



## Perceptions of barriers towards dental appointment keeping among patients of a tertiary care setting: A mixed method exploration

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### ABSTRACT

**Objectives:** To explore the barriers governing dental appointment keeping among patients reporting to a tertiary care setting. To assess the prevalence of missed dental appointments in a tertiary care center.

**Primary:** To explore the barriers governing dental appointment keeping among patients reporting to a tertiary care setting.

**Secondary:** To assess the prevalence of missed dental appointments in a tertiary care center.

**Methodology:** The study design adopted is a sequential explanatory mixed method design; here, quantitative data collection and analysis is followed by qualitative data/analysis. The quantitative arm recorded six months of retrospective data on missed appointments in the centre. Prevalence was estimated, and descriptive and inferential statistics were performed. For the qualitative component, focus group discussions and in-depth interviews were conducted among dental health professionals and patients. Data was transcribed, and thematic content analysis was performed using NVivo software.

**Results:** The prevalence of missed appointments in the tertiary care centre was 8.4 %. Personal/health issues (30.7 %) were noticed to be the most reported reason for missed appointments. Other causes include distance to the clinic (17.2 %), inflexible work schedule (14.7 %), transportation (12.3 %), dental anxiety (6.7 %), and economic issues (5.5 %). Qualitative data revealed the appointment system, experiences, consequences, responsible factors, management, and prevention of missed appointments in a tertiary care dental centre.

**Conclusion and recommendations:** Multiple barriers are identified for dental appointment-keeping behavior. Missed appointments are prevalent in the study setting, as dental treatments require multiple sittings to complete. The study's findings primarily focus on a tertiary care center and may reflect reduced prevalence due to the COVID-19 pandemic. Tailor-made interventions are suggested for tertiary care settings to manage and prevent missed appointments, paving the way for successful health care delivery.

### 1. Introduction

Dental appointments include oral health discussions, examinations, and treatment. Dental diseases progress slowly and require regular check-ups for early diagnosis. Patients usually seek treatment only when they experience severe pain, infection, or swelling. Dental treatments require multiple appointments, and follow-up is crucial for monitoring progress and complications.<sup>1–3</sup>

Missed dental appointments disrupt the continuity of care and workflow, waste resources, and harm patients' health.<sup>4,5</sup> Last-minute cancellations and no-shows stem from patient's lack of awareness. Undetected minor issues can turn into significant problems, requiring extensive procedures. Missed appointments impact other patients and

the dental setting, affecting the entire healthcare system.<sup>6</sup>

Dentists schedule appointments, provide appointment cards, and record the date and time in the patient's file. A reminder call is made a day before the appointment, yet dental practices still have a high rate of broken appointments.<sup>7</sup> Missed appointments affect the practice's functioning,<sup>8</sup> and regular tracking and record-keeping are needed to address the issue.

Patient and professional insights on existing barriers to dental appointment keeping must be understood to instil a positive attitude towards appointment keeping. Thus, understanding the reason behind missed appointments in dentistry will contribute to efficient patient management and developing strategies to reduce missed appointments.<sup>4,5,9,10</sup> Understanding barriers to dental appointment

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keeping is crucial for developing effective patient management strategies and reducing missed appointments. The impact of dental non-attendance is underestimated in dentistry in India, as the literature on missed appointments and their management is limited. Therefore, a mixed method exploration is planned whereby trends in dental appointment keeping in a tertiary care hospital are observed, and barriers governing the same will be explored.

## 2. Aims and objectives

**Primary:** To explore the barriers governing dental appointment keeping among patients reporting to a tertiary care setting.

**Secondary:** To assess the prevalence of missed dental appointments in a tertiary care hospital.

To explain the reported prevalence of missed appointments with qualitative interviews in an explanatory sequential design.

## 3. Materials and methods

Ethical approval was obtained from the Institution Review Board before the commencement of the study. (IRB-AIMS-2020-135). Participation information sheets containing details such as the purpose of the study, confidentiality, and right to refuse/withdraw were provided, and informed consent was also obtained from all the participants before conducting the interviews.

### 3.1. Study design

The study design adopted is a sequential explanatory mixed method design; here, quantitative data collection and analysis is followed by qualitative data/analysis. The prevalence of missed appointments was estimated in the quantitative arm, and a descriptive approach was selected in the qualitative component. The rationale for mixing the

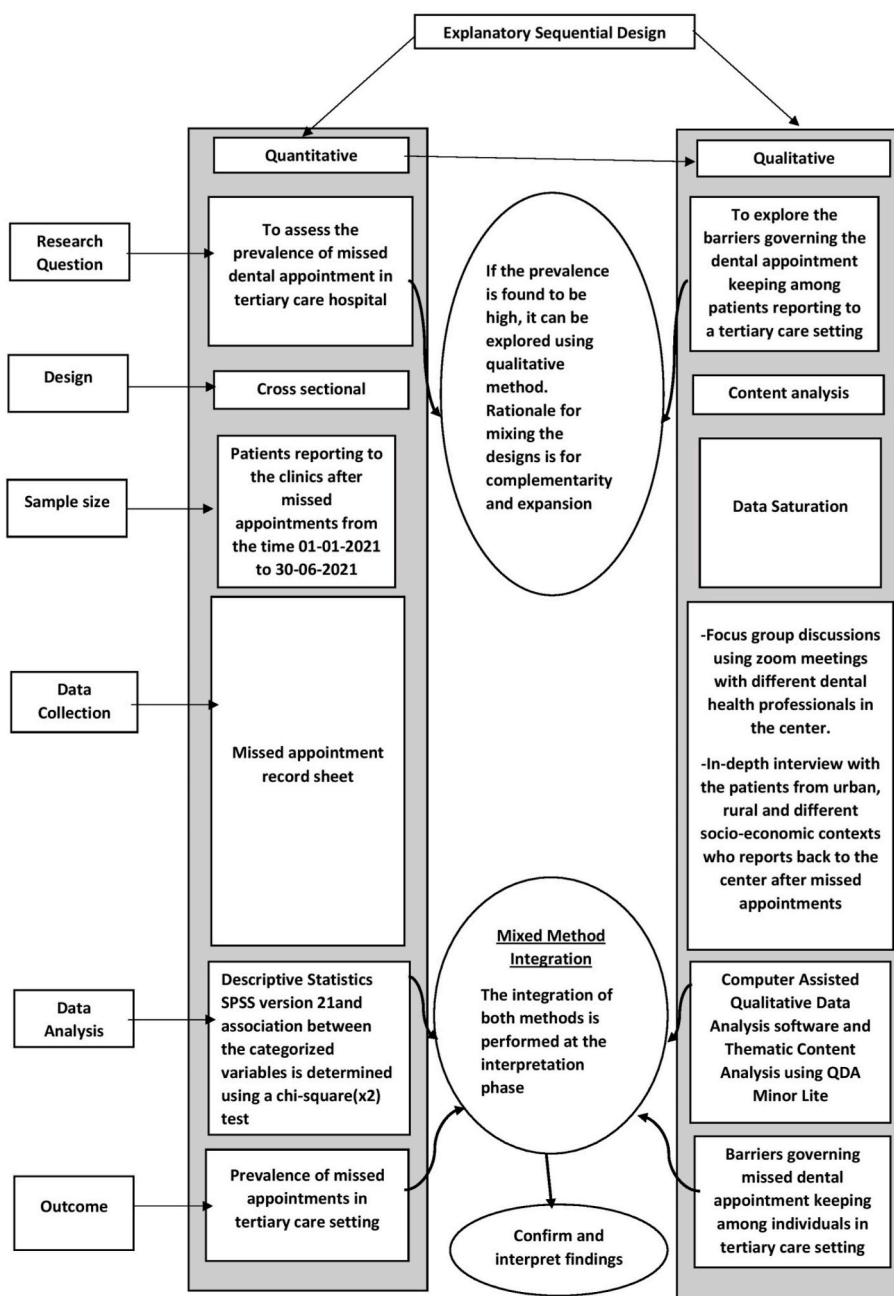


Fig. 1. Sequential explanatory mixed method design.

designs is for complementarity and expansion. Integration of both methods is performed at the interpretation phase. The study design flowchart is presented in Fig. 1.

### 3.2. Study setting and duration

The study is conducted in a tertiary care dental teaching center with a comprehensive dental clinic system for undergraduate students and separate postgraduate clinics for all the specialties excluding the oral pathology department. Appointments are scheduled by the students, managed by clinic coordinators, and recorded in patient’s case sheets and registers. Rescheduling of missed appointments was done by phone. The study spanned two months (01-08-2021 to 30-09-2021).

### 3.3. Quantitative arm

For the quantitative arm, a missed appointment record sheet was used in comprehensive and postgraduate clinics of a dental school. The sheet recorded socio-demographic data, specialty, treatment, sittings required, number, and reasons for missed appointments. Six months of retrospective data (01-01-2021 to 30-06-2021) were collected to determine the overall and specialty-wise prevalence of missed appointments. Descriptive statistics were performed using SPSS version 21. The Chi-square ( $\chi^2$ ) test determined the association between categorical variables.

### 3.4. Qualitative arm

For the qualitative arm, in-depth interviews were conducted among consented patients above 18 years of age who reported back after missed appointments to explore reasons for non-attendance. Health practitioners working in the tertiary care center were approached, and consenting practitioners were invited for a focus group discussion about their experience in encountering and managing missed appointments. Interview and discussion guides were designed based on a literature review and updated after each session. Purposive sampling represented different patients’ socio-economic contexts and health practitioner views. The principal investigator, trained in qualitative data collection methods, conducted the interview. Data saturation determined sample collection. Focus group discussions were conducted via Zoom platform (Zoom Meetings Version 5.0) and in-depth interviews were conducted as face-to-face meetings. Thematic content analysis was performed on recorded interviews and discussions using NVivo 12 (Released in 2017).

Both qualitative and quantitative data results were reported and compared side-by-side to generate meta-inferences. The fit of data was checked for expansion, discordance and confirmation.

### 3.5. Rigor in mixed method design

The quantitative data collection sheet and qualitative interview guides were content validated by five experts in clinical dentistry. Single investigator ensured reliability. Credibility was established by developing rapport with the patients through prolonged patient engagement before commencing interviews. Member checking was performed by contacting patients and healthcare providers by sharing verbatim transcripts and interpretations to confirm findings. Face-to-face feedback and telephonic feedback were obtained as per the availability of patients. Transferability was ensured using purposive sampling.

## 4. Results

### 4.1. Quantitative arm

Over six months (01-01-2021 to 30-06-2021), 150 missed appointments were recorded, giving an 8.4 % prevalence. Patients had a mean age of  $34.29 \pm 15.38$  years, with more missed appointments among

females (56 %) than males (44 %). Those with secondary schooling had the highest percentage of missed appointments (51.3 %), while professionals (5.3 %) and postgraduates (2.7 %) had the lowest. The result was statistically significant ( $p < 0.05$ ). The demographic details and its association with missed appointments is given in Table 1.

Missed appointments were noticed for nine procedures in the hospital records. Orthodontic fixed appliance therapy had the highest percentage of missed appointments (34 %), followed by restorations (25.3 %), requiring an average of four sittings. Dental extractions, scaling, and root planing had 16.7 % and 15.33 % of missed appointments, respectively. Root canal treatment, rehabilitative treatments of prosthodontics, oral lesion medical therapy, and dental implant procedures had lower percentages of missed appointments, ranging from 0.67 % to 2 %. Regarding the specialty-wise spread of missed appointments can be found in Table 2. Orthodontics had the highest reported dental no-shows (34 %) with the least documented in Oral Medicine (0.67 %) and Prosthodontics implant appointments (0.67 %).

The study population reported various reasons for missed appointments listed in Table 3. Personal or health issues were the most common reason (30.7 %). The inflexible work schedule of the patient (14.7 %), unavailability of transportation to the clinic (12.3 %), and distance to the clinic (7.2 %) were also reported as accessibility barriers. Dental anxiety or fear (6.7 %), forgetfulness (4.9 %), and economic barriers (5.5 %) were other behavioral factors reported. Dental health system barriers were also noted, such as chief complaints not being addressed (1.2 %) and patients’ inability to understand the doctor’s instructions (0.6 %). Language barriers (1.8 %), limited hours of operation (0.6 %), and residential instability (0.6 %) were other barriers. Around 3.1 % of missed appointments were for unknown reasons.

### 4.2. Qualitative arm

#### 4.2.1. Context-defining

A study was conducted at a tertiary care dental hospital with five comprehensive clinics and nine post graduate clinics. Dental health professionals from nine specialties, coordinators, and students (third year, fourth year) provide interdisciplinary treatment. As a rule, Patients assigned to individual clinics from a central reception were not allowed to transfer between the clinics. The hospital serves patients from all socioeconomic backgrounds, including those referred from screening programs and satellite centers, and offers free essential preventive and subsidized specialized treatments. The hospital is located near a medical college and receives patients from the medical side.

In-depth interviews were conducted among seven patients who missed their appointments in a tertiary care center. Consent was obtained before the interviews, and they were conducted in a private and comfortable space during their subsequent visit. Three focus group discussions (five members in each group) were conducted among dental practitioners who also consented. Thematic content analysis was used to identify six major themes and various subthemes.

**Table 1**  
Demographic characteristics of population and association with missed appointments.

Characteristic	Classification	Values (n = 150)	p value
Mean Age		34.29 ± 15.38 years	0.309
Gender	Male	66 (44 %)	0.480
	Female	84 (56 %)	
Education	Primary Schooling	12 (8 %)	0.023*
	Secondary Schooling	77 (51.3 %)	
	Graduate	49 (32.7 %)	
	Postgraduate	4 (2.7 %)	
	Professional	8 (5.3 %)	

Chi-square test, Significance level at p-value <0.05.

**Table 2**  
Missed appointments reported for different treatment procedures.

Specialty	Treatment performed	Average No of sittings required to complete treatment	Percentage of Missed Appointments
Periodontics	Scaling and root planing	2 Including follow-up	23 (15.33 %)
Oral Surgery	Extraction	2 Including follow-up	25 (16.7 %)
Conservative Dentistry and Endodontics	Restoration	4 Including follow-up	38 (25.3 %)
Orthodontics	Fixed Appliance Therapy	12 Including follow-up	51 (34.0 %)
Conservative Dentistry and Endodontics	Root Canal Treatment	4 Including follow-up	3 (2 %)
Prosthodontics	Removable Partial Denture	4 Including follow-up	4 (2.67 %)
Prosthodontics	Complete Denture	4 Including follow-up	4 (2.67 %)
Oral medicine	Oral lesion medical therapy	5 Including follow-up	1 (0.67 %)
Prosthodontics	Implant	6 Including follow-up	1 (0.67 %)

**Table 3**  
Reported reasons for missed appointments.

Reported Reasons	Percentages
Personal/Health issue	50 (30.7 %)
Distance to clinic	28 (17.2 %)
Inflexible work schedule	24 (14.7 %)
Transportation	20 (12.3 %)
Dental anxiety or fear	11 (6.7 %)
Economic Reason	9 (5.5 %)
Forgetfulness	8 (4.9 %)
Unknown	5 (3.1 %)
Language Barrier	3 (1.8 %)
Chief complaint not addressed	2 (1.2 %)
Residential Instability	1 (0.6 %)
Limited hours of operation	1 (0.6 %)
Does not understand instruction	1 (0.6 %)

4.2.2. *Researcher positionality*

The research team is a part of the daily functioning of comprehensive clinics and is involved in appointment scheduling and treatment. The team has members trained in qualitative, quantitative, and mixed-method design.

4.2.3. *Themes and sub-themes evolved*

**Theme 1: Appointment system in the dental setting:** In dental practices, managing appointments encompasses the coordination, documentation, and notification processes. In tertiary care, clinical coordinators oversee patient allotment, and students treat patients under faculty guidance. Visits are recorded in registers and case sheets, and appointments are scheduled considering patient and doctor convenience. Reminders are made the day before appointments in the center.

a. Person in charge of appointment scheduling

In teaching tertiary care centers, students schedule appointments themselves, which a clinical coordinator further manages. Receptionists or nursing staff don't have a role in scheduling and managing missed appointments.

"In our institution, most of the appointments are managed by the students themselves, and a coordinator in the clinic is often checking

them"- Dental Health Professional Female 4.

b. Recording of appointments

In educational institutions, patient details, appointment date/time, and student/doctor allotment are recorded in a register and personal diaries.

"In a book, if a patient is not coming, we will record in the department register." – Dental Health Professional Male 1.

c. Factors considered while scheduling appointments

The tertiary care center considers patient and doctor convenience to reduce missed appointments. Specific procedures require appointments to be scheduled according to patient preference. In the current setting, appointments are scheduled before patient preference for demo procedures. Medical conditions are also considered when scheduling appointments.

"An appointment should be to the convenience of both the patient as well the doctor" – Dental Health Professional Male 2.

**Theme 2: Missed appointment experience:** Currently, dental health professionals encounter a significant challenge with missed appointments. Missed appointments can occur either by patients or by practitioners. However, the appointments being missed by a practitioner are significantly less. Missing appointments have a significant impact on both the patients and the practitioners.

a. Frequency of missed appointments

Missed appointments are expected in tertiary care teaching settings, primarily due to patients. Doctor unavailability should be reported more as other doctors can take over.

"If the doctor is unavailable when a patient arrives, we can transfer the case to another doctor as we have enough doctors available. Thus, the main issue could be patients not showing up." – Dental Health Professional Male 2.

**Theme 3: Factors responsible for Missed Appointment:** Missed appointments in tertiary care are due to socio-economic, behavioral, treatment, structural, communication, and doctor unavailability factors.

a. Socio-economic factors

Patients cite personal reasons like lack of time and work schedule for missed appointments, while financial difficulties and poor oral health literacy are common reasons reported by dental professionals.

"It was due to personal issues. I had some commitments, so after finishing that, I didn't get enough time to reach here for the appointment." – Dental Patient Male 1.

"Usually, the main thing, besides their personal issues, is the lack of proper oral health literacy." - Dental Health Professional Male 5.

b. Behavioral factors

Fear, anxiety, perception of necessity, and attitude toward treatment affect dental appointment-keeping behavior. Patients prioritize aesthetically concerned treatments.

"Due to fear. As students are doing the treatment, we are scared about how the treatment goes."- Dental Patient Female 2.

c. Treatment implications for missing dental appointments.

Patients seek dental treatment to alleviate pain and may miss appointments once pain is relieved. Professionals stress the need to educate patients on the importance of multiple sittings and follow-up appointments.

"Most of the time when pain is relieved, they don't turn up for next

appointments; in that case, patient educational videos, etc., will educate them.”-Dental Health Professional Male 5.

#### d. Structural factors

In educational institutions, appointment scheduling by students under doctor guidance may lead to a lack of direct patient-doctor communication, causing fear or ignorance that affects appointment keeping. This and the perception of greater flexibility in dental college systems results in higher missed appointment rates. Structural factors like lack of transportation and distance to clinics affect rural areas. Other factors include unaddressed complaints, traffic, and lack of dental insurance in India.

“Distance to the clinic was the problem which made me miss the appointment”- Dental Patient Female 5.

#### e. Lack of communications

Lack of communication and failure to convince patients about the necessity of their treatment are major reasons for missed dental appointments.

“Missed appointments may result from poor patient-doctor communication, which can be especially troublesome in an institutional setting.”-Dental Health Professional male 2.

#### f. Unavailability of doctors

The unavailability of doctors can result in missed dental appointments. In educational institutions like dental colleges, the chances of missed appointments due to the unavailability of doctors are less, as there will always be other doctors available to take over in the absence of one.

“Prosthodontists typically prioritize patient attendance, making it unlikely for them to miss appointments. If patients do miss appointments, it’s usually due to the doctor’s unavailability.”- Dental Health Professional Male 4.

**Theme 4: Consequences of missed appointments:** Missed appointments have consequences on patients, practitioners, clinic operations, and disease progression. Clinic operations can be disrupted, causing a ripple effect on other appointments, and disease progression can worsen without timely treatment. Rescheduling missed appointments can also affect treatment time, resources, and workflow, leading to increased duration of treatment and further procedures.

#### a. Patient inconvenience

Patient inconvenience is an essential factor that occurs because of missed appointments. When the patient misses an appointment, we need to reschedule the appointment, which can affect appointment timing given to other patients. This can affect treatment time, resources, and workflow, causing inconvenience to doctors, other patients, and supporting staff.

“As a patient, missing my allotted appointment time would inconvenience others who are waiting to see the doctor and disrupt their schedules.”- Dental Patient Male 1.

#### b. Practitioner inconvenience

When the patient misses an appointment, scheduling will be affected. The practitioner might need to compromise to include that patient for further appointments, which can affect the treatment.

“After we give appointments and if the patient misses the appointment, our entire schedule will be affected, like we will not be able to meet up with the schedule”- Dental Health Professional Male 4.

#### c. Clinic operation

Missed appointments can significantly impact clinical practice. The need to reschedule a missed appointment can affect appointments in later days and cause financial loss. In orthodontics, a missed appointment can lead to malocclusion and require additional time and money to correct. Additionally, missed appointments can disrupt the scheduling of further treatment procedures, causing difficulty in rescheduling.

“We have to reschedule the other appointment because we have created a time slot for that particular patient for particular treatment”-Dental Health Professional Male 1.

#### d. Disease progression

Missed appointments can increase treatment duration and worsen dental conditions. Delaying treatment can lead to complex procedures. Mild dental issues like restoration or scaling can worsen if not treated promptly. Practitioners plan the treatment based on a two or four week duration, and if the patient misses an appointment, there can be a sudden progression of the disease.

“Depending on the aggressiveness of the disease progression, so if they miss their appointment, when they get back, there may be a sudden progression of the disease.” - Dental Health Professional Female 7.

**Theme 5: Managing missed appointments:** Missed dental appointments are managed by rescheduling in a tertiary care setting. The time slot can be allotted to a patient needing emergency care. The missed appointments are easily overlooked as there is always availability of doctors, undergraduates, and postgraduates who could take up procedures in the absence of another doctor.

#### a. Re-scheduling

Rescheduling appointments is necessary when either the patient or the doctor is unavailable. This can be challenging as it affects other patients’ schedules, and not all doctors are available every day. The decision to reschedule is based on the urgency of the required treatment. If it’s not an emergency, the appointment can be postponed later. When patients cancel, their time slot may be given to someone needing emergency care.

“Rescheduling is pretty tiresome as it involves other patients and doctor’s schedules, and everything needs to be managed”-Dental Health Professional Female 2.

#### b. Treatment by another doctor

Managing missed appointments in a tertiary care setup is more manageable, as even if one doctor is unavailable, other doctors can take up the procedure, ensuring continuity of care.

“Even if the patient comes in and the doctor is not available, we have enough doctors here where we can shift or transfer the case.” – Dental Health Professional Male 2.

**Theme 6: Preventing missed appointments:** Preventing missed appointments requires behavioral and structural changes in patients and institutions. Fixing convenient appointment times, educating patients about disease progression, and emphasizing the importance of timely intervention can help. Additionally, patients requiring long follow-up treatment, such as orthodontics, need motivation to attend appointments. The nature of the treatment procedures should also be considered when scheduling appointments.

#### a. Patient convenience

Patient convenience should be considered during scheduling. Adequate time for lengthy procedures and minimum appointments for anxious patients is essential.

“We must consider the patient’s family and work obligations, and some procedures may be time-consuming, so their convenience should be a priority.”- Dental Health Professional Male 1.

#### b. Reminders

In tertiary care center, appointment reminders can be given through calls, messages or SMS. Automated patient engagement platforms can also be used for reminders. The institution provides appointment cards with the date and time mentioned on it.

“We try to call them a day before surgery to confirm whether they are willing to come.” -Dental Health Professional Male 3.

#### c. Practitioner convenience

While rescheduling an appointment, practitioner convenience should be checked. The practitioner can convince the patient that it is convenient for both the patient and the doctor.

“If we are rescheduling our appointment, we can do so according to the doctor.” - Dental Patient Female 1.

#### d. Patient Education

Educating patients about the treatment and its consequences is essential to ensure that appointments are met. Patients may not return after their pain is relieved, so doctors must explain the nature of the treatment and the need for follow-up, especially in cases of multiple treatments like root canal treatment. For lengthy procedures like orthodontic treatment, patient education is crucial.

“Most of the time when pain is relieved, they don't turn up for next appointments. In that case, patient educational videos will educate them”. – Dental Health Professional Male 5.

#### e. Treatment considerations

Appointment scheduling should prioritize patients with medical emergencies and those with medical conditions such as hypertension or diabetes. Patients should be informed about the number of appointments required and the time needed for lengthy procedures. It is also essential to split lengthy procedures into comfortable appointments for the patient.

“I instill in my patient that you should not miss the appointment next time because it's a lengthy procedure or a split appointment.” – Dental Health Professional Male 2.

#### f. Patient motivation

Patient motivation is essential to reduce missed appointments. For long-term treatment procedures like orthodontic treatment, it is crucial that the patient is internally motivated; otherwise, they might miss the appointments, which will affect the treatment.

“Orthodontic treatment is lengthy and requires patient motivation. Unmotivated patients may miss appointments, while internally motivated patients are more likely to adhere to the treatment plan.”-Dental Health Professional Female 3.

### 4.3. Meta inferences

Majority of the findings from the quantitative data agreed with qualitative data. The higher number of missed appointments for dental treatments which needs multiple sittings can be explained by the qualitative finding of lack of patient motivation as the underlying reason. Even though care was taken by the dental professionals in scheduling appointments for patients with systemic diseases as revealed in qualitative findings, personal/health issues were reported to be the main cause of missed appointments. This discordance needs to be explored by further research. Lack of transportation was reported in both the arms thereby confirming the accessibility issue. Inability to understand the doctors' instructions, reported in the quantitative findings can be explained by the poor communication in the tertiary care settings, which

indicates a health system issue.

## 5. Discussion

This study investigated missed appointments in a dental hospital with five clinics staffed by third and final-year students. Similar appointment systems were found in studies by Sachdeo et al. and Tiech et al. at Tufts University School of Dental Medicine (TUSDM) and Case Western Reserve University School of Dental Medicine (SODM), respectively. TUSDM and SODM grouped students, supervised them with specialty professionals, and managed schedules with patient care coordinators or coordinators, like our system, apart from our system where the care was given entirely within the clinics. TUSDM partnered with community providers for patient care.<sup>11</sup> The SODM also implemented a no-show policy where patients would be ineligible for further treatment after three missed appointments, reducing no-show rates.<sup>12</sup>

Previous studies have extensively documented the prevalence of missed dental appointments across various age groups. Among the pediatric population, studies have reported a range of prevalence from 6.7 % to 52 %, <sup>2,13–17</sup> while among adolescents, young adults, and adults, the reported prevalence varied from 17.34 % to 79.1 %<sup>3,18,19</sup> and 1 %–58 % respectively.<sup>6,10,20–22</sup> However, the present study observed a different trend, noting lower rates of missed appointments among adolescents, young adults, and adults. We found no missed appointments among pediatric dentistry patients, possibly due to reduced emphasis on milk teeth care and fewer patient visits during the pandemic.<sup>23</sup>

Using focus groups and interviews with patients and dental health professionals, we identified factors affecting appointment-keeping behavior. According to the present study, the most common socioeconomic factors were lack of time and busy schedules, which are consistent with previous studies.<sup>1,14,19,21,24–26</sup> Dental health professionals also noted financial difficulties<sup>4,6,20,22,25</sup> and poor oral health literacy<sup>6,27–29</sup> as factors, along with the distance to the clinic.<sup>4,21,30</sup> Our study also found that multiple appointments contribute to missed appointments. Some behavioral factors explored, including fear and anxiety, were commonly reported in previous studies.<sup>4–6,9,15,22,25</sup> Patients' perception that regular dental treatment was unnecessary also played a role.<sup>4,25,31,32</sup> Some studies identified a lack of trust in the dental healthcare system,<sup>26,33</sup> but our results showed that all interviewed patients were confident in the dental health professionals. Patient attitude towards their need for dental treatment was also identified as a factor, with dental health professionals noting that patients were more likely to attend appointments for treatments that were aesthetically concerned.

Our study found that treatment implications can also affect appointment-keeping behavior. Dental health professionals stated that patients tend to miss appointments once they feel relieved from pain. According to the dental health professionals we interviewed, educating patients about the importance of multiple appointments is necessary.<sup>21</sup>

Structural factors affecting appointment-keeping behavior were also identified in our study. Contrary to previous literature, lack of communication with receptionists<sup>15,30</sup> was not a significant factor in missed appointments. However, some dental health professionals noted that patients may hesitate to communicate directly with doctors, especially in private clinics.<sup>4,27,33</sup> The flexibility of appointment scheduling was identified as a factor in educational institutions, where alternative care providers are available, and appointments can be rescheduled faster. Another factor was transportation, which was consistent with previous literature results.<sup>4,21,30</sup> As the center of our study is in the city, we could also identify traffic blocks as one of the other reasons why patients miss their appointments.

Fernandez et al. found that dental students who treated patients under a doctor's supervision cancelled appointments frequently.<sup>33</sup> Still, our study contradicts this and found patients satisfied with this system. The unavailability of doctors may result in missed appointments, but this scenario is rare in educational and private clinics, as other doctors are always available to manage the situation.



Missed appointments can be managed through rescheduling or providing treatment by another doctor. Rescheduling is preferred in tertiary care centers when another doctor is unavailable, considering the availability of both the doctor and the patient. In a study conducted by Kirby and Harris, it was found that in children and young people, three-quarters of missed appointments were rebooked within three weeks after communication with parents.<sup>17</sup>

Missed appointments pose challenges for patients and healthcare providers. Current appointment management systems involve providing patients with appointment cards that include the date and time of the appointment, followed by a reminder call the day prior to the scheduled date. This helps patients remember their appointments and may reduce the number of missed appointments. A study by Nelson et al. evaluated the effectiveness of a reminder messaging system for pediatric dental patients. Patients were divided into two groups, with one group receiving SMS reminders and the other receiving voice messages. The study found that voice messages were more effective in reducing no-show attendance (8.2 %) than SMS reminders (17.7 %).<sup>34</sup> In another study by Fernandez et al., lack of SMS reminders was found to contribute to missed appointments. The study also showed that better communication with receptionists and reminder calls were effective in reducing missed appointments.<sup>33</sup>

Charging patients for missed appointments is effective in reducing no-shows in dental care. Ismail et al. conducted a study in the U.A.E. where 44.5 % of surveyed patients thought it was fair to be charged for missed dental appointments, resulting in a lower missed appointment rate of 11.8 %. However, patients who felt it was unfair to charge had a higher missed appointment rate of 22.1 %.<sup>6</sup> This suggests that charging for missed appointments could deter patients who may otherwise not take the appointments seriously.

The study's strength lies in its mixed-methodology approach, allowing a comprehensive exploration of the prevalence of missed appointments and the underlying factors affecting patient behavior. Analyzing six months of quantitative data provided a solid foundation for understanding missed appointment patterns, ensuring findings aligned with participant experiences. However, notable limitations include social desirability bias among patients, impacting their willingness to share feelings candidly, and challenges in tracking missed appointments across multiple visits. Additionally, the study's focus on an urban tertiary care hospital may limit the representation of rural population perspectives. The reduced pediatric dentistry patient count during the pandemic, without recorded missed appointments, also stands as a limitation, possibly understating the true prevalence due to the reduced patient inflow.

## 6. Conclusion

A mixed-method study found that 8.4 % of dental appointments were missed in a tertiary care center. Patient education was negatively correlated with appointment keeping, and the number of sittings required for dental treatment influenced attendance, with patient motivation playing a significant role. Orthodontic procedures requiring multiple sittings had a high prevalence of missed appointments. Personal/health issues were the most commonly reported reason for missed appointments, followed by accessibility, economic, behavior, health system, and communication barriers. Qualitative findings confirmed the quantitative data and identified emergent themes related to missed appointments, such as appointment systems, consequences, and management. Further research is needed to implement interventions based on these findings.

## Declaration of competing interest

The authors declare no conflict of interest.

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