

Demographic and Behavioral Analysis of Patients' Management of Dental Abscesses and Assessment of Their Awareness: An Analytical Cross-Sectional Study in Damascus, Syria Running Title: Dental Abscesses Care-Seeking in Syria

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Abstract

Background

Dental abscesses represent a common emergency condition that can lead to life-threatening complications if untreated. This study assessed health-seeking behavior and factors associated with delayed treatment among dental abscess patients in Damascus, Syria.

Methods

An analytical cross-sectional study following STROBE guideline was conducted in Damascus and its countryside between November 14 and December 27, 2025, including 500 patients had a dental abscess, consecutively selected from 1572 clinic attendees. Data were collected using a pilot-tested structured questionnaire on demographic, infection history, treatment behavior, and information sources. bivariate Chi-square tests and multivariable binary logistic regression identified independent predictors of dentist visitation, adjusting for demographic confounders. Statistical significance was set at $p < 0.05$.

Results

59.2% of participants didn't visit a dentist during their last infection, citing belief in spontaneous resolution (33.6%), fear of treatment (32.8%), and financial constraints (29%). 52% believed antibiotics alone are sufficient in treating the abscess, and 71.6% relied on family and friends as their primary source of information. Painkillers were the first action for 34.2%, while 62.2% used complementary home remedies. Educational level was significantly associated with dentist visitation and remained the only independent predictor after adjusting for age, gender, marital status, employment, and residence (adjusted OR = 1.58 per educational category, 95% CI: 1.28–1.95, $p < 0.001$). Although 96% preferred medical treatment and 77.8% wanted health education, 94% delayed treatment until pain worsened, and 49.8% developed complications. A composite knowledge/attitude score showed low reliability (Cronbach's $\alpha = 0.39$); items were therefore analyzed individually rather than a combined scale.

Conclusion

The study revealed a gap between awareness and actual behavior, with widespread misconceptions and unsafe self-treatment practices. Educational level was the strongest independent correlate of appropriate health behavior. These findings highlight the need for intervention targeting cognitive, psychological, and financial barriers and support a greater role for dentists as trusted health information sources.

Trial registration

1. Introduction

Dental abscesses pose a multifaceted global public health challenge, combining severe clinical risks with complex social and socioeconomic barriers. Epidemiologically, the lifetime prevalence of this condition varies widely, spanning from 5% to 46% across different populations, with significantly lower healthcare utilization and higher complications rates documented in low- and middle-income countries [1, 2]. Clinically, untreated localized infection can progress into life-threatening complications, including deep neck cellulitis, sepsis, and bacterial endocarditis, particularly among older patients or those with compromised immunity [3]. According to World Health Organization data, oral diseases affect approximately 3.5 billion people globally, with marked disparities in disease burden distribution between developed and developing regions, where the highest prevalence is concentrated in communities with limited resources and fragile healthcare systems [4]. The Arab and middle eastern context reflects this global disparity, as limited studies have revealed concerning patterns in the management of dental abscesses, highlighting a complex interplay of cultural, social, and economic factors. In a Saudi study involving 1004 patients, the prevalence of self-medication reached 63.25%, with 17.79% relying on antibiotics without prescription [5]. Similarly, in Egypt, the rate of antibiotics use without prescription for oral conditions was 19.4% [6]. This scarcity of dedicated evidence is not unique to the Arab world, cross-sectional studies of dental abscess patients in Ghana have similarly noted that, despite the substantial burden of the condition, health-seeking behavior specific to dental abscesses had received little targeted research attention, with most affected individuals relying on symptom-driven, delayed care-seeking and alternative treatment rather than prompt professional intervention [7, 8]. Collectively, these findings indicate the presence of a complex network of factors influencing health behavior in the region; however, a detailed understanding of these dynamics, particularly in crisis-affected situations, remains restricted. The Syrian context presents one of the most prominent examples of such fragile environments, offering a model for investigating healthcare behaviors during protracted crisis. After more than a decade of armed conflict, the Syrian healthcare sector faces severe shortage of qualified healthcare personnel, extensive deterioration of infrastructure, and dramatic increases in treatment costs that have rendered healthcare access unaffordable for large segments of the population [9]. In these fragile settings, understanding patient behavioral patterns toward emergency conditions such as dental abscesses is crucial for developing local response strategies aligned with the resilience models demonstrated by the Syrian healthcare sector despite infrastructure destruction and workforce displacement [10]. The significance of this study is further reinforced by the demographic characteristics of Damascus Governorate and its countryside, which together include 2.5 million inhabitants demonstrating diverse social and economic background with a notable proportion residing in rural areas suffering from chronic shortages of specialized healthcare services. In these areas, private dental clinics are often the only available treatment option, with costs exceeding the financial capacity of many individuals in the absence of comprehensive dental insurance coverage. Despite the need for such investigations, the scientific literature concerning patient behavior toward dental abscesses in crisis-affected environments

remains limited. Most existing studies primarily focus on clinical aspects and pharmacological protocols for acute pain management, as reflected in recent clinical guidelines [11], or are conducted in stable healthcare settings that do not adequately represent the realities of vulnerable communities. Furthermore, available regional studies on healthcare communication within the Arab world show a marked deficiency in research output, with Arab contributions accounting for a small fraction of global biomedical research production, alongside limited field data from countries experiencing prolonged crisis such as Syria [12]. The knowledge gap raises important questions: How do individuals make treatment decisions under condition of uncertainty and resource scarcity? What are the primary factors shaping health behavior when conventional healthcare systems are disrupted? And how do cultural beliefs interact with financial and psychological barriers to influence treatment delay?

To the best authors' knowledge this is the first study in a crisis-affected setting to utilize multivariable logistic regression analysis to identify independent demographic determinants of patient health-seeking behavior during acute odontogenic infections, thereby providing a robust evidence base for targeted public health interventions. Therefore, the current study aims to achieve a comprehensive analytical understanding of the factors associated with patient behavior toward dental abscesses within the existing Syrian context. Explicitly, the study seeks to: 1- analyze the demographic, social, and economic characteristics of patients with dental abscesses; 2- examine the trajectory of treatment delay and identify multi-level barriers, including financial, psychological, and cognitive factors; 3- assess the level of health awareness and common practices related to abscess management, including self-treatment and complementary home remedies; and 4- identify the demographic and social indicators most strongly associated with appropriate health behavior. Through this analysis, the study aims to provide evidence that may contribute to developing targeted strategies for improving access to suitable dental care in crisis-affected environments and to establish a foundational database for future studies and public health interventions.

2. Methodology

2.1 Study design

The current study adopted an analytical cross-sectional design, appropriate for investigating the prevalence of a phenomenon and analyzing associated factors at a specific point in time. This study was designed and reported in accordance with the STROBE statement for cross-sectional studies; the completed STROBE checklist is provided as Supplementary File S1. The study was conducted in the dental clinics of the Faculty of Dentistry at Al-Sham Private University, located in the Mazraa area of Damascus, Syria, spanning from November 14 to December 27, 2025. The location was selected because of its accessibility to residents of Damascus and its countryside, thereby ensuring a diverse sample representing both urban and rural populations. During the study period, a total of 1572 patients attended the clinics, from whom 500 participants were selected according to the predefined inclusion criteria.

2.2 Study population and sample size

The study targeted all patients attending the clinics who had been clinically diagnosed with a dental abscess. The final sample consisted of 500 participants, enrolled consecutively from 1572 patients attending the clinics during the study period until the pre-calculated target sample size was reached (Fig. 1). Participants represented different age categories ranging from individuals younger than 20 years to those aged 50 years and above, allowing assessment of behaviors across age groups. The sample size was calculated using Cochran's formula for large populations according to the following equation:

$$n = (Z^2 \times p \times (1-p)) / e^2$$

Where n = required sample size. Z = standard value corresponding to the confidence level (1.96 for a 95% confidence level); p = expected proportion of the phenomenon in the population (0.5 was used as the most conservative estimate to maximize sample size); e = margin of error (0.045, corresponding to 4.5%).

Applying the formula: $n = (1.96)^2 \times 0.50 \times (1-0.50) / (0.045)^2 = (3.8416 \times 0.25) / 0.002025 = 0.9604 / 0.002025 = 474.27 \approx 475$ participants.

To enhance statistical power and compensate for possible exclusions or incomplete data, the target sample size was increased to 500 participants, which was fully achieved. Participants were recruited using a consecutive convenience sampling method from patients attending the clinics during the study period who fulfilled the inclusion criteria, which included: 1- confirmed clinical diagnosis of a dental abscess, 2- ability to communicate and answer questionnaire items, and 3- willingness to participate in the study. Patients who refused participation or failed to complete the questionnaire were excluded.

2.3 Data collection

A structured questionnaire was specifically designed for this study based on a review of previous literature and similar studies in the field. The questionnaire consisted of 31 items distributed across three main sections. The first section focused on demographic and socioeconomic characteristics, including age group, gender, marital status, educational level, employment status, and the place of residence (Damascus city or its countryside). The second section investigated participants' medical history and behavioral responses to dental abscesses, including previous diagnosis, timing of abscess occurrence, anatomical location, associated symptoms, first action taken after symptom onset, type of treatment received, medication use, complementary home remedies, and reasons for not visiting a dentist. Several items in this section (e.g., reasons for not visiting a dentist, home remedies used) permitted more than one response per participant. The third section assessed knowledge and attitudes related to dental abscesses, including beliefs regarding treatment effectiveness, awareness of warning signs and complications, understanding of the preventive role of regular dental check-ups, sources of

information, attitudes toward medical and traditional treatment, desire for health education, and preferred treatment location. To ensure content validity and suitability of the questionnaire for the local context, the preliminary version was reviewed by three experts specialized in dentistry and scientific research methodology, who evaluated clarity, relevance to study objectives, and potential sources of bias; minor modifications were subsequently made to improve wording clarity and logical sequence. To assess the internal consistency of the knowledge/attitude items, a composite score was formed from five conceptually related binary items (beliefs regarding antibiotic sufficiency and spontaneous resolution of the abscess, reverse-coded; belief in the preventive value of regular dental visits; desire for health education; and preference for professional over traditional treatment). Cronbach's alpha for this five-item composite was low ($\alpha = 0.39$, $n = 479$), falling below the conventional threshold of acceptability ($\alpha \geq 0.60$). Accordingly, each knowledge/attitude item was analyzed and reported individually (Section 3.3) rather than as a combined scale score. A pilot study was then conducted on an independent sample of 30 patients who were not included in the final analysis, aimed at evaluating question comprehensibility, estimating interview duration, and identifying practical difficulties. No major modifications were required following this stage, confirming the suitability of the questionnaire for full-scale implementation.

2.4 Data collection procedure

Data collection followed a standardized protocol to ensure consistency and minimize bias. The research team consisted of a dentist, an academic supervisor at the university, and a fifth-year dental student, all of whom received prior training regarding study objectives, neutral interviewing techniques, and accurate response recording procedures. All interviews were conducted face-to-face in private rooms within the clinics to ensure participant privacy and comfort while minimizing external influence on responses. Each interview lasted approximately 15–20 minutes.

2.5 Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS), version 27. Descriptive statistics, including frequencies and percentages were used to summarize demographic characteristics and questionnaire responses related to behaviors, knowledge, and attitude. Association between categorical variables was assessed using the Chi-square test, including relationships between demographic variables and behavioral patterns, and between health beliefs and actual practices. Statistical significance was set at $p < 0.05$, and Chi-square values with the corresponding degrees of freedom were recorded for each analysis. For items that permitted multiple responses per participant (e.g. reasons for not visiting a dentist, home remedies used), each response option was analyzed descriptively as a separate binary (yes/no) variable, and these items were not entered into standard Pearson Chi-square tests of association, since the independence assumption underlying that test is violated when respondents can select more than one category. Given the number of bivariate comparisons performed (more than ten), results should be interpreted with awareness of the increased risk of Type 1 error from multiple testing. Due to the face-to-face method of data collection, missing data was minimal. Rare missing responses were excluded only from analyses involving the corresponding

variable, to avoid affecting other statistical analyses. All statistical tests were conducted using a significance level of $\alpha = 0.05$. To identify factors independently associated with visiting a dentist while adjusting for potential confounding among demographic variables, a multivariable binary logistic regression model was fitted with dentist visitation (yes/no) as the outcome. Age group and educational level were entered as ordinal trend items, reflecting their inherently ordered categories, alongside gender, marital status, employment status, and place of residence as categorical covariates. Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test, and results are reported as adjusted odds ratios (aOR) with 95% confidence intervals.

3. Results

This study analyzed the responses of 500 patients previously diagnosed with dental abscess in Damascus Governorate and its countryside. The findings are presented according to the main domains of the questionnaire: demographic characteristics, patient behaviors toward dental abscesses, level of health awareness, and statistical relationships between variables.

3.1 Demographic characteristics of the sample:

Participants were unevenly distributed across age groups. The 40-49-year age group represented the largest proportion of the sample (23.8%, $n = 119$), followed by participants aged 50 years and above (22.8%, $n = 114$), and those aged 30–39 years (20.0%, $n = 100$). Participants aged 20–29 years and those younger than 20 years represented 17.8% ($n = 89$) and 15.6% ($n = 78$), respectively. Overall, 66.4% of participants ($n = 332$) were older than 30 years. Females constituted the majority of the sample at 61.4% ($n = 307$), compared with 38.6% ($n = 193$) males. Regarding marital status, most participants were married (71.6%, $n = 358$), while single participants represented 24.6% ($n = 123$), and the other category accounted for 3.8% ($n = 19$). Educational attainment was generally low. Participants whose education did not exceed primary school constituted 60.8% ($n = 304$), including uneducated individuals (7.6%, $n = 38$) and those with primary education (53.2%, $n = 266$). Secondary education accounted for 22.8% ($n = 114$), whereas university degree holders represented 15.4% ($n = 77$), and postgraduate degree holders only 1.0% ($n = 5$). Regarding employment status, 58.0% ($n = 290$) reported being unemployed, while 42.0% ($n = 210$) were employed. Rural residency predominated, with 62.8% ($n = 314$) residing in Rural Damascus compared with 37.2% ($n = 186$) residing in Damascus city.

3.2 Patterns of behavior toward dental abscesses

Nearly all participants (99.6%, $n = 498$) reported having previously been diagnosed with a dental abscess, reflecting the widespread occurrence of the condition within the studied population. Regarding the timing of infection, 45.8% ($n = 229$) experienced an abscess within the previous year, 22.2% ($n = 111$) between one and two years earlier, 13.2% ($n = 66$) between three and five years earlier, and 18.8% ($n = 94$) six or more years earlier. During their most recent abscess episode, 59.2% ($n = 296$) of participants did not visit a dentist, whereas 40.8% ($n = 204$) sought professional dental care. Participants reported multiple reasons for avoiding dental consultation (multiple responses permitted, analyzed descriptively

— see Section 2.6), including believing the abscess would resolve spontaneously (33.6%, n = 168), fear of treatment (32.8%, n = 164), lack of financial resources (29.0%, n = 145), and lack of trust in healthcare providers (4.6%, n = 23). Because participants could select more than one response, the total number of responses exceeded the number of participants, reflecting the overlap of psychological, financial, and cognitive barriers. Regarding anatomical distribution, lower molars represented the most commonly affected teeth (42.8%, n = 214), followed by upper molars (16.4%, n = 82), upper anterior teeth (8.8%, n = 44), upper premolars (8.8%, n = 44), lower premolars (8.4%, n = 42), and lower anterior teeth (1.8%, n = 9). Only 0.4% (n = 2) were unable to recall the abscess location. The most reported symptom combination was pain, swelling, and fever (35.0%, n = 175). Other symptom patterns included pain with swelling and difficulty eating (14.2%, n = 71), pain with swelling and pus discharge (8.4%, n = 42), pain with swelling alone (12.6%, n = 63), and pain alone (7.0%, n = 35). Treatment modalities varied among participants. Tooth extraction was reported by 37.6% (n = 188), root canal treatment by 32.2% (n = 161), while 30.2% (n = 151) reported receiving no treatment. When participants were asked about the first action taken following abscess onset, taking painkillers was the most common response (34.2%, n = 171), followed by taking antibiotics (19.6%, n = 98). Multiple simultaneous actions were reported by 29.8% (n = 149), whereas only 9.0% (n = 45) directly visited a dentist. Furthermore, 4.8% (n = 24) ignored the condition entirely, while 0.8% (n = 4) relied on folk remedies. Medication use was highly prevalent, with 99.0% (n = 495) reporting the use of medications during abscess episodes. Dual-drug use was the most common pattern (69.8%, n = 349), while 8.6% (n = 43) reported using three medications simultaneously. Some participants relied exclusively on acetaminophen (paracetamol) (9.4%, n = 47), non-steroidal anti-inflammatory drugs (NSAIDs) (7.2%, n = 36), antibiotics (2.6%, n = 13), spiramycin with metronidazole (2.0%, n = 10), or anti-edema agents (0.4%, n = 2). Complementary home remedies were also commonly used. Mouth rinses were used by 62.2% (n = 311), cloves by 9.6% (n = 48), garlic by 2.2% (n = 11), and smoke by 1.0% (n = 5), while 18.0% (n = 90) relied exclusively on medical treatment.

3.3 Level of health awareness toward dental abscesses

The findings revealed widespread misconceptions regarding dental abscess management. More than half of participants (52%, n = 260) believed that antibiotics alone are sufficient for treating an abscess, while 43.2% (n = 216) disagreed, and 4.8% (n = 24) were uncertain. Additionally, 36.8% (n = 184) believed that a dental abscess could be resolved spontaneously without medical intervention, whereas 63.2% (n = 316) rejected this belief. Most participants reported experiencing early warning signs before abscess development. Swelling or a lump in the jaw or gingival area was reported by 96.2% (n = 481), while 91.2% (n = 456) experienced pain or increased sensitivity before abscess formation. Despite the presence of these warning signs, most participants delayed seeking care. Regarding preventive awareness, 61.8% (n = 309) believed that regular dental visits could prevent dental abscesses, while 38.2% (n = 191) did not share this belief. Family and friends represented the primary source of information for 71.6% (n = 358) of participants, followed by dentists (19.6%, n = 98), social media or the internet (2.6%, n = 13), and pharmacists (2.6%, n = 13). A minority (3.6%, n = 18) reported having no information source. These findings indicate heavy reliance on non-professional information sources. A notable discrepancy emerged between participants' attitudes and actual behaviors. Although 96.0% (n = 480) expressed a

preference for professional dental treatment over traditional remedies, and 77.8% (n = 389) expressed willingness to receive health education, 94.0% (n = 470) admitted delaying treatment until pain became severe. Complications related to dental abscesses were reported by 49.8% (n = 249) of participants. Previous dental experiences influenced current treatment behavior in 50.2% (n = 251) of participants. Regarding adherence to professional recommendations, 70.8% (n = 354) reported strict adherence to dentists' instructions, while 18.2% (n = 91) reported occasional difficulty adhering, and 11.0% (n = 55) admitted inconsistent compliance. Moreover, 74.2% (n = 371) reported feeling comfortable using mouthwashes or herbal remedies for abscess treatment. Regarding preferred treatment settings, 58.8% (n = 294) preferred private clinics, whereas 40.6% (n = 203) preferred public hospitals.

3.4 Relationship between variables:

Chi-square analysis demonstrated several statistically significant associations between demographic and behavioral variables. A statistically significant association was found between educational level and visiting a dentist (χ^2 (4, N = 500) = 29.522, $p < 0.001$), indicating that higher educational attainment was associated with a greater likelihood of seeking professional care. Educational level was also significantly associated with the first action taken after abscess onset (χ^2 (24, N = 500) = 41.314, $p = 0.015$). Additionally, a statistically significant association was observed between age group and the first action taken following abscess onset (χ^2 (24, N = 500) = 45.364, $p = 0.005$), suggesting age-related differences in initial treatment behavior. It should be noted that 13 of these 25 cells (37.1%) had an expected count below 5 for the age–first action analysis, and 18 of 35 cells (51.4%) for the educational-first action analysis; the sparse expected counts in these larger contingency tables (7 first-action categories) mean the Chi-square approximation is less reliable here, and these two associations should be interpreted with caution. In contrast, age was not significantly associated with visiting a dentist (χ^2 (4, N = 500) = 2.827, $p = 0.587$). Similarly, gender showed no statistically significant association with visiting a dentist (χ^2 (1, N = 500) = 0.786, $p = 0.375$) or with the first action taken (χ^2 (6, N = 500) = 6.692, $p = 0.350$). Marital status (χ^2 (2, N = 500) = 0.174, $p = 0.917$), employment status (χ^2 (1, N = 500) = 0.096, $p = 0.757$), and place of residence (χ^2 (1, N = 500) = 0.044, $p = 0.834$) also showed no statistically significant relationship with dental consultation behavior. Regarding medication use patterns, no statistically significant relationships were observed between age and type of medications used (χ^2 (24, N = 500) = 28.623, $p = 0.235$), gender and medication type (χ^2 (6, N = 500) = 7.598, $p = 0.269$), or educational level and medication type (χ^2 (24, N = 500) = 32.866, $p = 0.107$). Likewise, the desire to receive health education showed no statistically significant relationship with age (χ^2 (4, N = 500) = 4.350, $p = 0.361$), gender (χ^2 (1, N = 500) = 1.298, $p = 0.255$), or educational level (χ^2 (4, N = 500) = 4.977, $p = 0.290$), indicating widespread interest in health education across all demographic categories. Finally, gender showed no statistically significant relationship with adherence to dentists' recommendations (χ^2 (2, N = 500) = 0.895, $p = 0.639$), and employment status also revealed no statistically significant relationship with adherence behavior (χ^2 (2, N = 500) = 4.532, $p = 0.104$). Table 1 summarizes all 17 bivariate Chi-square analyses performed in this study, including test statistics, degree of freedom, and p-values, to provide full transparency regarding the pattern of statistically significant and non-significant associations.

Table 1
Chi-square analyses including test statistics, degrees of freedom, and p-values

Variable 1	Variable 2	χ^2	df	p-value
Educational level	Visiting a dentist	29.522	4	< 0.001*
Educational level	First action taken	41.314	24	0.015*
Age group	First action taken	45.364	24	0.005*
Age group	Visiting a dentist	2.827	4	0.587
Gender	Visiting a dentist	0.786	1	0.375
Gender	First action taken	6.692	6	0.350
Marital status	Visiting a dentist	0.174	2	0.917
Employment status	Visiting a dentist	0.096	1	0.757
Place of residence	Visiting a dentist	0.044	1	0.834
Age group	Medication type used	28.623	24	0.235
Gender	Medication type used	7.598	6	0.269
Educational level	Medication type used	32.866	24	0.107
Age group	Desire for health education	4.350	4	0.361
Gender	Desire for health education	1.298	1	0.255
Educational level	Desire for health education	4.977	4	0.290
Gender	Adherence to recommendation	0.895	2	0.639
Employment status	Adherence to recommendation	4.532	2	0.104
*Statistically significant at $p < 0.05$				

The multivariable logistic regression model was statistically significant overall (likelihood-ratio χ^2 (6) = 21.34, $p = 0.0016$) and showed good calibration (Hosmer-Lemeshow χ^2 (8) = 5.55, $p = 0.697$), with a modest McFadden pseudo- R^2 of 0.032, indicating that demographic factors alone explain only a limited share of the variability in dentist-visiting behavior. After adjusting for age, gender, marital status, employment status, and place of residence, educational level remained the only variable independently and significantly associated with visiting a dentist (adjusted OR = 1.58 per one-category increase in education, 95% CI: 1.28–1.95, $p < 0.001$). None of the remaining covariates reached statistical significance after adjustments: age (aOR = 1.13, 95% CI: 0.96–1.34, $p = 0.140$), female gender (aOR = 1.15, 95% CI: 0.73–1.81, $p = 0.549$), married status (aOR = 0.75, 95% CI: 0.45–1.23, $p = 0.254$), employment (aOR = 0.88, 95% CI: 0.56–1.39, $p = 0.591$), and rural residence (aOR = 1.04, 95% CI: 0.71–1.54, $p = 0.826$). Table 2 summarizes the full model.

Table 2
Multivariable logistic regression for factors associated with visiting a dentist.

Covariate	aOR	95% CI	p-value
Age group (ordinal, 5 levels)	1.13	0.96–1.34	0.140
Female gender (ref: male)	1.15	0.73–1.81	0.549
Married (ref: not married)	0.75	0.45–1.23	0.254
Educational level (ordinal, 5 levels)	1.58	1.28–1.95	< 0.001*
Employment (ref: unemployed)	0.88	0.56–1.39	0.591
Rural residence (ref: Damascus city)	1.04	0.71–1.54	0.826

*Statistically significant at $p < 0.05$; aOR = adjusted odds ratio; CI = confidence interval.

4. Discussion

4.1 Demographic characteristics: outlining the features of the most vulnerable groups:

The findings revealed a distinct demographic pattern among patients with dental abscesses, characterized by a predominance of females (61.4%), a notable concentration within the 40-49-year age group (23.8%), and a high proportion of residents from Rural Damascus (62.8%). Most importantly, more than half of the participants (53.2%) had not progressed beyond primary education, while unemployment was highly prevalent (58.0%). This clustering of social and economic vulnerability factors suggests that dental abscesses are not merely isolated health conditions but may be indicators of broader social deprivation limiting access to timely preventive and curative dental care [13]. These outcomes are consistent with global evidence demonstrating associations between low educational attainment, reduced income, poor oral health, and increased prevalence of untreated dental diseases [14]. Within the Syrian context specifically, this accumulation of vulnerability factors reflects the ongoing consequences of prolonged conflict, including deterioration of healthcare infrastructure and shortages of specialized healthcare personnel, which further restrict access to dental services for vulnerable populations [15]. Importantly, the cumulative effect of these vulnerabilities may help explain why even obvious symptoms fail to trigger prompt healthcare-seeking behavior, as structural barriers such as limited income and poor health literacy may outweigh the motivating effect of pain itself [16]. This interpretation is consistent with the statistical analysis, which showed a significant association between educational level and visiting a dentist ($p < 0.001$), supporting the relevance of education to health behavior in this population. This association was subsequently confirmed to be independent of other demographic factors through multivariable logistic regression (Section 3.4). This finding confirms, using a method that accounts for potential confounding among demographic variables, that the bivariate association between educational

level and dentist visitation reported earlier (Section 3.4) is not attributable to its overlap with age, gender, marital status, employment, or residence. Notably, the confidence intervals around the adjusted estimate are comparatively narrow (95% CI: 1.28–1.95), in contrast to a similarly designed Ghanaian study of dental abscess patients in which multivariable odds ratios for socio-demographic predictors of anxiety and knowledge carried extremely wide confidence intervals (e.g. aOR = 23.28, 95% CI: 2.71-200.06) [8], a pattern often observed when a multivariable model with numerous categorical predictors is fitted to comparatively small sample (n = 100). The current study's substantially larger sample (n = 500) likely contributed to more stable and precise effect estimates. The independent role of educational level converges with findings from another Ghanaian cross-sectional study of dental abscess patients, which correspondingly reported a statistically significant association between patients' level of education and their likelihood of seeking orthodox dental treatment (p = 0.015), while no other background characteristics, including age, gender, marital status, religion, or occupation, showed a significant association with treatment-seeking behavior [7]. The convergence of this specific finding across two independent samples in different countries lends additional support to educational level as a consistent cross-cultural determinant of dental-care seeking behavior.

4.2 Behavior and treatment practices: from early symptoms to critical delay

The trajectory of patient behavior revealed a gap between recognizing symptoms and seeking appropriate professional care. Although most participants recognized early warning signs such as swelling (96.2%) and pain or increased sensitivity (91.2%), 59.2% did not visit a dentist. Instead, self-management behaviors predominated, including taking painkillers (34.2%), antibiotics (19.6%), or combining multiple self-treatment strategies (29.8%). This pattern is consistent with previous studies indicating that individuals frequently resort to self-medication during episodes of acute dental pain, leading to delayed diagnosis and definitive treatment [17]. Furthermore, the temporal distribution of infections – with 45.8% occurring within the previous year and substantial proportions reported across earlier periods – reflects both persistence and recurrence of the problem, suggesting inadequate long-term management. The reasons for avoiding dental consultation were distributed across three barriers of roughly similar magnitude: incorrect beliefs regarding spontaneous healing (33.6%), fear of treatment (32.8%), and financial limitations (29.0%). This distribution highlights the multidimensional nature of treatment delay, suggesting that the problem cannot be attributed to one factor alone [18]. Anatomically, lower molars represented the most affected teeth (42.8%), followed by upper molars (16.4%), consistent with international evidence showing increased susceptibility of posterior teeth to dental caries and infection [19]. Complementary and traditional practices were also widely reported. More than half of participants (62.2%) used home remedies, including cloves (9.6%) and garlic (2.2%). These practices reflect the cultural dimension of pain management; whereby traditional knowledge is transmitted across generations and may provide temporary symptomatic relief without addressing the underlying source of infection [20]. This proportion is broadly consistent with the study conducted by Boadu et al, in which 54% of participants reported relying on home remedies such as saltwater rinses instead of seeking professional dental care [8], suggesting that self-management of dental abscesses through readily

available household remedies is a recurring pattern across different low-resource settings rather than a phenomenon specific to the Syrian context. Notably, 30.2% of participants reported receiving no treatment whatsoever, reflecting a concerning level of neglect toward potentially serious conditions. Consequently, nearly half of the participants (49.8%) experienced complications related to the abscess, underscoring the potentially severe consequences of delayed or absent treatment [21]. This complication rate should serve as an important signal for healthcare authorities regarding the need for early intervention strategies, particularly given the association between lower educational level and delayed care-seeking behavior observed here.

4.3 Knowledge, awareness, and future Aspirations: from misconceptions to opportunities for change

Analysis of participants' beliefs demonstrated a substantial knowledge gap that may contribute to inappropriate treatment behaviors. More than half of the participants (52.0%) believed that antibiotics alone are sufficient for treating a dental abscess, while 36.8% believed that abscesses may be resolved spontaneously without professional intervention. These misconceptions appear closely linked to the dominant reliance on non-professional information sources. Family and friends represented the primary source of information for 71.6% of participants, whereas only 19.6% obtained information from dentists [22, 23]. Pharmacists represented only 2.6% of information sources, suggesting an underutilized educational role for pharmacists within the healthcare system. Additionally, 3.6% of participants reported having no information regarding dental abscesses at all, highlighting a particularly vulnerable subgroup requiring targeted educational support. Interestingly, 74.2% of participants reported feeling comfortable using mouthwashes or herbal remedies, reflecting openness toward complementary practices that could potentially be incorporated safely within evidence-based healthcare guidance. Furthermore, approximately half of the participants (50.2%) acknowledged that previous dental experiences influence their current treatment behaviors. This finding may partially explain the high prevalence of treatment-related fear (32.8%) and emphasizes the importance of establishing positive dentist–patient relationships. Regarding adherence to professional instructions, most participants (70.8%) reported complete adherence to dentists' recommendations, whereas 18.2% reported occasional difficulty adhering, and 11.0% admitted inconsistent compliance. These findings suggest that most patients are receptive to professional guidance when it is delivered clearly and effectively. Encouragingly, the results also revealed several indicators of readiness for positive behavioral change. Most participants (61.8%) recognized the importance of regular preventive dental visits, while 77.8% expressed an explicit desire to receive health education regarding dental abscesses. Most notably, 96.0% preferred professional medical treatment over traditional remedies, reflecting substantial confidence in formal healthcare systems [24]. Regarding preferred treatment settings, 58.8% favored private clinics compared with 40.6% preferred public hospitals. This distribution may reflect differing expectations regarding service quality, privacy, and waiting times, particularly within the context of the significant challenges currently facing public hospitals in Syria. Collectively, these findings portray a patient population characterized by limited health knowledge but simultaneously receptive to education, trusting of modern medicine, influenced by prior healthcare experiences, and in need of clear therapeutic

guidance. The success of future interventions will likely depend on leveraging this willingness for change through targeted educational programs addressing the specific misconceptions identified in the present study, while simultaneously reducing the financial and psychological barriers that prevent individuals from translating positive attitudes into actual healthcare-seeking behavior [25]. Within the Syrian context, these findings provide a foundation for developing public health interventions tailored to the realities of prolonged crisis and its impact on healthcare systems and patient behavior. These findings also open the door for future interventional studies evaluating the effectiveness of educational strategies targeting the most vulnerable population groups identified in the present research.

4.4 Study limitations

Despite the contribution of this study to understanding health behaviors toward dental abscesses within the Syrian context, several methodological and practical limitations should be considered when interpreting the findings. Methodologically, the cross-sectional design limits the ability to establish causal relationships between variables, as it allows only the identification of associations at a single point in time. In addition, reliance on self-reported data may have introduced potential biases, particularly recall bias, as participants may not accurately remember details of previous experiences, and social desirability bias, whereby some participants may provide responses perceived as socially acceptable, especially regarding personal health practices and treatment behaviors. Regarding the study sample, the geographical focus on Damascus Governorate and its countryside limits the generalizability of the findings to the broader Syrian population, as patterns of awareness, healthcare-seeking behavior, and access to services may differ across governorates with varying demographic and socioeconomic characteristics. Furthermore, the use of convenience sampling rather than probability-based random sampling may reduce the representativeness of the sample. Nevertheless, the relatively diverse distribution of participants across age groups and educational levels partially mitigates this limitation. Additionally, the relatively small size of certain subgroups, particularly participants with postgraduate education, may have reduced the statistical power of subgroup-specific analyses. Concerning the measurement tool, the questionnaire was developed based on previous literature and existing instruments. Its content validity was assessed through expert review and pilot testing; however, internal-consistency testing of the knowledge/attitude items (Section 2.3) yielded a low Cronbach's alpha ($\alpha = 0.39$), indicating that these items should not be interpreted as a single unidimensional scale, and were therefore analyzed and reported individually rather than as a composite score. This represents a genuine limitation of the newly developed instrument: future revisions of the tool should consider whether the knowledge/attitude section can be restructured, or reduced to conceptually narrower sub-domains, to achieve acceptable internal consistency. Moreover, transferring the tool into a different cultural and linguistic context may still involve certain limitations, as some medical concepts may be interpreted differently according to cultural background, potentially affecting the sensitivity of the questionnaire in capturing all dimensions of the phenomenon under investigation. The questionnaire also primarily focused on quantitative assessment and did not explore qualitative dimensions that could have provided deeper insight into the personal and social contexts underlying observed behaviors. From an analytical perspective, although a multivariable logistic regression model (Section 3.4) was used to adjust for

demographic confounding among age, gender, marital status, education, employment, and residence, it did not account for other potential confounders that were not captured by the questionnaire, such as detailed monthly income, type of health insurance coverage, and distance from healthcare facilities. Also, the bivariate Chi-square comparisons reported in Section 3.4 were performed without adjustment for multiple testing, which should be considered when interpreting the reported p-values (see Section 2.6). Finally, it should be acknowledged that the specific data collection period (November 14 to December 27, 2025) may not fully capture potential seasonal variations in dental clinic attendance patterns and healthcare-seeking behavior. Despite these limitations, the present study provides valuable insight into awareness, beliefs, and behaviors related to dental abscesses within the studied population and represents a foundation for future research employing more advanced methodological designs, longitudinal approaches, qualitative exploration, and larger, more representative samples.

5. Conclusion

This study reveals a multidimensional pattern in the management of dental abscesses within the studied Syrian population, characterized by a substantial gap between symptom onset and seeking specialized dental care. More than half of the participants did not visit a dentist during their most recent infection, with reasons distributed almost equally among incorrect beliefs regarding spontaneous healing, psychological fear of dental treatment procedures, and financial barriers limiting access to healthcare services. This triad of barriers suggests that the problem extends beyond a simple lack of information and reflects a complex interaction between cognitive, psychological, and economic factors. The findings also indicate a widespread prevalence of self-treatment practices that are often ineffective. Taking painkillers and antibiotics represented the first response for most participants, while the importance of early professional intervention was largely overlooked. These behaviors appear to be reinforced by misconceptions, particularly the belief that antibiotics alone are sufficient for treating dental abscesses, a belief that runs counter to established medical principles emphasizing the necessity of eliminating the infection source and, when required, performing surgical drainage as a fundamental component of treatment. This pattern of health beliefs is further reinforced by the substantial reliance on family members and friends as the primary source of information, often at the expense of reliable professional healthcare sources. Importantly, 96.2% of participants reported noticing swelling or a lump before deterioration of the condition, and 91.2% experienced pain or increased sensitivity beforehand, indicating the presence of clear early warning signs that were nevertheless not acted upon promptly. Consequently, nearly half of the participants developed complications related to delayed treatment. Statistical analysis identified educational level as the factor most strongly and independently associated with appropriate health behavior. This association held not only in bivariate testing but also in multivariable logistic regression adjusting for age, gender, marital status, employment, and residence (adjusted OR = 1.58 per educational category, 95% CI: 1.28–1.95, $p < 0.001$), confirming that its relationship with dentist visitation is not attributable to overlap with other demographic factors. This finding places education at the center of future interventional strategies and suggests that improving oral health literacy should begin by empowering individuals cognitively and behaviorally. In contrast, traditional demographic variables such

as gender, age, marital status, employment, and place of residence did not show significant independent associations with dentist visitation after adjustment, suggesting that the quality of health awareness transcends demographic classifications alone. The study also revealed a contradiction between participants' positive attitudes and their actual practices. Although the overwhelming majority preferred professional medical treatment and expressed a strong desire to receive health education, most participants admitted delaying treatment until pain became severe. Furthermore, nearly half acknowledged that previous experiences with dentists influence their current treatment behavior. This discrepancy between awareness and practice highlights the limitations of traditional educational approaches alone and emphasizes the need for integrated intervention strategies addressing the multiple roots of the problem. Such strategies should include correcting misconceptions through reliable educational channels, reducing financial barriers that hinder access to dental care, developing mechanisms to alleviate psychological fears associated with dental treatment, and strengthening adherence to professional recommendations after receiving care.

6. Recommendation

First: Targeted Community Awareness Programs. Community-based educational programs should be specifically designed for the most vulnerable groups, particularly rural women and individuals with limited educational attainment. These programs should focus on correcting misconceptions regarding the role of antibiotics and the false belief in spontaneous healing, while emphasizing that elimination of the infection source and surgical drainage, when indicated, constitute the cornerstone of effective treatment [26, 27]. Second: Overcoming Financial and Psychological Barriers. Efforts should focus on improving access to affordable dental treatment through expanding insurance coverage and reducing treatment costs. In parallel, patient-centered clinical approaches should be developed to enhance trust, improve communication, and alleviate fear and anxiety associated with dental procedures [28, 29]. Third: Strengthening Health System Capacities. Healthcare system capacities should be reinforced through the expansion of endodontic services, continuous training of general dental practitioners in emergency management of dental infections, and the establishment of effective referral systems linking primary healthcare facilities with specialized dental centers [30]. Fourth: Integrating Oral Health into Public Health Policies. Oral health should be integrated into broader national public health strategies through collaboration among the healthcare, educational, and social sectors, and dental services should be incorporated into universal health coverage programs to ensure equitable access to essential oral healthcare [5]. Fifth: Promoting Research and Continuous Surveillance. A national surveillance system should be established to monitor the prevalence and outcomes of dental infections, evaluate behavioral trends, and periodically assess the effectiveness of implemented interventions and awareness programs [31].

7. Future research proposals

First: In-Depth Qualitative Studies. Future qualitative studies are recommended to explore the psychological, cultural, and social dimensions underlying delayed treatment-seeking behavior among

patients with dental abscesses [32]. Second: Interventional Studies. Interventional research using quasi-experimental designs with control groups and long-term follow-up periods is needed to evaluate the effectiveness of educational and behavioral intervention programs aimed at improving awareness and promoting early dental consultation [33]. Third: Longitudinal Behavioral Studies. Longitudinal studies following patients over periods of 12–24 months are recommended to assess behavioral changes over time, monitor adherence to preventive practices, and evaluate the sustainability of health education outcomes [34]. Fourth: Economic Burden Assessment Studies. Further research should investigate the direct and indirect economic burden associated with dental abscesses, including treatment costs, productivity loss, emergency healthcare utilization, and the broader socioeconomic impact on affected individuals and healthcare systems [35]. Fifth: School-Based Health Literacy Programs. Future studies should evaluate the effectiveness of oral health literacy programs implemented in schools, particularly their role in modifying misconceptions, improving preventive behaviors, and promoting long-term positive attitudes toward oral healthcare among younger populations [36].

Abbreviations

aOR: Adjusted Odds Ratio; CI: Confidence Interval; SD: Standard Deviation; SPSS: Statistical Package for the Social Sciences; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Research Ethics Committee at Al-Sham Private University (Approval No. DD-080626-21) prior to the data collection and was conducted in accordance with the ethical principles of the Declaration of Helsinki. The objectives, risks, and benefits of the study were thoroughly explained to all potential participants, emphasizing that participation was entirely voluntary and that withdrawal was possible at any stage without affecting their ongoing healthcare. For participants younger than 16 years, written informed consent was obtained from a parent or legal guardian, together with assent from the minor participant, prior to enrollment. For participants aged 16 years and above, written informed consent was obtained directly from the participant. All collected data were treated with strict confidentiality; numerical codes were assigned to participants in the electronic database, while paper questionnaires were stored in locked files accessible only to the research team.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analyzed during the current study are publicly available in the figshare repository and can be accessed at <https://doi.org/10.6084/m9.figshare.33339693>

Competing interests

The authors declare that they have no competing interests.

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Authors' Contribution

MSE and KAH contributed to designing the questionnaire and formulating its questions, conducting face-to-face interviews with patients, collecting field data, and writing the first draft of the manuscript. FH and AHA supervised the review and evaluation process of the questionnaire, provided scientific guidance throughout all stages of the research, reviewed the initial draft and made the necessary modifications, continuously followed up on the progress of the research work, and contributed to the final formulation of the manuscript. AHA performed the statistical analysis and interpretation of the data, made the scientific revision.

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Figures

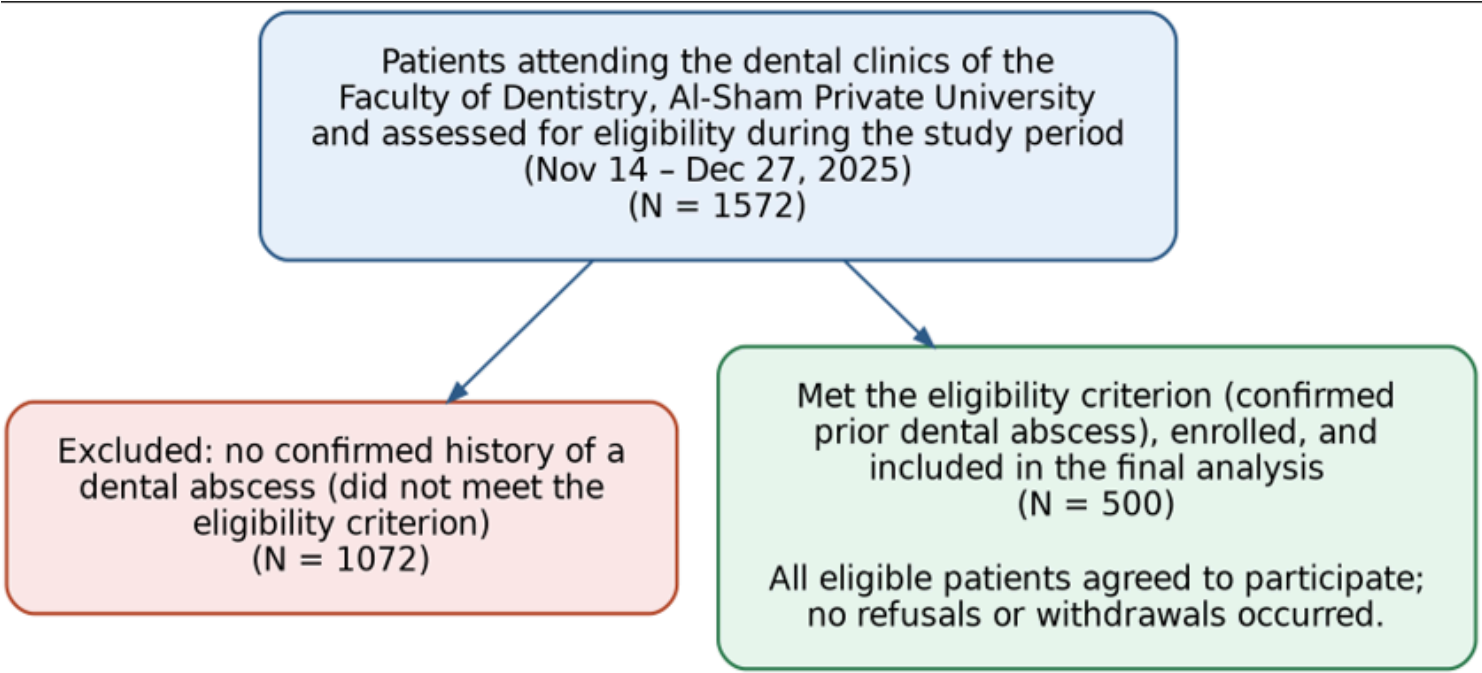


Figure 1

STROBE flow diagram of patient eligibility screening and enrollment.

Supplementary Files

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