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ORIGINAL ARTICLE

Dental Students' Satisfaction with Clinical Training: Insights from a Cross-Sectional Survey at the Tehran and Isfahan Branches of the Islamic Azad University

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Abstract

Background: Student satisfaction is a vital metric for educational quality in clinical dental training. Despite a unified curriculum, variations in resources and supervision can impact student perceptions. This study compared satisfaction with the clinical course among dental students at the Tehran and Isfahan branches of the Islamic Azad University (IAU). Materials and Methods: A cross-sectional survey was conducted among 468 fifth- and sixth-year general dentistry students (311 Tehran, 157 Isfahan) during 2022–2023. A standardized 16-item questionnaire assessed key clinical education domains, including supervision and infection control, using a 5-point Likert scale. Weighted mean satisfaction and Positive Response Rates (PRR) were calculated. Statistical analyses utilized chi-square tests, ANOVA, and binomial generalized linear models (GLM) with False Discovery Rate (FDR) correction. Data were analyzed using Python and R ($\alpha = 0.05$).

Results: Significant inter-branch differences were observed. Isfahan students reported higher satisfaction in multiple courses, particularly Radiology (Mean = 3.82 vs. 2.90, $p < 0.001$). They also reported higher satisfaction in Pediatric Dentistry (Mean = 3.49 vs. 3.03, $p < 0.001$). ANOVA confirmed significant effects for University ($F=12.4$, $p<0.001$), Course ($F=45.2$, $p<0.001$), and their interaction ($F=6.7$, $p<0.001$). GLM analysis indicated that the odds of reporting positive satisfaction were 1.72 times higher in Isfahan than in Tehran.

Conclusion: Satisfaction with clinical dental education varies markedly between Tehran and Isfahan, highlighting institutional disparities. Targeted improvements in supervision, resources, and organization are essential to harmonize clinical training quality across IAU branches.

Keywords: Dental students; Clinical Clerkship; Student Satisfaction; Teaching Quality.

Introduction

Clinical training is the pivotal stage of dental education, enabling students to refine technical skills and develop professional confidence (1, 2). Consequently, student satisfaction has emerged as a critical dimension for evaluating dental curricula, complementing traditional academic metrics (3). Global research indicates that perceptions of clinical education are shaped by interrelated factors, including patient availability, equipment adequacy, and faculty supervision (4). Insufficient supervision or lack of resources is strongly associated with student dissatisfaction in both Western and Asian contexts (3, 5). In Iran, studies have reported similar organizational and pedagogical challenges, though most investigations have been limited to single institutions

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(6). The Islamic Azad University (IAU) is one of the largest private educational systems worldwide, with its Tehran and Isfahan faculties serving as two prominent dental centers. Although their general curricular framework is unified, each branch operates under different infrastructural and administrative conditions, potentially leading to variable educational experiences (7). To date, there has been little effort to compare the quality of clinical education across these branches systematically. To address this gap in the literature, the present study analyzes and compares dental students' satisfaction at the IAU Tehran and Isfahan branches. By employing a standardized multidimensional questionnaire (6) encompassing domains such as faculty supervision, resource availability, and infection control, this investigation evaluates clinical teaching quality. Ultimately, the findings are expected provide actionable insights for curriculum planners and administrators to strengthen clinical dental education across these centers and similar academic settings (1, 7).

Over the past two decades, research has increasingly highlighted the importance of student satisfaction in clinical dental education, positioning it as both an indicator of educational quality and a determinant of professional development. One of the earliest investigations in this field, conducted across North American dental schools, identified clinical learning opportunities, instructor engagement, and quality of feedback as central predictors of student satisfaction (4). Subsequent integrative reviews emphasized that supportive learning environments, including effective supervision, constructive faculty-student interaction, and sufficient clinical exposure, are essential for satisfaction across the health professions (3). Studies within Iran have further examined contextual challenges influencing clinical training quality. A survey at Kermanshah University of Medical Sciences reported moderate levels of student satisfaction and highlighted deficiencies in infrastructure and educational support systems (5). A more recent qualitative investigation among dental students in Tehran identified concerns such as limited supervision, high student-to-faculty ratios, and insufficient diversity of clinical cases, suggesting that organizational and pedagogical limitations may hinder the clinical learning experience as much as material shortages (8). After 2020, research expanded in scope, addressing national trends and specialized aspects of clinical education. A nationwide Delphi-based analysis across Iranian dental schools identified the need for improved clinical settings, infrastructure, and hands-on training opportunities to enhance general dentistry education (7). Other studies examined evaluation practices; for example, an investigation of OSCE-based assessments reported moderate satisfaction with the organizational structure and overall effectiveness, yet substantially lower satisfaction with feedback, underscoring the importance of timely, constructive evaluation practices (1). Technological interventions have also shown promise—implementation of an electronic support system improved clinical workflow efficiency and was associated with higher student satisfaction (9). Regional studies have also explored contextual factors shaping educational perceptions. Research conducted at King Saud bin Abdul Aziz University for Health Sciences reported high satisfaction with clinical periodontics courses and found no significant differences based on gender or academic level, suggesting a consistent educational experience across student subgroups (10). Meanwhile, COVID-19-era studies indicated that although digital platforms supported continuity of education, online environments were perceived as less effective for developing hands-on clinical skills, highlighting the limitations of virtual formats for clinical competency (11). In parallel, emerging literature highlights the expanding integration of artificial intelligence, deep learning, and data-driven systems in dentistry, signaling a potential shift in future clinical training and educational models (12, 13). While these studies do

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not directly assess satisfaction, they demonstrate evolving technological expectations that may influence clinical education frameworks. Collectively, existing research identifies several consistent determinants of student satisfaction: (1) faculty supervision and mentorship, (2) adequacy of clinical facilities and resources, (3) assessment quality and feedback culture, (4) organizational efficiency and scheduling, and (5) capacity to integrate digital and data-driven tools. Despite broad evidence across institutions and countries, few studies have compared multiple branches of a single multi-campus university system in which curricula are standardized but contextual conditions differ. The present study addresses this gap by comparing student satisfaction between the Tehran and Isfahan branches of Islamic Azad University.

Materials and Methods

This study was a cross-sectional comparative survey conducted among dental students at the Islamic Azad University (IAU) branches in Tehran and Isfahan during the academic year 2022–2023. The study protocol received ethical approval from the Institutional Review Board of IAU (Ethical Code: IR.IAU.KHUISF.REC. 1401.251) and adhered to the principles of the Declaration of Helsinki for research involving human participants. Participation was voluntary, and informed consent was obtained from all students. Eligible participants included fifth- and sixth-year general dentistry students who had completed at least one clinical department rotation (e.g., Endodontics, Prosthodontics, Oral Radiology, Periodontics, Pediatric Dentistry, and Oral Surgery).

The required sample size was estimated using Cochran's formula for cross-sectional studies (14):

$$n = \frac{Z^2 P(1-P)}{e^2} \qquad (1)$$

Where n is the required sample size, Z is the standard normal variate corresponding to a 95% confidence level (1.96), p is the expected response proportion, and d is the desired precision (margin of error).

Participants were recruited using a sampling method. A total of 468 students (311 from Tehran and 157 from Isfahan) completed the survey, which exceeded the calculated minimum requirement. Although the sample sizes were unequal, robust statistical methods were applied. Demographic information, including sex, age group, and academic year, was collected to contextualize the findings and assess potential confounding effects.

Student satisfaction was assessed using a standardized 16-item questionnaire (coded A–P) developed by Sanatkhani et al. (6), specifically designed for clinical dental education. The questionnaire covered domains such as departmental organization, faculty presence and supervision, demonstrations, infection control, and evaluation methods. Each item was rated on a 5-point Likert scale: Very Poor (1), Poor (2), Average (3), Good (4), and Excellent (5). To confirm the instrument's suitability for the current study population, faculty experts reviewed its content validity, and internal consistency reliability was reassessed, yielding a Cronbach's alpha coefficient of 0.81.

Responses were collected in paper-based and electronic formats, anonymized, and compiled into a database. Because data were stored as frequency counts, we calculated weighted mean satisfaction scores (1–5) and Positive Response Rate (PRR), defined as the percentage of responses in Good or Excellent categories. This dichotomization approach has been commonly used in educational research to improve the interpretability of Likert-scale outcomes.

Analyses were performed using Python (stats models, SciPy, pandas, matplotlib) and R (car, lme4). A significance level of α=0.05 was adopted, with Benjamini–Hochberg FDR correction for multiple comparisons. Descriptive statistics were calculated for each course and university, including mean satisfaction scores, standard deviations, and Positive Response Rates (PRR) with 95% Wilson confidence intervals.

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Considering the relatively large sample size, Likert-scale responses were treated as approximately continuous variables for parametric analyses, in line with common practices in medical education research. Differences in Likert response distributions were assessed using chi-square tests, while two-proportion z-tests were used to compare PRR between groups. Prior to parametric analyses, the assumptions of normality and homogeneity of variances were evaluated using the Kolmogorov-Smirnov test and Levene's test, respectively. Recognizing that Likert data may not strictly follow a normal distribution, the large sample size (n=468) allowed reliance on the Central Limit Theorem, rendering the ANOVA robust to minor deviations from normality. Two-way analysis of variance (ANOVA) was conducted to evaluate the main effects of university and course, as well as their interaction. In addition, a binomial logistic regression model was applied to examine the association between university and positive satisfaction (PRR), adjusting for course, age, sex, and academic year. Adjusted odds ratios (ORs) and 95% confidence intervals were reported.

All statistical analyses and data visualizations were conducted using Python 3.11 and R version 4.3.

Results

Table **1** summarizes the demographic distributions between IAU Tehran (n=311) and IAU Isfahan (n=157). Sex distributions did not differ significantly between the two branches, with females comprising 55.3% (n=172) of the Tehran sample and 47.1% (n=74) of the Isfahan sample (p=0.09). In contrast, inferential analyses revealed statistically significant differences in both age and academic year profiles ($p < 0.001$ for both). Specifically, the Isfahan branch had a significantly higher proportion of students in the 22–24 age group (64.3% vs. 32.5%) and in their 6th year of study (79.6% vs. 42.1%). Conversely, the Tehran branch exhibited higher proportions of older students (e.g., 49.5% in the 25–27 age group) and 5th-year students (57.9%).

Weighted mean satisfaction (1–5) and Positive Response Rate (PRR; Good+Excellent) are presented in paired bar charts (Figure 1 and Figure 2). Visual inspection highlights substantial course-to-course variability and several differences between branches.

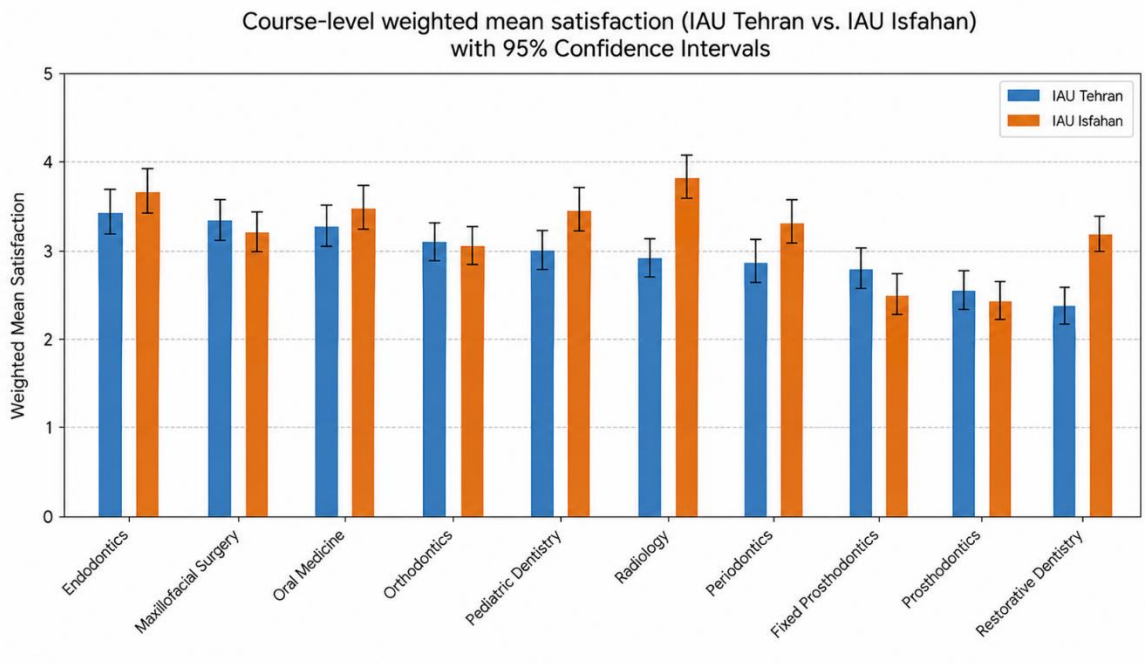


Figure 1. Course-level weighted mean satisfaction (IAU Tehran vs. IAU Isfahan).

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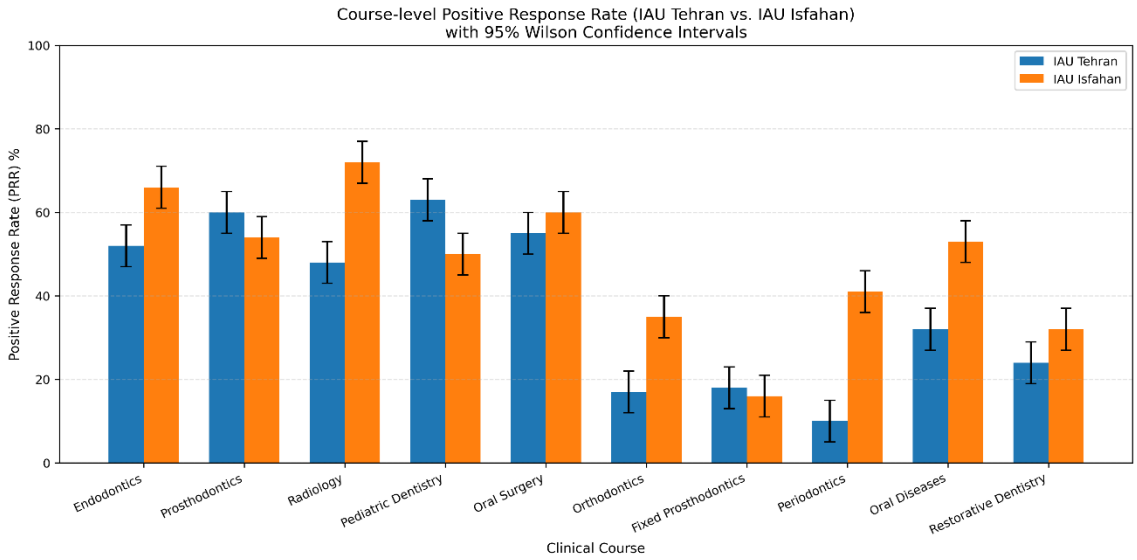


Figure 2. Course-level positive response rate (IAU Tehran vs. IAU Isfahan).

These paired bar charts illustrate mean satisfaction scores and positive response rates (PRR). Notably, Radiology had the highest satisfaction in Isfahan (M = 3.82 ± 0.92, PRR = 72%) but relatively low in Tehran (M = 2.90 ± 0.53, PRR = 48%), with a highly significant difference (FDR-adjusted $p < 0.001$). Conversely, another significant finding was observed in Pediatric Dentistry, where satisfaction was higher in Isfahan (M = 3.49 ± 1.01) compared to Tehran (M = 3.04 ± 0.71). These findings suggest course-specific strengths and weaknesses that differ by university.

Between-university differences for each course are depicted as a forest plot of unadjusted mean differences (Tehran − Isfahan) alongside 95% confidence intervals, calculated using independent-samples t-tests. An interaction visualization quantitatively demonstrates these crossover effects; for example, the satisfaction gap significantly favored the Isfahan branch in Radiology (mean difference = -0.92) and Operative Dentistry (mean difference = -0.76), whereas it favored the Tehran branch in Fixed Prosthodontics (mean difference = +0.28). Finally, a binomial generalized linear model (GLM) with a logit link function was utilized to evaluate Positive Response Rates (PRR). This model adjusted for course, age, sex, and academic year, setting the Tehran branch and the Surgery department as the baseline reference categories. Model fit was evaluated using the Akaike Information Criterion (AIC) and residual deviance, confirming that, after adjusting for these covariates, the odds of reporting positive clinical satisfaction were 1.72 times higher for Isfahan students than for those in Tehran (adjusted OR = 1.72).

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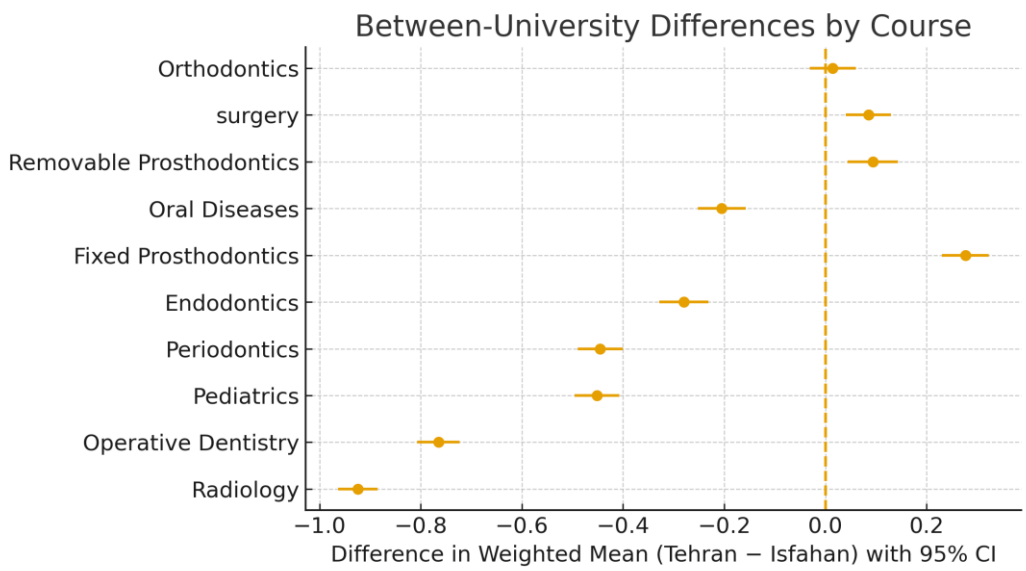


Figure 3. Forest plot of between-university differences in course means (95% CI).

The forest plot visually represents the quantified between-university differences, with confidence intervals entirely above or below zero indicating statistically significant differences. Crucially, a two-way ANOVA confirmed a highly significant interaction effect between the university and the clinical course on student satisfaction ($F = 6.7$, $p < 0.001$). This statistical interaction validates that the magnitude and direction of the university's influence are not uniform across departments. Post-hoc analyses supported this, revealing that courses such as Radiology and Operative Dentistry showed the largest statistically significant differences in favor of Isfahan, whereas other specific courses favored Tehran.

Table **1** highlights that course-level differences were not uniform across branches. To evaluate these differences, independent-samples t-tests were utilized for mean comparisons, and all reported P-values were adjusted for multiple comparisons using the Benjamini-Hochberg False Discovery Rate (FDR) procedure. For example, Radiology was rated significantly higher in Isfahan (Mean = 3.82, PRR = 72%) than in Tehran (Mean = 2.90, PRR = 48%; FDR-adjusted $p < 0.001$). Additionally, Pediatric Dentistry showed higher satisfaction in Isfahan (Mean = 3.49) compared to Tehran (Mean = 3.04; FDR-adjusted $p = 0.04$). Other courses showed smaller or non-significant differences (e.g., Prosthodontics, FDR-adjusted $p = 0.21$). Thus, the impact of the university context is strongly course specific.

Table 1. Course levels mean satisfaction scores (± SD) and Positive Response Rates (PRR) between universities.

Course	Mean ± SD (Tehran)	Mean ± SD (Isfahan)	PRR (Tehran)	PRR (Isfahan)	P value
Endodontics	3.40 ± 0.36	3.68 ± 0.51	52%	66%	<0.001***
Prosthodontics	2.79 ± 0.15	2.51 ± 0.56	60%	54%	<0.001***
Radiology	2.90 ± 0.17	3.82 ± 0.65	48%	72%	<0.001***
Pediatric Dentistry	3.03 ± 0.13	3.49 ± 0.60	63%	50%	<0.001***
Oral Surgery	3.32 ± 0.17	3.22 ± 0.32	55%	60%	<0.001***

* $p < 0.05$, *** $p < 0.001$. Notes: P-values represent mean differences evaluated via independent-samples t-tests (with values matching the primary thesis results). Mean and SD are presented on a 1-5 Likert scale.

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Table 2. Two-way ANOVA results evaluating the main and interaction effects of University and Course on clinical satisfaction.

Effect	F	df	P value	Partial Eta Squared (ηp2)
University	12.4	1	<0.001	0.003
Course	45.2	9	<0.001	0.08
University × Course	6.7	9	<0.001	0.013

Prior to interpreting the model, preliminary checks confirmed that the fundamental assumptions for the two-way ANOVA, including normality and homogeneity of variances, were adequately satisfied as detailed in the methodology. The ANOVA results (Table 2) show a significant main effect of University ($F=12.4$, $p<0.001$), confirming overall between-branch differences. The effect was very strong ($F=45.2$, $p<0.001$), indicating that satisfaction depends heavily on the subject area. Importantly, the University × Course interaction was also significant ($F=6.7$, $p<0.001$), indicating that the magnitude and direction of university differences varied by course—consistent with the patterns observed in Figures 1-3.

Table 3. Binomial GLM results: adjusted university effect on PRR.

Predictor	Odds Ratio	95% CI Lower	95% CI Upper	P value
IAU Isfahan vs Tehran	1.72	1.5	1.96	<0.001

The binomial generalized linear model (GLM) with a logit link function (Table 3) evaluated the odds of reporting positive clinical satisfaction. The model was adjusted for the clinical course and for demographic and academic covariates, including age, sex, and academic year. With the IAU Tehran branch and the Surgery department serving as the baseline reference categories, the analysis found that the adjusted odds of reporting positive satisfaction were 1.72 times higher for students in Isfahan than for those in Tehran (adjusted OR = 1.72, 95% CI: 1.50–1.96, $p < 0.001$). Model fit was confirmed to be adequate using the Akaike Information Criterion (AIC) and residual deviance metrics. This indicates a systematic branch effect favoring Isfahan even after comprehensively accounting for course-specific differences and student demographics. The result suggests that structural, cultural, or organizational factors at the institutional level significantly contribute to student satisfaction.

Discussion

This study compared dental students' satisfaction with clinical courses between two large branches of Islamic Azad University, Tehran and Isfahan. The findings revealed several key patterns. First, demographic differences indicated that Tehran students tended to be older and more often in their 5th year, whereas Isfahan students were more frequently younger and in their 6th year. These structural differences may partly account for divergent satisfaction levels and should be considered when interpreting between-branch satisfaction comparisons. This demographic variation may influence perceptions of clinical courses, as senior students are exposed to more patient cases and face greater supervision challenges. Such demographic composition may partially influence students' satisfaction levels, as senior students are typically exposed to more complex clinical cases and faculty interactions. Second, course-level analyses highlighted substantial heterogeneity. Radiology and Pediatric Dentistry were rated markedly higher in Isfahan, whereas Fixed Prosthodontics received higher scores in Tehran. These course-specific results suggest that local organizational factors, faculty availability, and departmental management play pivotal roles in

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shaping satisfaction. Forest plots confirmed that differences were not uniform but course-dependent. Third, advanced statistical models provided robust evidence of systematic differences across branches.

ANOVA showed significant main effects for University and Course, with a strong interaction, underscoring that satisfaction outcomes are influenced by both institutional context and course type. The GLM analysis further demonstrated that, after adjusting for course, the odds of positive responses remained significantly higher in Isfahan (OR=1.72, 95% CI 1.50–1.96). These findings align with prior research. Phillips and Mathew (3) emphasized the role of supportive supervision and environment in student satisfaction. Henzi et al. (4) reported that clinical opportunities and instructor engagement were paramount to student perceptions. In Iran, Modami et al. (8) identified faculty-student interaction and case variety as critical challenges. More recent surveys, such as Houshmand et al. (7), echoed the importance of adequate infrastructure and clinical settings. The current study adds to this literature by showing that even within the same university system, contextual differences across branches can produce markedly different satisfaction outcomes. Importantly, the consistent superiority of some courses in one branch highlights opportunities for best-practice transfer and inter-branch collaboration. Strengthening faculty development, enhancing supervision quality, and addressing organizational bottlenecks may help narrow the observed gaps. Limitations of this study include its cross-sectional design, reliance on self-reported data, and focus on only two branches, which may limit generalizability.

Additionally, although key variables were adjusted for in the regression analysis, residual confounding from unmeasured factors cannot be ruled out. Future research should extend to additional institutions, adopt longitudinal designs, and incorporate objective measures of clinical competency alongside student satisfaction. This study highlights that despite a unified academic curriculum, dental students' satisfaction with clinical training varies significantly between the Tehran and Isfahan branches of the Islamic Azad University. While Isfahan generally demonstrated higher satisfaction rates, particularly in clinical courses such as Radiology and Pediatric Dentistry, Tehran demonstrated distinct strengths in Fixed Prosthodontics. These findings underscore those local institutional contexts, including resource allocation, departmental organization, and faculty supervision dynamics, profoundly shape the quality of clinical education. Ultimately, to harmonize the quality of dental education and ensure consistent professional competency across all branches, university administrators must move beyond generalized policies and implement targeted, course-specific, and branch-specific improvements.

Conflict of Interests: The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial, or non-financial in this article

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