Journal of
Oral Health and Oral Epidemiology

https://johoe.kmu.ac.ir
doi:10.34172/johoe.2507.1765
J Oral Health Oral Epidemiol 2026;15:2507.1765

Original Article

Prevalence of Tooth Number Anomalies in the Iranian Population: A Systematic Review and Meta-Analysis

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Abstract

Background: Hyperdontia and hypodontia are two tooth number anomalies that often cause esthetic and functional problems. Early detection is the key to more effective treatment. This research set out to estimate the aggregated prevalence of tooth number anomalies in Iran.

Methods: International databases comprising PubMed, Scopus, and ISI Web of Science, and Iranian databases including Magiran (Magiran.com) and Idml.research.ac.ir were systematically searched for cross-sectional studies on the prevalence of hyperdontia and hypodontia until December 2025. The random effects model was used to derive the combined prevalence estimate of each anomaly. Meta-regression and sensitivity analyses were performed to assess the sources of heterogeneity.

Results: The prevalence of each anomaly was estimated by the meta-analysis of 14 eligible studies regarding hyperdontia and 17 studies about hypodontia. The estimated prevalence of hyperdontia and hypodontia was 1.2% and 6.0% in Iran, respectively. Meta-regressions showed a significantly higher prevalence of hyperdontia in males, but hypodontia prevalence showed no association with sex. An insignificant reduction in the prevalence of both anomalies was noted over time. No significant correlation was found between age and hyperdontia, but hypodontia prevalence decreased with advancing age. In both anomalies, the maxilla was more involved than the mandible. Also, most patients with hypodontia had Angle's class II malocclusion.

Conclusion: The overall prevalence of hyperdontia and hypodontia was 1.2% and 6.0%, respectively, in the Iranian population. Moreover, considerable heterogeneity was observed in the prevalence of both anomalies.

Keywords: Anodontia, Tooth, Supernumerary, Meta-Analysis, Prevalence

Citation: Jabbarian R, Ranjbaran M, Samanipour A, Ghasemi M. Prevalence of tooth number anomalies in the Iranian population: a systematic review and meta-analysis. J Oral Health Oral Epidemiol 2026;15:2507.1765. doi:10.34172/johoe.2507.176

Received: July 8, 2025, **Revised:** November 4, 2025 **Accepted:** April 30, 2026, **ePublished:** May 31, 2026

Introduction

Dental developmental anomalies are frequently linked to oral health complications. These anomalies can be divided into various subgroups affecting tooth number, size, morphology, structure, and spatial position of the teeth.[1,2] Hypodontia and hyperdontia are specific developmental anomalies known as tooth number anomalies.[3] Disturbances of the initiation phase of tooth development or cell proliferation can cause hypodontia, while hyperdontia is the result of the continuation of enamel organ sprouting[4]. The etiology of hypodontia and hyperdontia may be attributed to genetic, environmental, or a multifactorial interplay of the two. In other words, tooth number anomalies are assumed to be multifactorial conditions, in which nature largely contributes to the etiology.[5] Hypodontia leads to tooth replacement issues. Also, decreased tooth number is not the only problem that these patients suffer from; delayed tooth development, reduction of vertical dimension of the face, tooth impaction, and unfavorable appearance adversely affecting self-esteem are among other complications.[4,5] Hypodontia usually requires complex treatments such as restorative and endodontic procedures or even surgery. It predominantly affects females. The teeth most commonly missed are the maxillary lateral incisors, mandibular second premolars, and maxillary second premolars.[6] The prevalence of hypodontia ranges from 4.28% to 8.5% in the literature.[7-10] According to a study carried out on the Turkish population, the prevalence of hypodontia was found to be 6%, which is notable given Turkey's geographical and ethnic proximity to Iran, suggesting potentially similar regional patterns in dental anomalies.[11]

Hyperdontia may lead to both functional and esthetic complications such as diastema, crowding, delayed tooth eruption, impaction of permanent teeth, rotation, root resorption of adjacent teeth, infection, and occlusal

interferences.[12] Timely diagnosis of delayed eruption of permanent teeth is crucial for preventing a wide range of dental complications.[13] Unlike hypodontia, hyperdontia is more prevalent in males.[14] The most frequent site of supernumerary tooth occurrence is the maxillary midline, called mesiodens.[15] The prevalence of hyperdontia is reportedly 1.2% to 3%.[16-19] The prevalence of tooth number anomalies in Iran has been investigated in several studies. The prevalence of hypodontia ranges from 5.21% [20] to 7.66%,[21] and reported hyperdontia prevalence varies from 0.74%[22] to 1.1%.[23] Rakhshan et al[24] performed a meta-analysis and subsequently reported the worldwide estimate of hypodontia at 6.53%. To date, many studies have assessed the prevalence of hypodontia and hyperdontia, and different findings have been obtained depending on the geographical location and study population. In Iran, multiple investigations have been carried out on this topic. However, a systematic review addressing the prevalence of tooth number anomalies in the Iranian population is lacking. Thus, this systematic review and meta-analysis aimed to investigate the overall prevalence of tooth number anomalies in Iran.

Methods

Study Design

The present systematic review and meta-analysis was carried out in compliance with the PRISMA 2020 reporting guidelines for systematic reviews and meta-analyses,[25] and its protocol was prospectively registered in the PROSPERO international database of systematic reviews (code: CRD42022342361). It was also approved by the Ethics Committee of Qazvin University of Medical Sciences (ethical code: IR.QUMS.REC.1401.123). The PICO framework was as follows:

- Population (P): The Iranian population without any specific syndrome; Exposure (E): Tooth number anomalies.
- Comparison (C): Individuals without tooth number anomalies.
- Outcome (O): Prevalence estimates of tooth number anomalies.

Eligibility Criteria

All cross-sectional studies on the main question published in English and Persian with available full texts were included in the present review. The exclusion criteria comprised studies that did not provide sufficient data for analysis, and studies that did not exclude patients with systemic conditions including ectodermal dysplasia, cleft lip and palate syndromes, Down syndrome, craniofacial dysostoses such as Crouzon and Apert, cleidocranial dysplasia, and Gardner syndrome.

Search Strategy

The data selection process was started by searching major international electronic databases including PubMed, Scopus, and Web of Science ISI, and Iranian databases including Magiran and idml.research.ac.ir. Grey literature was also assessed by searching the Thesis.research.ac.ir to add unpublished high-quality research theses. No time limit was set for the search, and all studies published until June 2025 were included in the assessment process. The combinations of keywords used in the search strategy included: Hypodontia OR anodontia OR oligodontia OR "dental aplasia" OR "dental agenesis" OR "tooth aplasia" OR "tooth agenesis" OR hyperdontia OR "tooth, supernumerary" OR mesiodens OR "congenitally missing teeth" OR "congenital missing of teeth" OR "congenital absence of teeth" OR "congenitally absent teeth") (prevalence OR epidemi* OR "cross sectional")) (Iran OR Iranian). The MeSH terms related to the keywords were also searched in PubMed. The details of the search can be found in Supplementary file.

Selection Process

After collecting the search results in Endnote 20.4.1, the duplicates were eliminated. Two reviewers (A. S. and M. Gh.) independently reviewed the remaining studies based on their titles and abstracts. In order to select the final relevant articles, the full text of the remaining studies was evaluated.

Risk of Bias Assessment

Two independent reviewers used the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data.[26] The Joanna Briggs Institute Critical Appraisal Checklist for analytical cross-sectional studies is a standardized instrument employed to assess the methodological quality and potential sources of bias in cross-sectional research. It helps reviewers systematically assess key aspects such as sample selection, measurement validity, control of confounding factors, and appropriateness of statistical analysis, ensuring that the study's findings are credible and accurately interpreted within the context of evidence-based practice. The calibration process was designed in the following steps: Selection of 10 random sample studies and assessing them twice with a 10-day interval and calculating Cohen's kappa. Three main groups of low quality (with less than 6 stars), moderate quality (studies with 6 - 7 stars), and high quality (with 8 or 9 stars) were considered. If any disagreement occurred, a third person who is a professor of Pediatric Dentistry would be consulted. The high and moderate quality studies were entered in the meta-analysis.

Data Collection Process

Relevant tables were designed to extract the eligible contents of the studies, and two individuals extracted the data including the first author's name, the study year, year of publication, the study location, sample size, participants' age, reported prevalence of hyperdontia and hypodontia, prevalence of tooth number anomalies in each gender, prevalence of tooth number anomalies separately in the maxilla and mandible, reported prevalence by tooth type, and reported prevalence by Angle's class of occlusion.

Statistical Analysis

STATA 17 (Stata Corp., LP, College Station, TX, USA) was used for data analysis. The initial step was to estimate the overall prevalence of hypodontia and hyperdontia, which was determined by the inverse variance random effect model along with the corresponding 95% confidence intervals. Heterogeneity was assessed using the Chi square (Q) test and the I^2 statistic. Furthermore, for investigating the effects of suspected heterogeneity factors, meta-regression was used, including the age of participants, sample size, and year of studies. Also, subgroup analysis by gender (male, female), type of tooth (molar, incisor), and type of evidence (article, grey literature) was performed. Sensitivity analysis (Leave-one-out meta-analysis) was used to evaluate the effect of eliminating the outlier data on the overall prevalence rates.

Results

The screening of articles was conducted step by step using the PRISMA flowchart (Figure 1), starting with 192 studies found in the main databases as mentioned in the Methods section and 2 more articles which were found by searching additional resources as grey literature. After removing the duplicates in Endnote 21.5, the titles and abstracts of 145 studies were assessed and 113 studies were excluded for irrelevant topics. The full texts of the remaining 32 articles were reviewed and evaluated in accordance with the eligibility criteria. A total of 22 studies were ultimately included in the review. The characteristics of the included 22 studies, separately for the two types of anomalies, are presented in Table 1. Some studies reported both types of anomalies while others evaluated either hypodontia or hyperdontia (not both).

Meta-Analytic Prevalence of Hyperdontia in the Iranian Population

The results of the Chi-square and I-squared tests (I^2) showed heterogeneity in the reported prevalence of hyperdontia in different studies (Chi-square = 57.3, $P < 0.001$ and $I^2 = 77.2\%$). Figure 2 presents the forest plot illustrating the prevalence reported in each study, along with the overall prevalence estimate of hyperdontia. Based on the results of 14 studies, the overall prevalence of hyperdontia in the Iranian population was estimated to be 1.2% (95% CI: 0.9% to 1.15%).

Pooled Prevalence of Hypodontia in the Iranian Population

The results of Chi-square and I-squared tests (I^2) revealed considerable heterogeneity in the hypodontia prevalence estimates reported across studies (Chi-square = 721.60, $P < 0.001$ and $I^2 = 97.8\%$). Drawing on 17 eligible studies, the pooled prevalence of hypodontia in the Iranian population

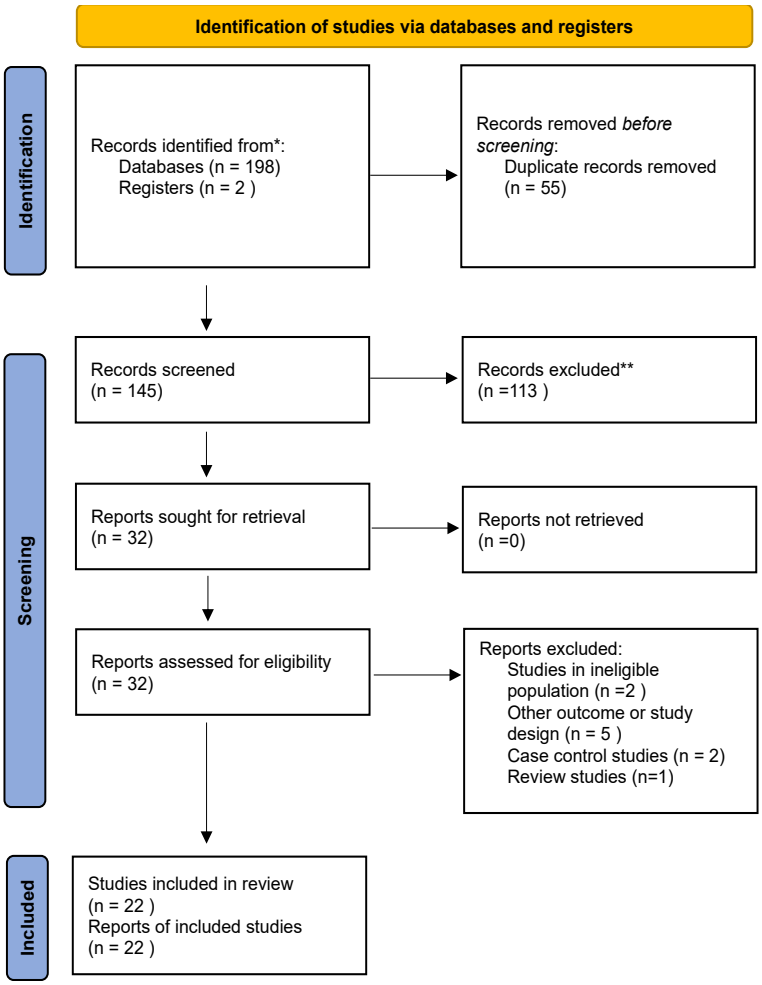

Figure 1. PRISMA flow diagram of study selection for systematic review and meta-analysis of hyperdontia and hypodontia in the Iranian population

Table 1. Characteristics of Studies Included in the Meta-Analysis of the Prevalence of Hyperdontia and Hypodontia (Separately)

Type of anomaly	Study	Publication year	Location	Prevalence	Sample size	Age	Source
Hyperdontia	Vahid-Dastjerdi [22]	2011	Tehran	0.0074	1751	9 to 27	Article
	Ghabanchi [27]	2010	Shiraz	0.024	414	15 to 60	Article
	Saberi [28]	2016	Zahedan	0.0051	1172	> 16	Article
	Hekmatfar [29]	2018	Ardabil	0.012	1800	12 to 60	Article
	Amini [12]	2013	Tehran	0.0072	3374	10 to 20	Article
	Vejdani [30]	2017	Guilan	0.032	154	10 to 30	Article
	Ahmadi [31]	2019	Hamadan	0.03	772	12 to 80	Article
	Hajmohammadi [32]	2021	Ardabil	0.0106	5000		Article
	Haghanifar [33]	2019	Mazandaran	0.008	8018	> 18	Article
	Nemati [23]	2013	Guilan	0.011	1224	7 to 76	Article
	Shokri [34]	2014	Hamadan	0.0243	1649	7 to 35	Article
	Ardakani [35]	2007	Yazd	0.035	480		Article
	Abesi [36]	2014	Babol	0.01	2000	7 to 12	Article
	Ahmadian Yazdi[37]	2016	Mashhad	0.013	3211		Thesis
Hypodontia	Shabzendedar [38]	2010	Mashhad	0.09	600	9 to 14	Article
	Hedayati [21]	2013	Southern Iran	0.0766	494	10 to 18	Article
	Saberi [28]	2016	Zahedan	0.0111	1172	> 16	Article
	Hekmatfar[29]	2018	Ardabil	0.037	1800	12 to 60	Article
	Amini[20]	2012	Tehran	0.0521	3374	10 to 20	Article
	Karimi-Afshar[39]	2018	Kerman	0.0536	1883		Article
	Vejdani[30]	2017	Guilan	0.084	154	10 to 30	Article
	Ahmadi[31]	2018	Hamadan	0.032	772	12 to 80	Article
	Sheikhi[40]	2012	Iran	0.109	2422	7 to 35	Article
	Haghanifar[33]	2019	Mazandaran	0.017	8018	> 18	Article
	Khaneh-Masjedi[41]	2006	Ahvaz	0.04	866	15	Article
	Shokri[34]	2014	Hamadan	0.057	1649	7 to 35	Article
	Razeghinejad[42]	2016	Azerbaijan	0.054	2480	10 to 20	Article
	Salehi-Vaziri[43]	2009	Qazvin	0.074	2619	15 to 18	Article
	Vahid-Dastjerdi[44]	2010	Tehran	0.091	1751	9 to 27	Article
	Ahmadian Yazdi[45]	2018	Mashhad	0.087	1754	10 to 30	Thesis
	Ahmadian Yazdi[37]	2016	Mashhad	0.077	3211		Thesis

was estimated at 6.0% (95% CI: 4.6% to 7.5%, Figure 3).

Subgroups Analysis

The analysis of subgroups based on gender and type of evidence (articles, theses) is shown in Table 2. According to the results, there was no statistically meaningful variation in the overall prevalence of hyperdontia between male and female individuals; however, the overall prevalence of hypodontia in males (6.00%) was higher than in females (5.00%). In terms of type of evidence, the combined prevalence of hyperdontia in published articles was estimated to be 1.2% (95% CI: 0.9% to 1.15%); in comparison, the corresponding estimate in the available theses was 1.3% (95% CI: 0.9% to 1.17%). In addition, the overall prevalence of hypodontia in published articles was estimated to be 5.7% (95% CI: 4.2% to 7.2%); this value was 8.1% (95% CI: 7.1% to 9.0%) in the remaining two theses. Also, according to the quality assessment of the included studies, the prevalence of both anomalies was marginally lower in high quality articles compared with those of moderate quality (Table 2).

Meta-Regression

According to the findings from the univariable meta-regression, regarding the publication year of the studies, although the reported prevalence of hyperdontia slightly decreased with time, it did not reach statistical significance (P = 0.436). The downward trend in hypodontia prevalence was faster than hyperdontia, but it was still not statistically significant (beta coefficient reduction for each year = -0.002, P = 0.357).

Moreover, as shown in Figure 4, no significant correlation was detected between the mean age of participants reported in the studies and the prevalence of hyperdontia (Beta coefficient for the increase in mean age = 0.0003, P = 0.446). However, the prevalence

Table 2. Subgroup Analysis Based on Gender and Type of Evidence

Variable	Subgroups	Hyperdontia prevalence (95% CI)	Hypodontia prevalence (95% CI)
Gender	Male	1.00 (1.00-2.00)	6.00 (4.00-8.00)
	female	1.00 (0.00-1.00)	5.00 (4.00-7.00)
Type of evidence	Published articles	1.2 (0.9 to 1.15)	5.7 (4.2 to 7.2)
	Gray literature	1.3 (0.9 to 1.17)	8.1 (7.1 to 9.0)
Quality of studies based on the JBI score	Moderate	1.6 (0.08-2.4)	6.5 (3.8-9.2)
	High	1.1 (0.08-1.5)	5.2 (3.1-7.2)

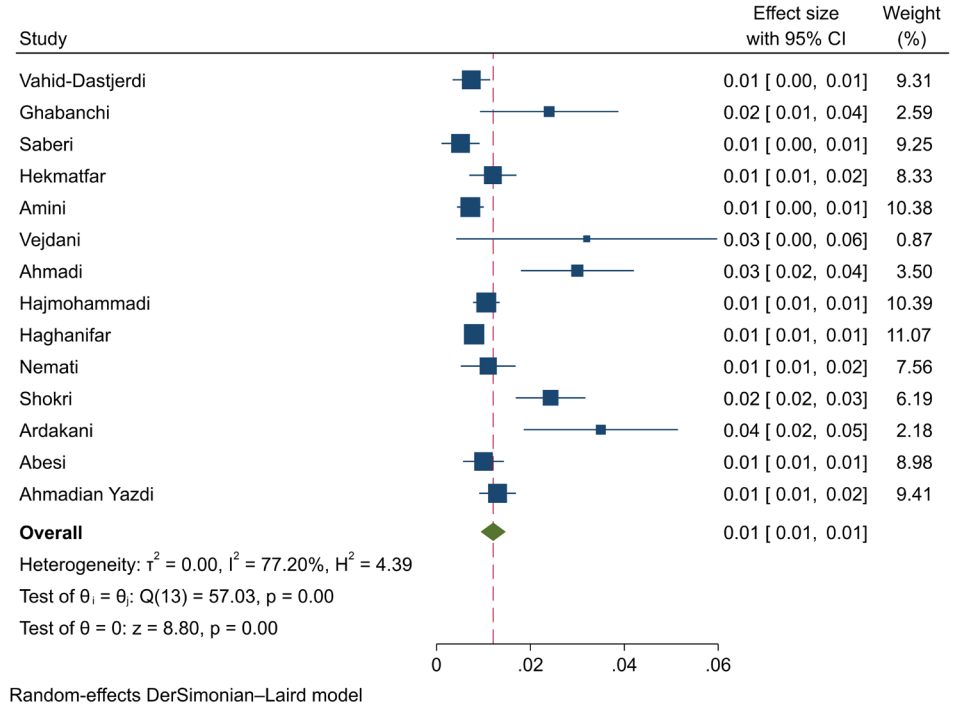

Figure 2. Forest plot showing the overall prevalence of hyperdontia (95% CI)

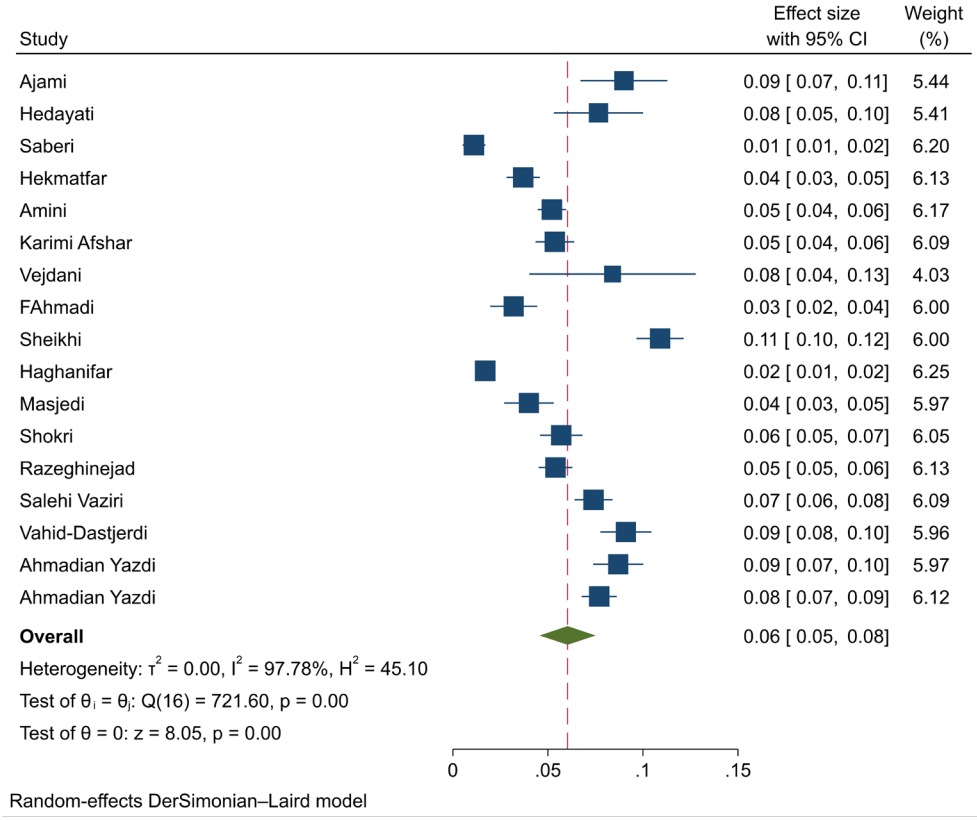

Figure 3. Forest plot showing the overall prevalence of hypodontia (95% CI)

of hypodontia reported across the included studies demonstrated a statistically significant decline as the mean age increased (Beta coefficient for the increase in mean age = -0.003, P = 0.003).

In a multivariable meta-regression model, the effect of different variables on prevalence of hyperdontia and hypodontia was simultaneously examined. According to the results, the variables of age (P = 0.058), sample size (P = 0.416), year of study (P = 0.406), JBI score (P = 0.181), and geographical region (north/south, P = 0.437) did not demonstrate any statistically significant association with the prevalence of hypodontia. Regarding hyperdontia, none of the variables — age (P = 0.197), sample size (P = 0.057), year of study (P = 0.474), JBI score (P = 0.718), and geographical region (north/south, P = 0.425) — showed a significant relationship.

As presented in Table 3, in terms of Angle's class of occlusion, hypodontia exhibited the highest prevalence among patients with Class II malocclusion (41%). The prevalence of both types of anomalies in the maxilla was higher compared with the mandibular arch. Also, the maxillary lateral incisors were the most commonly missing teeth, followed by mandibular second premolars and maxillary second premolars.

Sensitivity Analysis

The influence of omitting single studies on the overall prevalence was assessed through sensitivity analyses. Based on the findings, the maximum reported prevalence of hyperdontia was identified after removing the study by Haqqani Far et al,[33] equal to 1.3%, and the lowest prevalence was observed after excluding the study by Shokri et al,[34] equal to 1.08%. Also, by removing gray literature (Ahmadian Yazdi study), the pooled estimate was estimated to be 1.2% (95% CI: 0.9% to 1.5%, Figure 5).

Also, in terms of the effect of ignoring individual studies on the overall prevalence of hypodontia, the highest overall rate of occurrence after the exclusion of the study by Saberi et al[28] was 6.4%, and the lowest prevalence was 5.7% after excluding the study by Sheikhi et al[40] Also, by removing gray literature (two studies by Ahmadian Yazdi), the pooled estimate of hypodontia was estimated to be 5.7% (95% CI: 4.2% to 7.2%, Figure 6).

Discussion

The reported prevalence of hypodontia across different countries ranges widely, from 0.15% to 16.18% according to a previous study in 2015.[5] In the present investigation, a meta-analysis was conducted on this topic for the first

Table 3. Prevalence of hypodontia and hyperdontia based on Angle's class of occlusion, jaw type, and tooth type

Variable	Subgroups	Hyperdontia percentage (95% CI)	Hypodontia percentage (95% CI)
Angle's class of occlusion	Class I	-	37.00 (17.00-56.00)
	Class II		41.00 (25.00-57.00)
	Class III		22.00 (14.00-30.00)
Jaw type	Maxilla	80.5 (70.3-90.7)	58.9 (54.7-63.1)
	Mandible	19.5 (9.3-29.7)	41.1 (36.9-45.3)
Tooth type	Maxillary central incisors	-	0.9 (0.0428-1.7572)
	Maxillary lateral incisors		32.136 (25.88-38.38)
	Maxillary canines		3.603 (1.717-5.488)
	Maxillary first premolars		6.395 (2.882-9.907)
	Maxillary second premolars		12.629 (9.475-15.783)
	Maxillary first molars		0.467 (0.00-0.00)
	Maxillary second molars		0.549 (0.00-1.00)
	Mandibular central incisors		7.199 (3.338-11.059)
	Mandibular lateral incisors		3.544 (1.139-5.948)
	Mandibular canines		0.994 (0.00-1.00)
	Mandibular first premolars		2.865 (0.179-5.55)
	Mandibular second premolars		27.216 (21.034-33.397)
	Mandibular first molars		0.323 (0.00-0.00)
	Mandibular second molars		0.988 (0.00-1.00)

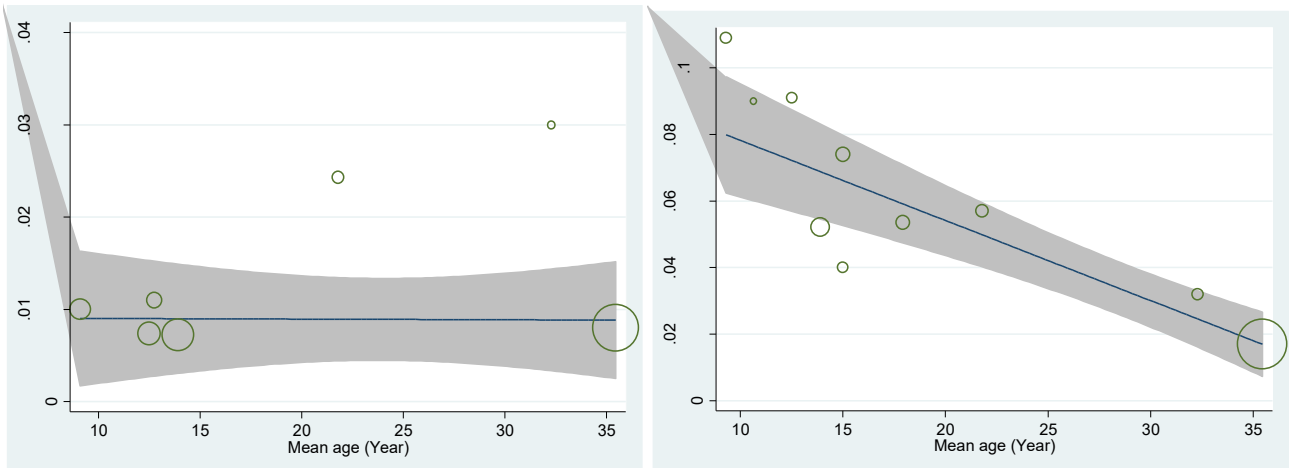

Figure 4: Prevalence of hyperdontia and hypodontia based on the mean age of the participants in the studies

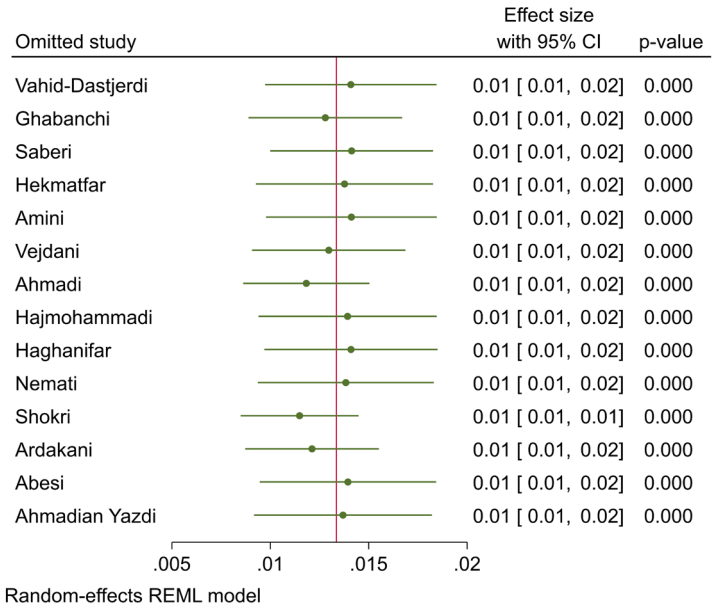

Figure 5. Sensitivity analysis assessing the impact of omitting single studies on the estimated overall prevalence of hyperdontia

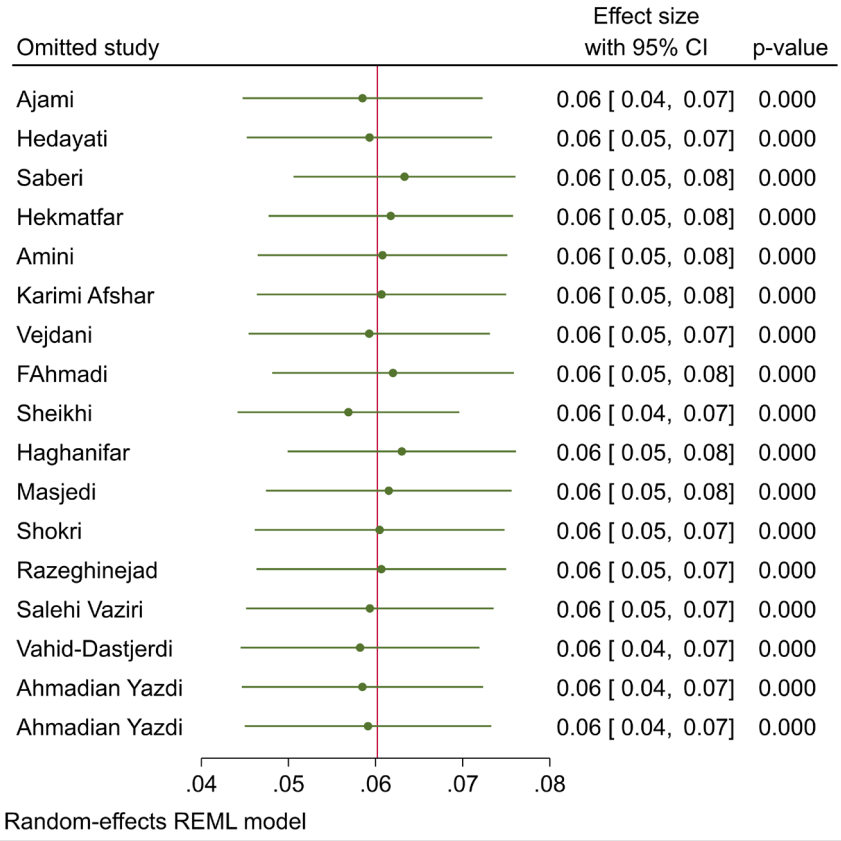

Figure 6. Sensitivity analysis assessing how the exclusion of single studies influences the pooled prevalence estimate of hypodontia

time in Iran by collecting data from 22 cross-sectional studies investigating the prevalence of tooth number anomalies. According to the findings from 14 studies, the pooled prevalence of hyperdontia was 1.2% (95% CI: 0.9% to 1.15%), and based on the results of 17 studies, the overall prevalence of hypodontia was 6.0% (95% CI: 4.6% to 7.5%) in Iran. The findings showed that the prevalence of hyperdontia differs according to location and time. In the meta-analysis conducted by Rakhshan and Rakhshan (2015), populations from Western Asia, including Iran, Turkey, Arabia, and India, demonstrated a markedly lower prevalence (approximately 3 - 5%) compared with Eastern Asian populations, where prevalence rates reached 8 - 11%. The study reported that Asian Caucasians, Persian, Arab, Turkish, and Indian populations demonstrated a significantly lower rate of tooth agenesis compared with other ethnic or continental groups ($P = 0.0005$), indicating that the West Asian region — geographically adjacent to Iran — belongs to the low-prevalence zone of congenital dental anomalies.[24]

In another study conducted by Almuheiri et al., the reported prevalence of hyperdontia in Iran exceeded that documented for other countries in the Middle Eastern region.[46] However, the prevalence of hyperdontia in Iran is lower than in Switzerland[47] and South Africa.[48] This finding highlights the racial and geographical disparity in the global incidence of hyperdontia. Such variations in the prevalence of hyperdontia can be due to various factors, including different sampling methods, sample size, racial factors, diagnostic tools, and age of participants.[16] According to a study by Khalaf et al. (2014),[49] the worldwide prevalence of hypodontia was 6.4% and the prevalence of hypodontia in the Asian continent was 6.3%, which were close to the results of the present study. Yet, gender, racial, and genetic differences can have a great impact on the prevalence of hypodontia.[6] Targeted diagnostic efforts focusing on children in early mixed dentition, particularly in regions with higher recorded rates, could substantially reduce the future orthodontic burden. Incorporating periodic dental anomaly screening into school-based oral health programs and optimizing orthodontic resource distribution according to regional demand can enhance cost-effectiveness and accessibility within the Iranian dental healthcare system.

The reported range of hyperdontia prevalence across the included studies reviewed in this meta-analysis varied from 0.51% (the lowest) reported by Saberi et al[28] in Zahedan to 3.5% (the highest) reported by Ardakani et al[35] in Yazd. According to the Chi-square and I-squared test, the level of heterogeneity among the studies was substantial. The observed variability across studies can be related to personal differences in the diagnosis of this condition, as shown by the sensitivity analysis. By excluding the investigation by Shokri et al,[34] the prevalence of hyperdontia reached 1.08%, which can be due to their presented method since they did not mention how they calibrated the examiners. Another reason could be the wide age range of participants in some studies (over 18 years of age).[23,28,33]

According to the Chi-square and I-squared test, the extent of heterogeneity related to hypodontia prevalence was notably high across the studies. The highest overall prevalence after the exclusion of the study by Saberi et al. [28] was 6.4%, and the lowest prevalence was 5.7% after excluding the study by Sheikhi et al.[40]

Subgroup analysis based on the quality of published articles showed that the prevalence of both types of anomalies in high quality articles was slightly lower than in moderate quality articles. Another reason for the high heterogeneity can be the older participants in some studies who might have given wrong information about their tooth extractions or congenital missing of their teeth, which can lead to false positive or false negative diagnosis of hypodontia. Furthermore, another sensitivity analysis regarding the discrepancy between the hypodontia prevalence reported in published articles and in theses indicated that the prevalence of hypodontia in theses was 8.1%, and by removing them from the analysis, the overall prevalence reached 5.7%. Besides, the prevalence of hyperdontia documented in the sole thesis conducted by Ahmadian Yazdi et al. (2016)[37] was more than the overall prevalence of hyperdontia reported in the articles. Therefore, the observed difference in the prevalence rates could have been caused by a possible error in the methodology of the gray literature. The gray literature includes theses, which are sometimes done in a short time and with a small sample size, and adequate information about their methodology or their full text may not be available; thus, they may be less reliable.[50]

A different age range was seen across studies, and it can be one factor responsible for the aforementioned heterogeneity. Although no statistically meaningful association was observed between age and the prevalence of hyperdontia, the prevalence of hyperdontia reported in the studies decreased with age, which can be due to extraction or loss of additional teeth at an older age and giving the researchers an incorrect history about tooth extraction.[22] However, the hypodontia prevalence reported in the included studies significantly decreased with age, which can be related to the fact that evidence of mineralization of the mandibular premolar crown may not be seen in radiographic examinations until around the age of nine in children, and when the age is younger than 9, an overestimation of congenital premolar missing may occur.[5]

Differences in the geographical location of studies have a significant impact on the reported prevalence rates. The reviewed studies had been conducted in 14 cities in the capitals of provinces, and several studies had been conducted in some cities such as Tehran (4 studies), Hamedan, Mashhad, and Ardabil (2 studies); while, no study had been conducted in other large cities such as Zanjan, Arak, and Qom.

The methodological quality of the reviewed studies is another factor causing heterogeneity. The findings derived from the meta-regression analysis showed that the prevalence rates decreased with an increase in the quality of articles.

The results of the gender-based analysis showed that the prevalence of hyperdontia in males and females was not significantly different, which was consistent with the findings of a systematic review by Alvira-González et al.[51] However, it was inconsistent with the findings of studies by Tetay-Salgado et al.[52] and Kashyap et al.[53] In such studies, male participants exhibited a significantly higher prevalence of hyperdontia compared with females. Controversy in this regard may stem from variations in racial composition or sampling procedures.

It was also found that the prevalence of hypodontia was 6% in males and 5% in females, but this difference did not reach statistical significance. As noted in the investigation by Reshitaj et al,[54] there was a statistically significant sex-related variation in hypodontia prevalence. However, in the research conducted by Khalaf et al[49] and Walton et al,[55] females demonstrated a higher occurrence of hypodontia. This discrepancy could be due to the fact that in some of

the studies, the number of male participants was much lower than female participants. Also, another reason is that females appear to pay more attention to their appearance and are more willing to undergo orthodontic treatment. Resultantly, it is more likely to identify them, and some biological factors such as a smaller jaw can also have a role in this respect.[5] In a study by Karimi Afshar et al,[39] 1463 females and 420 males were examined, and the prevalence of hypodontia was reported to be 9.28% in males and 4.23% in females.

Maxillary lateral incisors, mandibular second premolars, and maxillary second premolars constituted the teeth most frequently absent. Maxillary second molars, maxillary first molars, and mandibular first molars were among the least frequently missing teeth. This pattern of congenital tooth absence aligned with the findings reported by Jawad et al[56] Other investigations by Polder et al[57] and Khalaf et al[49] described an alternative pattern of prevalence of congenital missing of different teeth. This variation can be attributed to differences in sampling methods, sample size, type of population studied, type and accuracy of the study, and technique of analyzing the results.

Hypodontia prevalence in the maxillary arch exceeded that in the mandibular arch. The present findings were consistent with observations from prior research.[58,59] However, in the study by Backman et al,[17] the prevalence of hypodontia in the mandible was higher than that in the maxilla. Polder et al[57] stated that hypodontia rates were nearly comparable between the two jaws. Hyperdontia prevalence was likewise greater in the maxilla compared with the mandible, aligning with reports from studies by Arandi et al[60] and Khandelwal et al[14] Although the reason is not fully understood, it may be attributed to the very high prevalence of premaxillary hyperdontia, the reason for which has not yet been clearly elucidated.[61]

In the present analysis, the greatest hypodontia prevalence was observed among individuals with Class II malocclusion. However, Uslu et al[62] showed that hypodontia occurred more frequently in Class III patients. Celikoglu et al[63] stated that the prevalence of hypodontia was greater in individuals classified as Class I. This difference can be related to race.

As stated earlier, one main limitation of this study was the implementation of meta-regression analysis based on gender and age, since some studies did not report these parameters. Future cross-sectional studies are recommended to include influential factors such as gender and age of participants. Also, calibration of examining clinicians should be necessarily performed. Moreover, other clinicians may be requested to verify and confirm the diagnoses. Furthermore, all diagnostic criteria should be instructed to clinicians before the examinations. Also, on the grounds that evidence of mineralization of mandibular premolar tooth crown may not be radiographically detectable until the age of 9 years in children, the youngest age to assess tooth number anomalies should be 9 years of age. Moreover, cross-sectional studies in different geographical regions, especially in large cities, are required to find a prevalence rate that more accurately represents the national prevalence rate.

Conclusions

According to the findings of this review, the estimated overall prevalence of hyperdontia was 1.2%, while hypodontia had an overall prevalence of 6.0% in the Iranian population, with both anomalies demonstrating a gradual decline over time. The pooled prevalence of hyperdontia among male and female individuals was 1.0%, and hypodontia prevalence was 6.0% in males and 5.0% in females. No significant association was identified between the mean age of participants across studies and the prevalence of hyperdontia. In contrast, the reported prevalence of hypodontia showed a significant age-related decrease. Most individuals with hypodontia presented with Angle's Class II malocclusion. Both dental anomalies occurred more frequently in the maxillary arch. Among the missing teeth, maxillary lateral incisors were the most frequently affected, followed by mandibular second premolars and maxillary second premolars.

Acknowledgments

The authors would like to express their sincere gratitude to Qazvin University of Medical Sciences for providing the facilities, resources, and institutional support that made this research possible. The authors also acknowledge the valuable academic guidance and technical assistance received throughout the course of the study.

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Competing Interests

The authors declare that they have no competing interests related to the content of this manuscript.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

The protocol was registered in the PROSPERO international register of systematic reviews (code: CRD42022342361). It was also approved by the Ethics Committee of Qazvin University of Medical Sciences (ethical code IR.QUMS.REC.1401.123).

Funding

This research received no external funding.

Supplementary File

Supplementary file contains Table S1.

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