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Influence of Cost, Perceived Service Quality, and Patient Satisfaction on Loyalty at a Public University Dental Clinic in Iran

Laura M. Jensen[1]*, Erik Sørensen[1]

[1]Department of Public Health, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark.

***E-mail** ✉ laura.jensen@outlook.com

Abstract

Dental clinics linked to public universities not only serve an academic purpose but also deliver routine and advanced treatments to varied patient groups at rates supported by public funding. Recognizing the role of patient retention—along with elements like affordability, care standards, and contentment that shape it—remains vital for the ongoing viability of such facilities. The objective of this research was to evaluate how affordability, care standards, and contentment affect patient retention at the dental facility of a state-funded medical university. A cross-sectional investigation was carried out at the dental facility of Alborz University of Medical Sciences located in Karaj, Iran, spanning 2023 to 2024. Information was gathered from 190 individuals selected via convenience sampling, utilizing four instruments: basic participant details, views on affordability and care standards, contentment levels, and retention among dental patients. Analysis involved structural equation modeling (SEM) through PLS software, with fit indicators (rms Theta, SRMR, and NFI) applied to evaluate the model. Associations among factors were further explored using SPSS version 22, incorporating independent t-tests, ANOVA, chi-square analyses, and Pearson's correlation.

Affordability exerted a notable influence on patient retention ($P < 0.001$), alongside the joint impact of care standards and contentment. Affordability also markedly affected both care standards and contentment ($P < 0.001$). Review of participant characteristics revealed that treatments delivered by teaching staff, in contrast to those by trainees, correlated with greater retention ($P < 0.01$). Retention among patients at state university dental facilities is chiefly shaped by viewed care standards and contentment, while affordability plays a key supporting role. To boost retention, facility leaders ought to implement comprehensive approaches focused on elevating care standards (especially via enhanced oversight by teaching staff), boosting contentment, and preserving reasonable fee levels. These outcomes highlight the importance of addressing both treatment-related and supportive elements of care in educational dental environments.

Keywords: Cost, Perceived service quality, Patient satisfaction, Iran

Introduction

Retention of patients plays an essential role in maintaining the long-term viability of healthcare organizations, especially within dental fields, where individuals hold specific anticipations, views, and conduct tendencies [1]. Treatments in dentistry stand apart from typical medical interventions owing to elevated expenses, restricted coverage by insurers, and frequent treatment-related fears, posing distinct obstacles to keeping patients [2].

Retention in dental contexts manifests in conduct-related aspects (such as returning appointments) and mindset-related aspects (such as confidence and contentment) [3, 4]. Individuals might show retention toward particular providers or certain institutions, influenced by elements including viewed care standards, clinic features, employee conduct, and value for money [4–6]. Research findings suggest that ease of access, treatment

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effectiveness, strong provider-patient dialogue, and thorough aftercare monitoring are central to improving contentment and building enduring retention [6].

Within Iran, numerous residents find dental treatments economically out of reach even with public support, emphasizing the requirement for fee approaches aligned with public economic capacity [7, 8]. Standards of care—covering treatment results, compliance with hygiene measures, and strong interpersonal exchanges—represent another vital element in contentment [9, 10]. Dental facilities connected to public universities must balance superior care levels with their teaching obligations [11, 12].

Contentment among patients, viewed as alignment between anticipated and experienced care, relies on various aspects like operational smoothness, advanced equipment, and provider interactions [13–15]. In competitive health environments, contentment forms the core for ongoing patient engagement and retention [16]. Certain forward-thinking programs have introduced approaches centered on patients, where trainees deliver ongoing treatment to the same individuals, promoting deeper connections and improved sustained involvement [17].

Public dental clinics in Iranian universities primarily cater to lower-income groups via supported treatments [7, 8]. Their combined teaching and care responsibilities demand particular focus on developing confidence and ensuring standards to maintain patient involvement [18]. This research explores the combined roles of cost awareness, care standards, and contentment in shaping retention within this distinctive environment.

Building on existing studies in health marketing and theories of consumer conduct, this work suggests that viewed care standards and equitable affordability serve as primary drivers of contentment, which then promotes retention. This structure aligns with recognized frameworks like SERVQUAL [19] and Expectancy-Disconfirmation Theory [20], each placing contentment as an intermediary between views of care and retention actions. Studies in health contexts reinforce these links, indicating that superior viewed standards and fair costs increase contentment, thereby strengthening retention [3, 4, 16].

To foster confidence and reliability, it is necessary to assess the current state of major drivers, explore their connections, and measure their effects for better-guided choices. Through identifying elements impacting retention, this research offers data-supported recommendations to support patient attraction and maintenance. Given the scarcity of investigations into retention among dental patients, these outcomes help address a notable research void. Accordingly, this investigation was performed to explore the elements influencing retention of dental patients at the dental facility of a state medical sciences university.

Materials and Methods

Study design

Study setting and design

This descriptive-analytical, cross-sectional investigation took place from 2023 to 2024 at the dental facility affiliated with Alborz University of Medical Sciences in Karaj, Iran. The facility operates as a referral hub, delivering a full range of routine and advanced dental treatments, such as endodontics, restorative procedures, prosthodontics, oral surgery, orthodontics, periodontics, and pediatric dentistry. Functioning under a combined teaching and care framework, the center offers reduced-cost services aligned with official government rates while also acting as an educational venue where dental trainees perform procedures under the guidance of teaching staff.

Study population and context

The target population included individuals from varied socioeconomic levels who received treatment at this university-linked facility. Serving as a key regional provider, the center handles a substantial yearly patient load, offering a unique environment to investigate service provision at the overlap of academic instruction and community healthcare. The diverse patient profile, along with its supported cost model, provides an ideal backdrop for assessing the elements that affect patient retention in government-supported dental programs.

Data collection

Sample size calculation employed the formula applied in the research by Mahendrayana *et al*. [19]. With a 99% confidence level ($\alpha = 0.01$), 90% power ($\beta = 0.10$), and an estimated $r = 0.29$, the minimum required participants were calculated as 171. Allowing for a possible 25% dropout due to incomplete responses, 214 individuals were initially enrolled. Ultimately, 190 fully completed questionnaires were obtained and used for analysis.

Data were gathered from 190 individuals through convenience sampling. Participants were chosen among clinic attendees during a one-week timeframe to include

representation from all relevant providers, encompassing teaching staff across different specialties and trainees.

Inclusion criteria comprised: individuals aged 18 years or older (to enhance response reliability and comply with legal consent requirements); those who had undergone at least one consultation or procedure at the facility; and those who finished the questionnaire within one week following their service. Exclusion criteria involved questionnaires with less than 80% completion, more than 20% unanswered items, or patterns of uniform or repeated responses across sections.

For data gathering, trained interviewers were positioned within the clinic. Daily and shift-based quotas were established according to typical patient flow patterns documented at the reception desk. Interviewers identified eligible patients, secured informed consent, and provided questionnaires to those who qualified. Distribution and collection proceeded until the target sample was achieved, with the process extended beyond the initial week if needed.

In this study, data were collected using four questionnaires, with their details and validity/reliability information outlined below:

Demographic questionnaire

This tool was designed specifically for the study to gather participants' baseline characteristics, such as age, gender, educational attainment, specialty department visited, income level, health insurance coverage, frequency of visits, personal relationships with clinic staff, and type of service provider (faculty member or student). It aimed to capture essential sociodemographic factors that may affect patients' experiences.

Perceived price and quality questionnaire

This instrument was created based on a review of existing literature and adaptation of previously validated tools [21, 22]. It consists of two separate parts:

Price perception section (3 items)

Assesses:

- Expected pricing
- Perceived cost levels
- Value for services received

Scoring: 5-point Likert scale (1 = "very inappropriate" to 5 = "very appropriate")

Possible score range: 3–15

Reliability: Cronbach's α = 0.90

Quality perception section (38 items distributed across 6 dimensions)

Dimensions:

1. Comfort of facilities
2. Efficiency of services (including insurance processing)
3. Effectiveness of treatment
4. Accessibility
5. Technical skills of providers
6. Responsiveness of staff

Scoring: 5-point Likert scale (1 = "very poor" to 5 = "very good")

Possible score range: 38–190

Reliability: Cronbach's α = 0.96

Validity: Confirmed via expert panel evaluation

Patient satisfaction questionnaire

This validated 20-item scale, drawn from prior studies [23], measures several key areas:

- Administrative procedures (e.g., appointment booking and record management)
- Clinical encounters (e.g., waiting times and provider punctuality)
- Interpersonal aspects (e.g., staff behavior and communication)
- Technical proficiency (e.g., hygiene standards and procedural expertise)
- Follow-up care after treatment

Scoring: Likert-type scale (detailed anchors not specified in the original description)

Reliability: Cronbach's α = 0.95

Validity: Established through expert review

Patient loyalty questionnaire

This 12-item scale evaluates two core components [21]:

- Attitudinal loyalty (6 items): Degree of psychological attachment
- Behavioral loyalty (6 items): Intention to return or repurchase services

Scoring: 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree")

Possible score range: 12–60

Reliability: Cronbach's α = 0.94

Validity: Confirmed via expert review

All questionnaires were subjected to content validation through targeted discussions with an expert panel to ensure their applicability within the Iranian dental

healthcare setting. The consistently high Cronbach's alpha values ($\alpha \geq 0.90$) demonstrate strong internal consistency for each instrument.

Controlling for common method bias

Various procedural strategies were implemented to mitigate the potential for common method bias associated with surveys relying on self-report measures. These strategies involved guaranteeing respondent anonymity and data confidentiality, employing diverse scale formats across different measures (such as varying Likert-type scales in terms of point lengths and endpoint labels), and arranging the order of items to minimize consistent response tendencies. Furthermore, a post-hoc evaluation using Harman's single-factor test was performed to examine the extent of common method variance.

Analytical approach

The primary analytical technique utilized was Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS version [4], which is particularly appropriate for preliminary research involving modest sample sizes and intricate interrelations between latent variables. The choice of PLS-SEM was based on its capacity to concurrently evaluate both the measurement and structural components of the model, its lack of dependence on assumptions of multivariate normality, and its compatibility with reflective measurement specifications. Assessment of model adequacy relied on metrics including the Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and RMS Theta. Beyond direct path estimations, indirect effects were investigated through mediation analysis employing bootstrapping procedures with 5,000 subsamples, facilitating the examination of pathways such as those linking satisfaction to loyalty.

The analysis also incorporated descriptive and inferential statistical procedures. Descriptive summaries included calculations of means, medians, and standard deviations, whereas inferential approaches encompassed independent samples t-tests, analysis of variance (ANOVA), chi-square tests, and Pearson's product-moment correlations. Considering the study's sample size, data distribution was evaluated via skewness and kurtosis values to check for normality in continuous variables. Variable interrelations were explored in SPSS version 22, applying a statistical significance threshold of 0.05.

Ethics approval and informed consent

Ethical clearance for the research was granted by the Ethics Committee at Alborz University of Medical Sciences (IR.ABZUMS.REC.1402.033). All study protocols complied with the principles set forth in the Declaration of Helsinki. Respondents received a detailed information document outlining the research objectives, the optional nature of involvement, and assurances regarding data protection. Informed consent in written form was secured from every individual prior to participation.

Findings

Of the 281 respondents, 66.3% were men and 33.7% women, with participant ages spanning 12 to 59 years. Demographic information indicated that 31.1% had no personal income, while 20% reported being without health insurance coverage. With respect to clinic attendance, 41% were attending for the initial visit, whereas 47% had attended on four or more occasions. The majority (56.3%) were directed to the facility through recommendations from relatives or acquaintances, and 44.2% noted that a family member or friend worked there. Regarding treatment delivery, 43.2% of procedures were performed by dental trainees, compared to 13.2% by specialist dentists (academic staff).

Associations at the bivariate level

Pearson correlation analyses identified significant positive associations across the primary variables ($P < 0.001$). As presented in **Table 1**, perceptions of pricing fairness displayed moderate correlations with overall satisfaction ($r = 0.347$) and patient loyalty ($r = 0.310$), implying that views of affordable costs contributed to greater contentment and higher intentions to revisit. Perceptions of care quality demonstrated robust correlations with satisfaction ($r = 0.896$) and loyalty ($r = 0.757$), highlighting the critical influence of perceived service excellence on patient contentment and retention. Satisfaction itself showed a particularly strong association with loyalty ($r = 0.806$), emphasizing its pivotal intermediary function.

Table 1. Correlation and significance levels between the studied domains

Domains	Correlation and *P*-value	Price	Quality	Satisfaction	Loyalty
Price	Correlation	1	0.344	0.347	0.31
	P Value		0.000	0.000	0.000
Quality	Correlation		1	0.896	0.757
	P Value			0.000	0.000
Satisfaction	Correlation			1	0.806
	P Value				0.000
Loyalty	Correlation				1
	P Value				

These results support the proposed direct and indirect associations among the variables under investigation, providing justification for a more in-depth examination through structural equation modeling.

Development and assessment of the model

In order to investigate the structural interconnections among the variables, three distinct models were constructed. The preliminary models **(Figures 1 and 2)** exhibited an excessively strong correlation between perceived quality and satisfaction, which surpassed the respective correlations of each construct with its own measurement indicators, resulting in non-compliance with the criteria for discriminant validity.

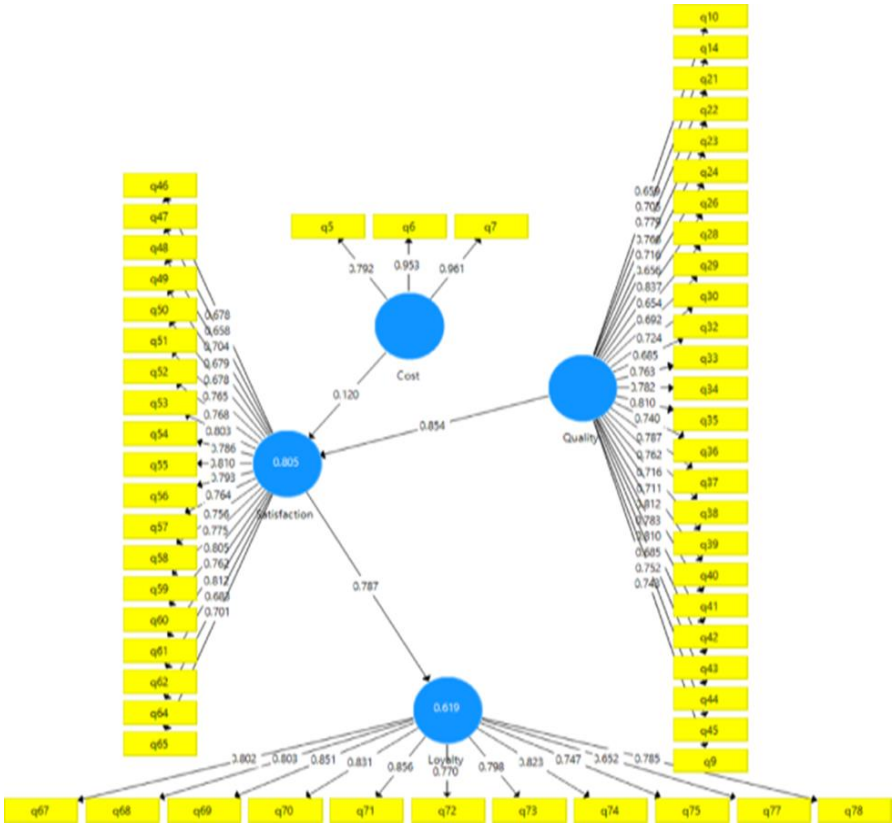


Figure 1. Model 1: An excessively strong correlation observed between perceived quality and patient satisfaction, surpassing the squared correlations of each latent construct with its respective indicators, thereby demonstrating failure to establish discriminant validity.

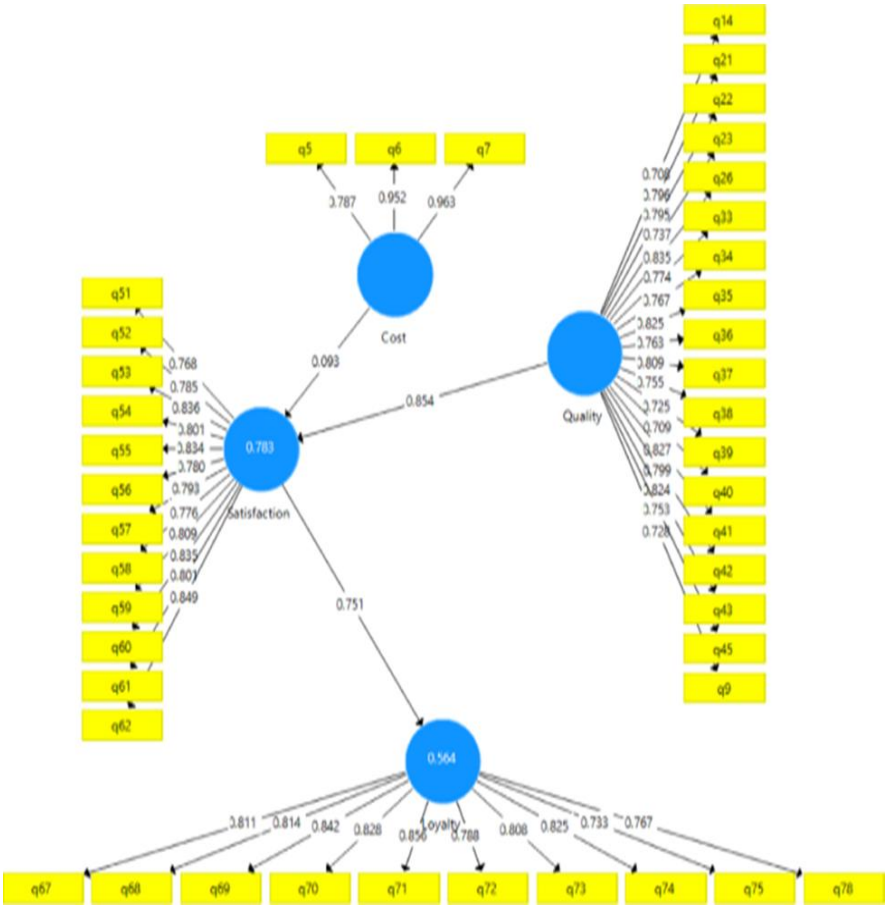
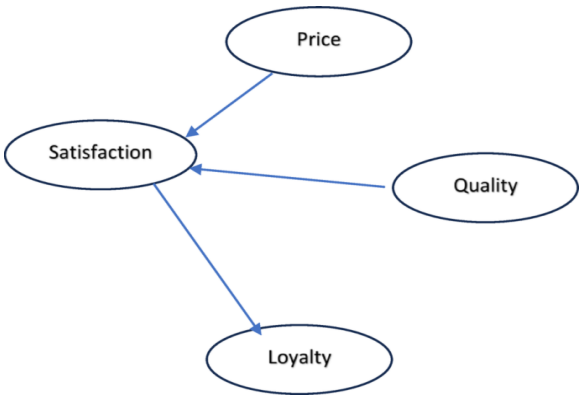


Figure 2. Model 2: A notably strong correlation between perceived quality and patient satisfaction, further reinforced by the robust associations of each latent construct with its corresponding indicators, resulting in a persistent failure to achieve discriminant validity.



Models 1 and 2 Diagrams

As a result, in Model 3 **(Figure 3)**, perceived quality and satisfaction were combined to form a single latent factor (Latent Variable).

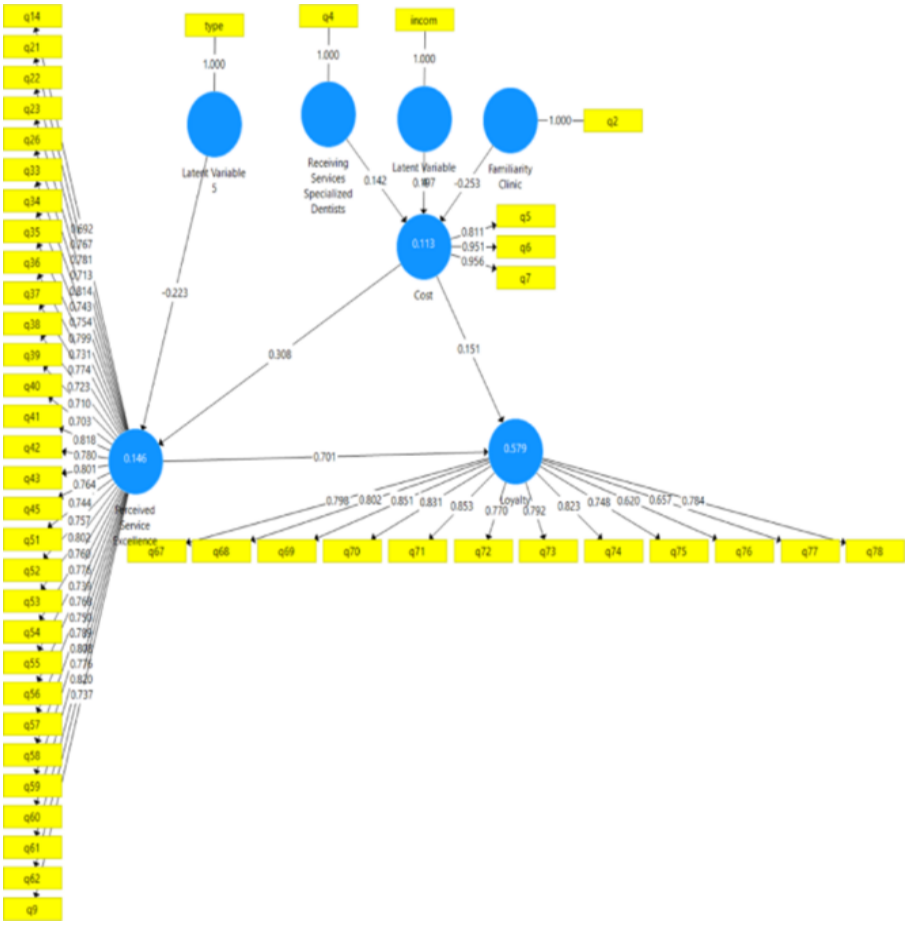


Figure 3. Model 3: consolidation of quality and satisfaction variables (perceived service excellence)

Model 3 exhibited satisfactory fit according to several indices, as presented in **Table 2**.

Table 2. Construct validity indicators and

Construct validity indicators						
Indicators	**Cronbach**	**rho_A**	**Composite reliability**	**Average variance extracted (AVE)**	**Q^2-CV RED**	**Q^2-CV COM**
Latent Variable 1 (Perceived quality and satisfaction)	0.98	0.98	0.98	0.584	0.078	0.521
Latent Variable 2	0.9	1.00	0.93	0.83	0.0843	0.583
Latent Variable 3	0.94	0.95	0.95	0.61	0.314	0.511

Perceived quality and satisfaction were unified into one latent factor (Latent Variable 1), which, for the scope of this study, is designated as Perceived Service Excellence to capture the patient's comprehensive appraisal of their service experience **(Table 3)**.

Table 3. Overall model fit indices

Index	**SRMR**	**rms Theta**	**NFI**
Value	0.077 <	0.117 <	0.72 >
Threshold	0.1	0.12	0.7

The model showed an SRMR of 0.0773, which is under the 0.10 threshold, indicating a good fit; an rms Theta of 0.117, below the 0.12 cutoff, confirming indicator reliability; and an NFI of 0.72, surpassing the 0.70 benchmark, further validating the model's adequacy.

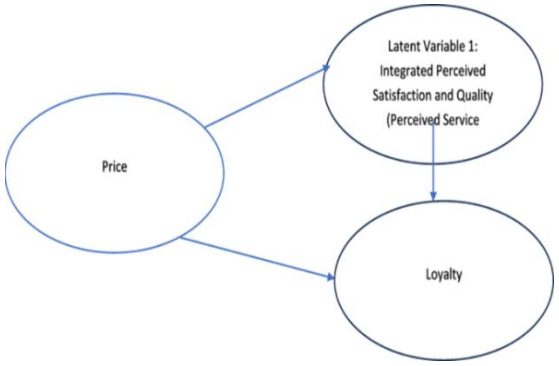


Diagram of Model 3.

Explained variance and predictors

Within the third model, three demographic factors exerted a significant influence on the perceived price construct (LV2): being referred by friends or family showed a negative effect, whereas elevated income brackets and treatment provided by faculty members demonstrated positive influences. Collectively, these elements accounted for 11.3% of the variation in perceived cost.

The category of health insurance had a notable impact on the latent variable encompassing quality and satisfaction (LV1). Notably, individuals holding basic or supplementary coverage indicated reduced levels of perceived quality and satisfaction, with the insurance category explaining 14.5% of the variation in LV1.

Patient loyalty (LV3), in the end, was substantially affected by the two latent variables: LV1 (Perceived Service Excellence) and LV2 (Perceived Price). Together, they accounted for 57.9% of the variation in patient loyalty, indicating that perceptions of service delivery and pricing serve as robust determinants of patients' ongoing allegiance to the clinic.

Demographic predictors of loyalty

Further examination indicated that the provider type was significantly linked to loyalty ($P < 0.01$), as patients receiving care from specialist dentists displayed greater loyalty. Likewise, increased visit frequency to the clinic was significantly related to enhanced loyalty ($P < 0.01$). None of the remaining demographic characteristics, including age, gender, or insurance type, demonstrated a significant association with loyalty.

The research uncovered significant statistical associations between perceived price, perceived quality, satisfaction, and patient loyalty—results that are consistent with earlier investigations [24–28]. Through structural equation modeling, the study illustrated direct as well as indirect connections among these elements, emphasizing perceived price and the combined quality-satisfaction factor as primary influences on patient loyalty.

The substantial initial correlation observed between perceived quality and satisfaction prompted issues regarding discriminant validity, which resulted in merging them into one latent variable—Perceived Service Excellence—in the refined model. This modification enhanced the model's fit and reinforces the theoretical perspective that, in healthcare contexts, patients frequently view service quality and satisfaction as interrelated phenomena [29–31]. In line with prior work, including that of Meesala [26] and Astarini [32], the results affirm that satisfaction acts as a mediator in the influence of service quality and price on loyalty, underscoring the deep interconnection of these factors in forming patient behaviors and intentions.

Of particular note, the direct influence of price on loyalty underscores its importance in strategy, especially within public dental clinics where costs are a concern. In agreement with Lai *et al*. [33], the perception of pricing equity impacts not just satisfaction but also the probability of repeat visits. While changes to pricing may be impractical in public settings, specific supportive initiatives—like charitable contributions or subsidies targeted at those without insurance—might mitigate adverse price views and boost patient loyalty [34].

The findings further demonstrate that patient loyalty is enhanced when care is delivered by specialist faculty members. Such providers are viewed as possessing greater expertise, aligning with the observations of Park *et al*. [12] and additional studies [35], which indicated that advanced clinical proficiency markedly improves patient satisfaction and likelihood of revisit. In contrast, care provided by dentists with limited experience or non-specialist status correlated with diminished satisfaction [15].

Apart from provider attributes, loyalty exhibited a positive correlation with the number of clinic visits, implying that repeated interactions build patient familiarity and confidence in the facility over time—particularly when early encounters fulfill anticipations [2, 29, 36]. Nevertheless, loyalty is not entirely rooted in accumulated experiences; certain patients continue attending due to persistent treatment requirements or limited options elsewhere. Consequently, clinic

personnel must prioritize effective and reliable engagement right from the initial interaction [37, 38].

Service quality revealed itself as a multifaceted dimension—encompassing physical aspects, effective communication, respect for privacy, emotional care, and seamless staff coordination—that profoundly influences patient perceptions [39, 40]. Its substantial interconnection with satisfaction bolsters the argument for holistic improvement programs addressing both infrastructural (tangible) and relational (interpersonal) facets of delivery [41, 42]. In environments with limited resources, like university-based dental clinics, such upgrades can function as approaches to create added value, fulfilling patient needs while cultivating enduring institutional confidence [43, 44]. The pronounced empirical linkage between perceived quality and satisfaction implies that, in the setting of a university dental clinic, patients tend to regard these elements as closely intertwined. This probably stems from a wider theoretical overlap, wherein quality attributes—like responsiveness, proficiency, and cost reasonableness—directly contribute to feelings of satisfaction. Although merging these variables strengthened model fit and alleviated issues with discriminant validity, it introduces challenges in disentangling their separate impacts.

Demographic variables including age, gender, and insurance coverage showed no notable links to patient loyalty, in agreement with prior evidence that experiential factors and perceived value supersede demographic effects [24, 25, 29]. That said, earlier investigations have identified meaningful connections between insurance possession and dental service usage, along with various contextual and familial elements, whereas maternal education and family income did not exhibit similar influences [45]. This inconsistency points to potential differences in insurance's influence depending on whether the outcome is service uptake or sustained loyalty. In public university dental clinics, loyalty seems predominantly shaped by institutional elements such as cost manageability, ease of access, trustworthiness, and sensed equity in treatment [33, 39]. Upcoming studies might explore if demographic factors gain greater prominence in alternative institutional or cultural environments, or through interactions with variables like socioeconomic position or health knowledge.

Lastly, the investigation underscores the mediating function of the quality-satisfaction composite in linking price perceptions to loyalty. Patients frequently assess service quality in relation to expended costs, redirecting attention toward overall value perception after basic affordability issues are resolved. This process promotes favorable dispositions, echoing established work on institutional trust and service justification [43, 44]. The present research offers fresh perspectives on the processes underpinning loyalty within academic public clinics—settings often grappling with the integration of teaching obligations, budgetary limitations, and patient demands. Here, loyalty arises not merely from satisfaction but also from faith in the organization's societal purpose and viewed ethical standards.

Recommendations

Policy and Practice Implications: Considering the substantial role of perceived price in shaping loyalty, university-based clinics ought to pursue collaborative alliances with government bodies and non-governmental entities to secure subsidies for treatments aimed at vulnerable groups. Such initiatives would improve accessibility to care while reinforcing the clinic's reputation as a fair and inclusive healthcare provider.

Clinical Management Strategies: Increasing the involvement and oversight of faculty members in services provided by students could elevate perceptions of quality and overall satisfaction. It is also vital to maintain uniform standards in communication, courteous behavior, and emotional care among all personnel.

Health Education and Training Suggestions: Training curricula for dental professionals should incorporate dedicated components focused on patient-centered approaches, effective communication skills, and professional conduct to bolster the soft skills that directly affect patient retention.

Directions for Future Research: Subsequent investigations should examine the development of loyalty across time and in various dental settings (such as private or hybrid models). Employing mixed-methods approaches would yield deeper understanding of patients' interpretations of price, quality, and satisfaction during their decision-making.

Limitations

A number of limitations should be recognized. Primarily, the research relied on convenience sampling at one university clinic, potentially restricting the applicability of results to wider contexts. Although the sample was sufficient for structural equation modeling, it might not reflect extensive demographic variety or achieve optimal

gender representation. Collecting data over a single week could overlook fluctuations related to seasons or other timing factors in patient profiles or views.

Additionally, reliance on self-administered questionnaires—validated in Persian though they were—introduces possibilities of response biases, including social desirability and memory errors. Cultural influences on how individuals express satisfaction or loyalty were not thoroughly investigated.

Furthermore, the study treated price, quality, and satisfaction as broad constructs without breaking them down into specific subcomponents (such as empathy, responsiveness, or cost reasonableness), which reduces the detail of the findings.

Finally, the cross-sectional approach limits the ability to establish causality; prospective, longitudinal designs would more effectively track the evolving process of loyalty development.

Conclusion

The research enhances knowledge regarding the combined effects of price perceptions, service quality, and satisfaction on patient loyalty in a public university dental clinic. Distinct from typical private-sector frameworks, these results emphasize the complex character of loyalty in subsidized healthcare environments, where individuals balance considerations of cost, professional standards, and the organization's societal role.

Price stands out as a pivotal element, exerting both direct influence and indirect effects via perceived value and satisfaction, underscoring the need for public health administrators to tackle affordability alongside excellence in care to sustain patient commitment.

The absence of notable links between demographic characteristics and loyalty reinforces the dominance of institutional and experiential elements. Upcoming studies should investigate loyalty as an enduring phenomenon encompassing behavioral and attitudinal aspects, influenced by confidence in the institution, sensed fairness, and the strength of patient-provider bonds.

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