts, case reports, retrospective studies, opinion pieces, and letters to the editors were excluded. Any articles not in English or Arabic (native languages of the reviewers) were translated using the machine learning features of Google Translate to ensure the comprehensive inclusion of diverse populations and perspectives. The search was conducted on September 15, 2024.

Screening and study selection

Following the completion of the preliminary literature search, two investigators screened the articles in two phases. In the first phase, the records were screened according to titles and abstracts. Any records not meeting the selection criteria were excluded. In the second phase, full texts of any potentially eligible articles were downloaded and read comprehensively to adjudicate eligibility. Of these full texts, the studies strictly meeting the inclusion criteria were included in this review. Any disagreements between the reviewers were solved by discussion.

Data extraction

The entire data extraction process was caried out by two reviewers independently. Data extraction forms were created on Microsoft Excel with categories corresponding to data intended to be collected. Prior to data extraction, a pilot exercise using a sample of included studies was carried to identify any missing data categories. The following general characteristics were extracted from each study: number of patients, subgroups, ethnic groups, sex, age, caries, and oral health assessments carried out. Descriptive outcomes were extracted for all studies. From studies that had sufficient and similar outcome measurements, mean DMFS values recorded among non-tasters and super-tasters were extracted and pooled for meta-analysis.

Meta-analysis

Continuous data (standardized mean) values of DMFS scores recorded among super- and non-tasters were extracted and pooled using a random-effects model in RevMan 5.4 (Cochrane). Heterogeneity of the outcomes was calculated using I^2 statistic. Overall results were considered were statistically significant at $P < 0.05$.

Risk of bias assessment

Based on the type of studies included, the risk of bias in each study was assessed using JBI's Critical Appraisal Checklist for Analytical Cross Sectional Studies.[20] Briefly, this checklist appraises cross-sectional studies across the following domains: inclusion criteria, description of subjects and setting, validity of exposure measurement, measurement of the condition, identification and handling of confounding factors, measurement of outcomes, and statistical analyses.

Results

Results of literature search

Initial search resulted in 1259 records, of which 35 were duplicates. Thus, titles and abstracts of 1224 records were considered for eligibility. After exclusion of 1208 irrelevant records, full-texts of 16 articles were downloaded for screening.[21–36] Of these, seven articles excluded because of reasons specified in Tables.[21–27] Therefore, nine cross-sectional studies were included in this review for quantitative and qualitative synthesis.[28–36] The excluded studies and reason for exclusion are given in Table 1 and the search process is illustrated in Figure 1.

General characteristics of included studies

All include studies were analytical cross-sectional studies in which DMFS and/or DMFT was measured in super-tasters and non-tasters of PROP.[28–36] Number of included patients ranged from 100 to 600.[28–36] In eight studies, subgroups of non-tasters, medium tasters, and super-tasters of PROP were analyzed,[28–31,33–36] while in one study, only non-tasters and super-tasters were compared.[32] In one study, caries were compared between non-tasters, medium tasters, and super-tasters with patients with early childhood caries (ECC).[33] Ethnicity information of patients was provided in only study, which included 82.2 % Hispanic, 1.4 % Black, Asian 2.67 %, and 1.3 % white patients among its 150 participants.[28] Sex information was reported in seven studies,[28–36] which reported between 45 % and 57 % of the included population as females. DMFS was reported in eight studies.[28–31,33–36] Additionally, five studies also measured DMFT scores.[30–32,34,35] Of the nine studies included, one study did not report standard deviations or confidence intervals and hence was excluded from the meta-analysis.[29] All studies were selected for descriptive synthesis.[28–36] The general characteristics of the studies are provided in Table 2.

Overall outcomes of the studies

In seven of nine studies, there was a statistically significantly lesser DMFS and/or DMFT scores in the super-tasters and non-tasters of PROP.[28–31,33–36] In one study, the DMFT scores were lower in the super-tasters than non-tasters, but the difference was not statistically significant.[32] In one study, although lower DMFS values were recorded in super-tasters, no statistical analysis was conducted.[28] The overall outcomes of the studies are provided in Table 2.

Results of the meta-analysis

Overall, results of analysis of the pooled DMFS values in super-tasters and non-tasters revealed a statistically significant lower DMFS scores in the super-tasters ($P = 0.002$) but with thigh heterogeneity ($I^2 = 77$ %) (Figure 2). However, this difference was more pronounced when DMFT was measured ($P = 0.00001$) and less heterogeneous ($I^2 = 35$ %) (Figure 3).

Results of the risk of bias assessment

Three studies were graded as having a low level of bias,[28,35,36] two studies were graded as moderate,[30,31] and four studies were deemed as having a high level of bias.[29,32–34] The detailed results of the risk of bias assessment are presented in Table 3.

Table 1: List of excluded studies and reasons.

Excluded study (author, year)	Reason for exclusion
Furquim et al.[21]	PROP not used
Marquezin et al.[22]	Wrong outcomes
Ashi et al., 2017a[24]	PROP not used
Ashi et al., 2017b[23]	PROP not used
Ashi et al., 2019[25]	PROP not used
Jurczak et al., 2020[26]	PROP not used/wrong outcomes
Selvaraju et al., 2022[27]	PROP not used

PROP = 6-n-propylthiouracil.

Discussion

Several studies have explored the correlation between the PROP non-tasting status and DMFS scores, presenting a diverse array of methodologies and participant demographics.[29–36] These studies conducted cross-sectional analyses involving sizable cohorts of participants, examining their PROP taste perception and correlating them with DMFS and DMFT scores. In six of eight studies analyzed in this review,[28–31,33–36] a statistically significant association between PROP non-tasting and elevated DMFS and DMFT scores, suggesting a potential predisposition for increased caries susceptibility among individuals with reduced taste sensitivity. This was most likely due to the reduced threshold for sweet taste in non-tasters leading to lesser sugar intake.[21] Nonetheless, research indicates that taste perception is a combination of genetic and physiochemical factors.[37]

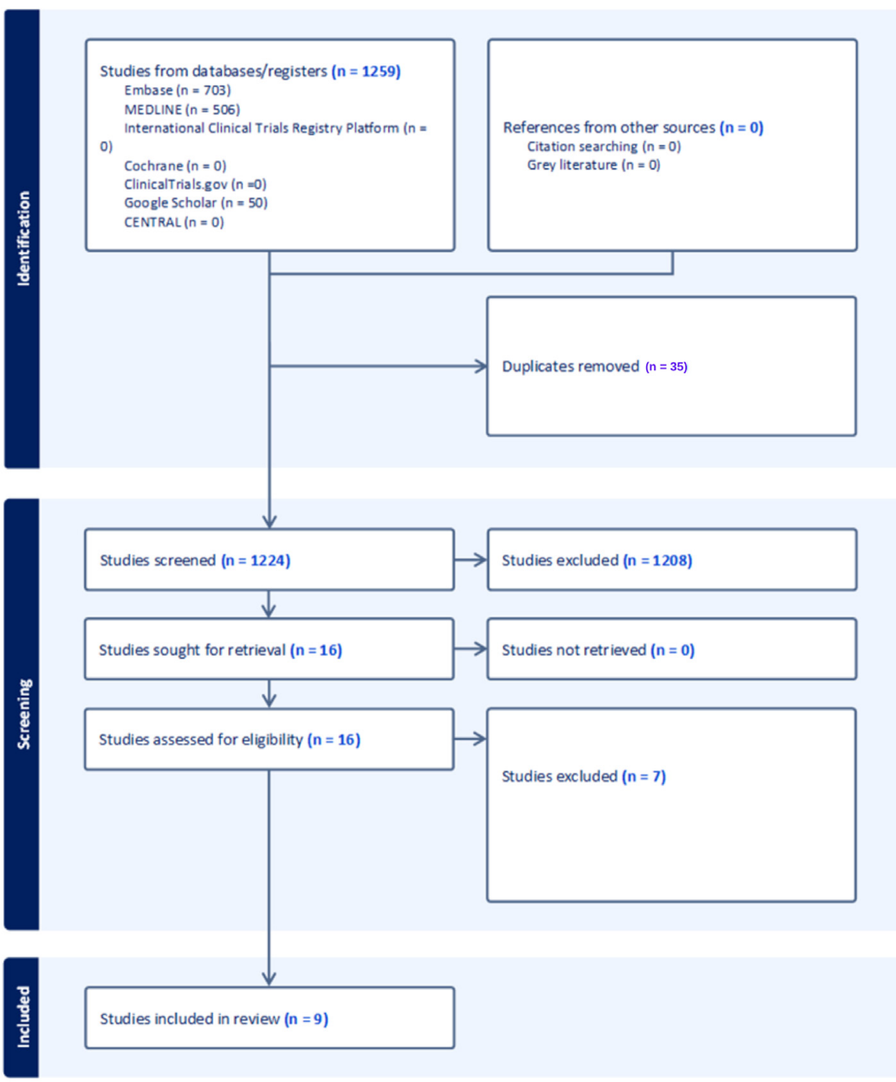

Figure 1: PRISMA flow chart of the search process employed for this review.

Table 2: General characteristics and descriptive outcomes of the included studies.

Study (author, year)	Country	Patients (n)	Sub-groups (n)	Ethnic groups	Female (n, %)	Age (years; mean ± SD; median (range))	Caries and OH assessments	Overall outcomes
Lin, 2003	USA	150	Non-tasters (n = 16) Medium tasters (n = 87) Super-tasters (n = 47)	Hispanic: 82.2 % Black: 14 % Asian: 2.67 % White: 1.3 %	n = 68, 45.33 %	Non-tasters: 8 ± 2.0 (6−11) Medium tasters: 9 ± 1.9 (6−12) Super-tasters: 9 ± 2.0 (6−12)	dmfs/DMFS, OHI−S	Non-tasters had (18.19 ± 13.3) had higher DMFS ($P < 0.001$) than super- tasters (1.00 ± 1.7). DMFS was higher in non-tasters than in medium tasters (8.87 ± 10.6). Taste was the only independent variable significantly related to overall caries experience ($P < 0.0001$)
Rupesh et al., 2006	India	340	Non-tasters (n = 63) Medium tasters (n = 168) Super tasters (n = 109)	NR	n = 152 (45 %)	Non-tasters: 7.98 ± 1.62 (6−12) Medium tasters: 9.05 ± 1.88 (6−12) Super-tasters: 8.17 ± 1.95 (6−12)	DMFS/dmfs	Super-tasters (4.00 ± 5.30) had a significantly lesser DMFS score compared to non-tasters (13.94 ± 10.51) ($P < 0.001$)
Hegde and Sharma, 2008	India	500	Non-tasters (n = 130) Medium tasters (n = 190) Supertasters (n = 180)	NR	n = 245 (49 %)	8−12 years	DMFS/Dfs	Non-taster children had higher DMFS (3.63; SD = NA) score than medium (1.92; SD = NA) and super-tasters (1.06; SD = NA). Statistical significance and standard deviations not reported.
Oter et al., 2011	Turkey	120	Super-tasters (n = 26) Medium tasters (n = 65) Non-tasters (n = 29) (Numbers calculate from percentages)	NR	NR	9.97 ± 1.59 (7−12 years)	DMFS, DMFT	Lower DMFS and DMFT scores in super-tasters (DMFS: 2.15 ± 3.27; DMFT: 1.46 ± 1.73) than medium tasters (DMFS: 2.62 ± 3.7; DMFT: 1.78 ± 1.86) and non-tasters (DMFS: 5.76 ± 7.04; DMFT: 3.2 ± 82.61) ($P < 0.01$)
Jyothirmai et al., 2011	India	200	Super-tasters (n = 8) Medium tasters (n = 70) Non-tasters (n = 122)	NR	100 (50 %)	15 years	DMFS, DMFT	Lower DMFS and DMFT scores in super-tasters (DMFS: 1.50 ± 0.55) than medium- (DMFS: 2.95 ± 1.62) and non-tasters (DMFS: 3.55 ± 2.19) ($P < 0.001$)
Shetty et al., 2014	India	100	Super tasters (n = 27) Medium tasters (n = 65) Non tasters (n = 8)	NR	NR	6−14 years	DMFT, *Streptococcus mutans*, dietary habits	Permanent dentition: Super tasters and medium tasters had a mean DMFT value of 0.259 and 1.349, respectively, whereas the non-tasters had a value of 2.625 ($P < 0.001$). Mixed dentition: The mean dft

								values were 0 and 0.184 for super Tasters and medium tasters, respectively, Whereas for non-tasters, a much higher Value of 5.125 was observed ($P < 0.001$). SD values not reported.
Karmakar et al., 2016	India	600	Super-tasters (n = 209) Medium tasters (n = 187) Non-tasters (n = 204)	NR	n = 317 (53 %)	6−12 years	DMFT	Non-tasters (DMFS: 2.53 ± 2.223) had a greater caries experience than the supertasters (0.57 ± 1.032) ($P < 0.001$). Females were found to be more tasters than nontasters, who also had higher rate of active caries.
Lakshmi et al., 2016	India	500	Non-tasters (n = 251) Super tasters (n = 249)	NR	n = 241 (60 %)	6−14 years	DMFT	Higher DMFT reported in non-tasters (DMFS: 1.7 ± 0.4) and super tasters (DMFS: 1.1 ± 0.8)
Nellamakkada et al., 2017	India	160	Non-tasters: n = 57 Medium taster: n = 59 Supertaster: n = 44 (With and without early childhood caries)	NR	n = 91 (57 %)	3−5 years	DMFS	Non-tasters (DMFS: 8.56 ± 6.31) had a significantly higher DMFS score compared to super-tasters (DMFS: 0.80 ± 2.31) and medium tasters (DMFS: 2.39 ± 3.92) ($P < 0.001$)

Furthermore, using taste sensitivity methods other than PROP has also revealed that there is a higher caries rate in non-tasters than super-tasters.[23–25] We excluded these studies because of methodological differences from our inclusion criteria but they are important observations that should be considered when synthesizing evidence concerning taste perception and caries rates.

However, it is crucial to acknowledge the nuances inherent in the methodologies employed across these studies.[29–36] This was reflected in the relatively high I^2 statistic result in the meta-analysis on middle fossa decompression (MFDS). Variability in sample sizes, participant demographics, and the specific protocols for assessing both taste perception and dental caries can contribute to divergent findings. Addressing these methodological considerations is paramount in drawing robust conclusions and establishing a comprehensive understanding of the observed association. While the association between PROP non-tasting and increased DMFS scores is becoming increasingly apparent, the underlying mechanisms remain an area of active exploration. One proposed mechanism centers around altered dietary preferences and oral hygiene practices among PROP non-tasters, potentially influencing their susceptibility to caries. Additionally, emerging evidence suggests that taste receptor genetic variations linked to PROP non-tasting may play a direct role in modulating oral microbiota composition, further impacting caries development.[17,38]

The implications of this association extend beyond the realms of academic inquiry, with potential ramifications for personalized dental care. If indeed PROP non-tasters exhibit a heightened risk for dental caries, clinicians may need to adapt preventive strategies, emphasizing tailored interventions such as increased surveillance, personalized dietary recommendations, and targeted oral hygiene regimens. Nevertheless, our risk of bias assessment revealed a number of methodological deficiencies in the studies. The majority of the studies did not account for or adjusted for confounding factors. Socioeconomic status plays a crucial role, as individuals with lower socioeconomic status may face barriers to dental care access, exhibit limited oral health education, and experience overall health disparities, all of which can contribute to higher rates of dental caries.[39] Dietary habits, particularly those rich in sugars and carbohydrates, significantly influence the development of caries, while inconsistent or inadequate oral hygiene practices, such as irregular brushing and flossing, contribute to their progression.[40] The presence of fluoride in drinking water and oral care products,[41] as well as genetic factors,[42] can further impact dental caries measurements in populations. Researchers must carefully account for these confounding factors when investigating dental caries to ensure that observed associations accurately reflect the true relationships between exposures and outcomes. The majority of the included studies did not describe the baseline characteristics of included patients in adequate detail. Therefore, it was not possible to ascertain if the groups were comparable at baseline, reducing the generalizability of the results.

There have been a number of reasons proposed for the higher caries observed in non-tasters. Genetically, it is because of the variations in the taste 2 receptor member 3 gene, which encodes for taste receptors on the tongue.[43] Because non-tasters have a higher threshold for sweet taste, they require a larger intake of sugars to accomplish the same taste perception as medium tasters and super-tasters, leading to higher numbers of cariogenic bacteria such as *S. mutans*. Indeed, chairside PROP tests could serve as a valuable tool for dental practitioners and hygienists, enabling them to develop personalized treatment plans tailored to each patient's unique taste sensitivity and caries risk profile.[30,44]

Despite the compelling nature of the existing evidence, it is imperative to acknowledge the limitations within the current body of research. Indeed, this systematic review has a number of limitations. First, because they were used across multiple studies, we focused on DMFS and DMFT as main outcomes. There are other measures of dental caries that have been introduced (e.g., International Caries Detection

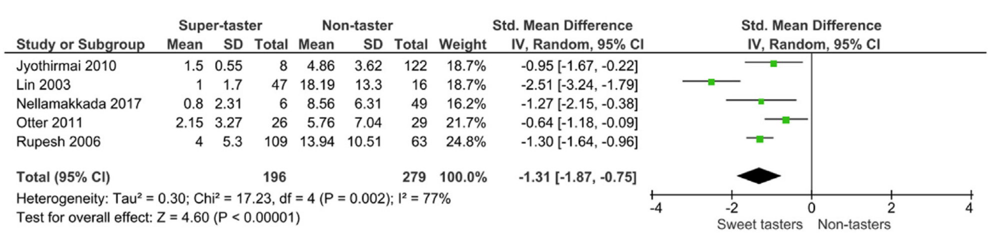

Figure 2: Forest Plot of the meta-analysis of DMFS scores in super-tasters and non-tasters. Lower is better.

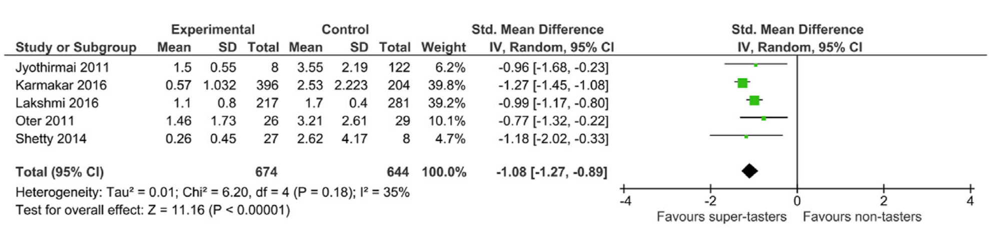

Figure 3: Forest Plot of the meta-analysis of DMFT scores in super- and non-tasters. Lower is better.

Table 3: Results of the risk of bias assessment.

Study (author, year)	Inclusion criteria	Description of subjects/setting	Validity of measurement	Measurement of condition	Confounding - identification	Confounding - handling	Outcome measurements	Statistics	Overall bias
Lin, 2003	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low
Rupesh et al., 2006	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Low
Hegde and Sharma, 2008	No	No	Yes	Yes	No	No	Yes	No	High
Oter et al., 2011	No	No	Yes	Yes	No	No	Yes	Yes	High
Jyothirmai et al., 2011	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Low
Shetty et al., 2014	Yes	No	Yes	Yes	No	No	Yes	Yes	Moderate
Karmakar et al., 2016	Yes	No	Yes	Yes	No	No	Yes	Yes	Moderate
Lakshmi et al., 2016	Yes	No	Yes	Yes	No	No	No	Yes	High
Nellamakkada et al., 2017	No	No	Yes	Yes	No	No	Yes	Yes	High

and Assessment System).[45] Once multiple studies have compared these indices in non-tasters and super-tasters, systematic reviews could include these as outcomes to generate evidence. Longitudinal studies, encompassing diverse populations and employing standardized methodologies, are also warranted to validate the observed associations and provide a more nuanced understanding of the dynamics between PROP non-tasting and DMFS scores. Additionally, a constraint of the DMF index lies in its equal weighting of decayed and well-restored teeth. The index follows specific rules for scoring individual teeth or surfaces. Each tooth (DMFT) or surface (DMFS) is counted only once, and priority is given to decayed, including secondary caries, over filled teeth/surfaces.[45,46]

Conclusion

Within the limitations of this review, it may be concluded that non-tasters have a higher risk of dental caries. However, future studies should adjust for variables such as age, oral hygiene, fluoride intake, and salivary flow to improve the generalizability of these observations. Clinical trials with sample sizes are warranted to inform future guidelines for planning the treatment for non-tasters and super-tasters.

Source of funding

This study was not supported by any sponsor or funder.

Conflict of interest

The authors have no conflicts of interest to declare.

Ethical approval

Not applicable.

Acknowledgment

We acknowledge the assistance of Dr. Zohaib Khurshid of King Faisal University and Dr Nawaf Almarzouki of King Abdul Aziz University for assisting us in this review.

Data availability statement

Not applicable.

References

1. Cheng L, et al. Expert consensus on dental caries management. **Int J Oral Sci 2022**; 14(1): 17.
2. Peres MA, et al. Oral diseases: a global public health challenge. **Lancet 2019**; 394(10194): 249–260.
3. Zhang Q, Ma Q, Wang Y, Wu H, Zou J. Molecular mechanisms of inhibiting glucosyltransferases for biofilm formation in Streptococcus mutans. **Int J Oral Sci 2021**; 13(1): 30.
4. Marshall TA. Dietary implications for dental caries: a practical approach on dietary counseling. **Dent Clin 2019**; 63(4): 595–605.

5. Valm AM. The structure of dental plaque microbial communities in the transition from health to dental caries and periodontal disease. **J Mol Biol 2019**; 431(16): 2957−2969.
6. Khan ZM, Waheed H, Khurshid Z, Zafar MS, Moin SF, Alam MK. Differentially expressed salivary proteins in dental caries patients. **BioMed Res Int 2021**; 2021.
7. Whelton HP, Spencer AJ, Do LG, Rugg-Gunn AJ. Fluoride revolution and dental caries: evolution of policies for global use. **J Dent Res 2019**; 98(8): 837−846.
8. Cavallari T, et al. Dental caries: genetic and protein interactions. **Arch Oral Biol 2019**; 108:104522.
9. Shimada Y, Yoshiyama M, Tagami J, Sumi Y. Evaluation of dental caries, tooth crack, and age-related changes in tooth structure using optical coherence tomography. **Jpn Dent Sci Rev 2020**; 56(1): 109−118.
10. Sabharwal A, Stellrecht E, Scannapieco FA. Associations between dental caries and systemic diseases: a scoping review. **BMC Oral Health 2021**; 21: 1−35.
11. Elyassi Gorji N, Nasiri P, Malekzadeh Shafaroudi A, Moosazadeh M. Comparison of dental caries (DMFT and DMFS indices) between asthmatic patients and control group in Iran: a meta-analysis. **Asthma Res Pract 2021**; 7(1): 1−9.
12. Dong H, et al. Oral microbiota-host interaction mediated by taste receptors (in eng) **Front Cell Infect Microbiol 2022**; 12: 802504. https://doi.org/10.3389/fcimb.2022.802504.
13. Luengthamchat N, Koontongkaew S, Utispan K. Bitter taste perception and dental biofilm cariogenicity in orthodontics (in eng) **Int Dent J 2022**; 72(6): 805−810. https://doi.org/10.1016/j.identj.2022.07.003.
14. Naciri LC, Mastinu M, Crnjar R, Tomassini Barbarossa I, Melis M. Automated classification of 6-n-propylthiouracil taster status with machine learning. **Nutrients 2022**; 14(2): 252.
15. Khan AM, Ali S, Jameela RV, Muhamood M, Haqh MF. Impact of fungiform papillae count on taste perception and different methods of taste assessment and their clinical applications: a comprehensive review. **Sultan Qaboos Univ Med J 2019**; 19(3):e184.
16. Essick GK, Chopra A, Guest S, McGlone F. Lingual tactile acuity, taste perception, and the density and diameter of fungiform papillae in female subjects. **Physiol Behav 2003**; 80(2−3): 289−302.
17. Chisini LA, Costa FDS, Horta BL, Tovo-Rodrigues L, Demarco FF, Correa MB. Sweet taste receptor gene and caries trajectory in the life course. **J Dent Res 2023**; 102(4): 422−430.
18. Rethlefsen ML, et al. PRISMA-S: an extension to the PRISMA statement for reporting literature searches in systematic reviews. **Syst Rev 2021**; 10(1): 1−19.
19. Shamseer L, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation (in eng) **BMJ 2 2015**; 350:g7647. https://doi.org/10.1136/bmj.g7647.
20. Moola S, et al. *Chapter 7: systematic reviews of etiology and risk*In **Joanna briggs institute reviewer's manual**, vol. 5. The Joanna Briggs Institute; 2017.
21. Furquim TR, Poli-Frederico RC, Maciel SM, Gonini-Júnior A, Walter LR. Sensitivity to bitter and sweet taste perception in schoolchildren and their relation to dental caries (in eng) **Oral Health Prev Dent 2010**; 8(3): 253−259.
22. Marquezin MC, Pedroni-Pereira A, Araujo DS, Rosar JV, Barbosa TS, Castelo PM. Descriptive analysis of the masticatory and salivary functions and gustatory sensitivity in healthy children (in eng) **Acta Odontol Scand 2016**; 74(6): 443−448. https://doi.org/10.1080/00016357.2016.1191085.
23. Ashi H, Lara-Capi C, Campus G, Klingberg G, Lingström P. Sweet taste perception and dental caries in 13- to 15-year-olds: a multicenter cross-sectional study (in eng) **Caries Res 2017**; 51(4): 443−450. https://doi.org/10.1159/000477367.
24. Ashi H, Campus G, Bertéus Forslund H, Hafiz W, Ahmed N, Lingström P. The influence of sweet taste perception on dietary intake in relation to dental caries and BMI in Saudi Arabian schoolchildren. **Int J Dent 2017**; 2017.
25. Ashi H, Campus G, Klingberg G, Forslund HB, Lingström P. Childhood obesity in relation to sweet taste perception and dental caries - a cross-sectional multicenter study (in eng) **Food Nutr Res 2019**; 63. https://doi.org/10.29219/fnr.v63.1682.
26. Jurczak A, et al. Differences in sweet taste perception and its association with the Streptococcus mutans cariogenic profile in preschool children with caries (in eng) **Nutrients 2020**; 12(9). https://doi.org/10.3390/nu12092592.
27. Selvaraju G, Subramanyam D, Shankari SV, Parthasarathi S, Thomas P, Settu S. Incidence of dental caries in relation to sweet taste perception and dietary habits among students - a cross sectional study (in eng) **J Pharm Bioallied Sci 2022**; 14(Suppl 1): S662−S665. https://doi.org/10.4103/jpbs.jpbs_862_21.
28. Lin BP. Caries experience in children with various genetic sensitivity levels to the bitter taste of 6-n-propylthiouracil (PROP): a pilot study (in eng) **Pediatr Dent 2003**; 25(1): 37−42.
29. Hedge AM, Sharma A. Genetic sensitivity to 6-n-propylthiouracil (PROP) as a screening tool for obesity and dental caries in children (in eng) **J Clin Pediatr Dent 2008**; 33(2): 107−111. Winter.
30. Shetty V, P. B L, Hegde AM. PROP test: prediction of caries risk by genetic taste perception among the visually impaired children (in eng) **Spec Care Dent 2014**; 34(1): 34−40. https://doi.org/10.1111/j.1754-4505.2012.00307.x.
31. Karmakar P, Arora R, Patel C, Sarvaiya B, Singh A, Patel M. Caries risk in children of Udaipur City, India using genetic taste sensitivity to 6-n-propylthiouracil (in eng) **J Int Soc Prev Community Dent 2016**; 6(6): 523−528. https://doi.org/10.4103/2231-0762.195508.
32. Lakshmi CR, Radhika D, Prabhat M, Bhavana SM, Sai Madhavi N. Association between genetic taste sensitivity, 2D:4D ratio, dental caries prevalence, and salivary flow rate in 6-14-year-old children: a cross-sectional study (in eng) **J Dent Res Dent Clin Dent Prospects 2016**; 10(3): 142−147. https://doi.org/10.15171/joddd.2016.023.
33. Nellamakkada K, Patil SS, Kakanur M, Kumar RS, Thakur R. Association of mothers' genetic taste perception to eating habits and its influence on early childhood caries in preschool children: an analytical study (in eng) **Int J Clin Pediatr Dent 2022**; 15(Suppl 2): S135−s139. https://doi.org/10.5005/jp-journals-10005-2139.
34. Öter B, Ulukapı I, Ulukapı H, Topçuoğlu N, Cıldır S. The relation between 6-n-propylthiouracil sensitivity and caries activity in schoolchildren (in eng) **Caries Res 2011**; 45(6): 556−560. https://doi.org/10.1159/000332432.
35. Jyothirmai J, Naganandini S, Aradhya S. Caries experience in 15-year-old school children in Bangalore with inherited taste sensitivity levels to 6-n-propylthiouracil: an observational study (in eng) **J Investig Clin Dent 2011**; 2(1): 51−56. https://doi.org/10.1111/j.2041-1626.2010.00029.x.
36. Rupesh S, Nayak UA. Genetic sensitivity to the bitter taste of 6-n propylthiouracil: a new risk determinant for dental caries in children (in eng) **J Indian Soc Pedod Prev Dent 2006**; 24(2): 63−68. https://doi.org/10.4103/0970-4388.26018.
37. Garneau NL, Nuessle TM, Sloan MM, Santorico SA, Coughlin BC, Hayes JE. Crowdsourcing taste research: genetic and phenotypic predictors of bitter taste perception as a model. **Front Integr Neurosci 2014**; 8: 33.
38. Kiliç M, GÜRbÜZ T, YÜCe Kahraman Ç, Cayir A, BİLgİÇ A, Kurt Y. Relationship between the TAS2R38 and TAS1R2 polymorphisms and the dental status in obese children. **Dent Med Probl 2022**; 59(2).
39. Engelmann JL, Tomazoni F, Oliveira MDM, Ardenghi TM. Association between dental caries and socioeconomic factors in schoolchildren-a multilevel analysis. **Braz Dent J 2016**; 27: 72−78.

40. Kim J-G, Cheon C-W, Lee D-C, Baik B-J. Relationship between dietary habits and dental caries experience in preschool children. **J Korean Acad Pediatr Dent 2001**; 28(2): 271–280.
41. Rugg-Gunn AJ, Do L. Effectiveness of water fluoridation in caries prevention. **Community Dent Oral Epidemiol 2012**; 40: 55–64.
42. Tutt A, et al. Risk estimation of distant metastasis in node-negative, estrogen receptor-positive breast cancer patients using an RT-PCR based prognostic expression signature. **BMC Cancer 2008**; 8: 1–15.
43. Dubovski N, Shoshan-Galeczki YB, Malach E, Niv MY. Taste and chirality: L-glucose sweetness is mediated by TAS1R2/TAS2R3 receptor. **Food Chem 2022**; 373:131393.
44. Verma P, Shetty V, Hegde A. Propylthiouracil (PROP)-A tool to determine taster status in relation to caries experience, streptococcus mutans levels and dietary preferences in children. **J Clin Pediatr Dent 2007**; 31(2): 113–117.
45. Ekstrand KR, Gimenez T, Ferreira FR, Mendes FM, Braga MM. The international caries detection and assessment system–ICDAS: a systematic review. **Caries Res 2018**; 52(5): 406–419.
46. Shulman JD, Cappelli DP. Chapter 1 - epidemiology of dental caries. In: Cappelli DP, Mobley CC, Saint Louis, editors. *Prevention in clinical oral health care*. Mosby; 2008. pp. 2–13.

How to cite this article: Ashi H. Differences in dental caries experience between super-tasters and non-tasters: A systematic review and meta-analysis. J Taibah Univ Med Sc 2025;20(3):288–297.