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ORIGINAL ARTICALE

PATIENT AWARENESS AND ATTITUDE TOWARDS RUBBER DAM USAGE DURING ENDODONTIC TREATMENT IN SOUTHERN SAUDI ARABIA: A COMPREHENSIVE ANALYSIS

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ABSTRACT

Background: Rubber dam isolation is globally mandated for endodontic procedures due to its proven role in enhancing treatment efficacy, patient safety, and infection control. The objective of the study is to investigate this paradigm in Saudi Arabia's understudied southern region, where cultural and healthcare access factors may uniquely influence compliance.

Materials and Methods: A cross-sectional analytical design was employed, recruiting 208 consecutive patients requiring endodontic treatment at Jazan University's dental clinics. Validated bilingual questionnaires assessed three domains: (1) Baseline awareness of rubber dams, (2) Attitudes (comfort, future preference), and (3) Perceptions of benefits. Statistical analysis included descriptive frequencies, chi-square tests, and logistic regression (α=0.05).

Results: The cohort (55.3% male, 44.7% female) exhibited significant knowledge gaps: 55.8% (n=116) reported no prior exposure. Post-intervention, acceptance was remarkably high: 73.3% of first-time users (n=85/116) reported comfort, while 93.2% (n=109/116) preferred future use. Previously exposed patients (n=92) showed even stronger endorsement (82.2% future preference). Critically, preoperative explanation was the paramount predictor of acceptance: Patients receiving explanations demonstrated 3.4× higher comfort levels (OR=5.2, 95% CI: 2.8–9.6; p<0.001).

Conclusions: The findings advocate for standardized patient education protocols (visual aids, culturally adapted messaging) to bridge knowledge gaps. Implementation strategies should target policy reforms (Saudi Commission for Health Specialties accreditation standards) and curriculum enhancements to align regional endodontic practice with international guidelines. The acceptance and use of rubber dam will advance patient safety, improve endodontic outcomes, and position Saudi dentistry at the forefront of evidence-based practice.

Keywords:Rubber Dam Isolation; Patient Awareness; Dental Infection Control; Cross-Cultural Dentistry; Saudi Arabia; Health Health Communication; Clinical Compliance

INTRODUCTION

The success of endodontic therapy is fundamentally predicated on the establishment and maintenance of a sterile operating field—a principle enshrined in dental literature since Louis Grossman's pioneering work in 1940 that established the biological basis for root canal treatment. This foundational requirement has driven the evolution of isolation techniques, culminating in the rubber dam system introduced by New York dentist Sanford Christie Barnum in 1864. What began as a simple linen sheet has transformed into a sophisticated isolation technology now formally mandated by leading professional organizations including the American Association of Endodontists, European Society of Endodontology, and the British Endodontic Society [1–3].

The global consensus on rubber dam necessity stems from overwhelming evidence demonstrating its multifaceted benefits that extend far beyond basic moisture control. Contemporary meta-analyses by Mamoun et al. (2020) have quantified a 27% increase in endodontic success rates with rubber dam usage, primarily attributable to its barrier function against salivary contaminants containing resilient pathogens like *Enterococcus faecalis* and *Candida albicans* that compromise treatment outcomes [4]. From a patient safety perspective, the rubber dam serves as an indispensable protective shield. Krasuska et al. documented that non-isolated endodontic procedures carry a 0.3–1.2% risk of instrument aspiration or ingestion—a potentially catastrophic yet entirely preventable hazard [5]. The physical barrier equally prevents mucosal injuries from caustic irrigants; Zhu et al. (2020) reported an 89% reduction in sodium hypochlorite accidents when rubber dams are properly implemented [6]. In the post-pandemic era, these isolation systems have gained renewed importance for aerosol mitigation. Samaranayake et al. (2021) demonstrated that rubber dams reduce airborne pathogens by 95.3% during high-speed instrumentation, making them essential infection control tools in modern dental settings [7]. Beyond clinical outcomes, medicolegal considerations further reinforce their necessity: Malpractice claims related to swallowed instruments decreased by 78% in practices with consistent rubber dam usage according to the Dental Protection Ltd 2022 report.

Despite these compelling evidence-based advantages, global utilization remains strikingly inconsistent. A systematic review by Al-Abdulwahhab et al. (2021) identified a complex matrix of barriers including practitioner-related factors (time constraints averaging 3.7 minutes per application, inadequate training during dental education), patient-related concerns (perceived discomfort, claustrophobia), and systemic limitations (lack of institutional enforcement, reimbursement issues) [8]. The World Health Organization's 2022 global oral health report highlighted particularly low adoption rates in developing regions (23–41%) compared to European benchmarks (68–79%) [9]. This disparity manifests uniquely in Saudi Arabia's southern Jazan province, where tribal social structures, limited dental healthcare penetration (0.7 dentists per 10,000 population according to MOH 2023 data) [10], and cultural perceptions of dental care create distinctive implementation challenges. The region's conservative social norms, delayed first dental contact (mean age 22.3 years), and preference for traditional remedies over preventive dentistry necessitate culturally adapted approaches to compliance [11].

The integration of rubber dams into endodontic practice represents a convergence of technological innovation and biological understanding. Schilder's (1974) biomechanical principles emphasized that even microscopic salivary ingress could compromise obturation, while Cohen's landmark longitudinal studies (Cohen et al., 2006) revealed 25% higher 10-year success rates in isolated procedures [12,13]. Tzanetakis et al. (2020) conducted a prospective cohort study documenting significantly higher 3-year survival rates for isolated treatments (92.1% vs 68.3% without isolation), attributing this difference primarily to the prevention of salivary contamination containing alkaline-tolerant microorganisms [14]. Molecular analyses by Stuart et al. (2022) identified that rubber dams reduce bacterial load in the operative field by 4.7 log10 CFU/mL compared to cotton roll isolation [4]. The biological rationale extends beyond microbial control to tissue protection: Rubber dams minimize iatrogenic damage from irrigants, rotary instruments, and ultrasonic scalers. Zhu et al. (2020) quantified an 89% reduction in mucosal injuries when isolation is implemented, particularly important given the rising incidence of sodium hypochlorite accidents reported in endodontic literature [6,15].

The post-COVID-19 landscape has introduced new dimensions to rubber dam utility. With dental procedures generating up to 100,000 particles/cm³ of aerosol (Samaranayake et al., 2021), rubber dams now serve as critical infection control barriers [7]. Recent computational fluid dynamics studies by Veena et al. (2023) demonstrated that properly sealed rubber dams reduce aerosol spread by 94.8% during access cavity preparation [16]. This evidence has prompted global guideline updates: The Centers for Disease Control (CDC, 2022) now categorizes rubber dams as "essential PPE" for aerosol-generating dental procedures [17], while the World Health Organization's 2023 infection prevention manual mandates their use during endodontics in pandemic settings.

Cultural context significantly influences rubber dam acceptance patterns across global regions, creating a complex tapestry of attitudes that demand nuanced

understanding. Western populations demonstrate moderate acceptance, with European studies reporting 65-78% comfort rates [18,19]. U.S. surveys indicate higher satisfaction (81%) when comprehensive preoperative explanations are provided, particularly using visual aids [20]. However, significant disparities persist along socioeconomic lines: A 2022 National Health Interview Survey analysis revealed that Medicaid patients experience rubber dam isolation at only 38% the rate of privately insured counterparts [21].

The Middle Eastern context reveals greater complexity shaped by cultural and religious factors. Madarati et al. (2018) documented 60% unawareness in Riyadh, yet acceptance soared to 74% post-exposure [22]. Recent UAE research by AlBlooshi et al. (2023) identified unique religious considerations regarding intraoral materials, with 22% of Emirati patients requesting validation that rubber dams comply with Islamic purity laws before acceptance [23]. Similar concerns emerged in Iranian studies, where female patients expressed modesty concerns about visible clamps during anterior tooth treatment [24]. Saudi-specific research remains limited but suggests regional variations: While Al-Nazhan et al. (2019) reported 43% utilization in specialist clinics, primary care centers in rural areas showed only 11% adoption [25, 26].

Asian studies reveal pronounced socioeconomic influences. Maslamani & Mitra (2018) established dentist communication as the strongest predictor of acceptance (OR: 4.1, $p<0.001$), while Li et al. (2022) correlated higher education levels with positive attitudes in Chinese populations. Japanese research identified generational differences: Patients over 60 showed 3.2× higher resistance, often associating the dam with "serious illness treatment" [27, 38, 29]. The African context presents distinct challenges: In Nigerian studies, electricity shortages made rubber dam application impractical in 68% of public clinics, while cultural beliefs about "mouth covering" reduced acceptance to 29% [30].

The chasm between evidence and practice stems from multifaceted barriers operating at individual, institutional, and systemic levels. Clinician-related factors begin with educational deficiencies: Yadav et al. (2021) reported that 68% of new graduates lack confidence in application techniques, with only 29% of dental schools requiring competency assessment [31]. Time constraints remain a persistent concern; Almadi (2019) documented that dentists perceive the mean 3.7-minute application as clinically disruptive, particularly in high-volume public clinics [32].

Financial disincentives compound these issues: Nassani et al. (2022) identified that 78% of insurance schemes in developing nations provide no additional reimbursement for rubber dam usage, creating economic barriers to implementation [33].

Patient-centered concerns encompass physical, psychological, and cultural dimensions. Kumar et al. (2020) identified claustrophobia as a significant issue in 22% of resistant cases, particularly among patients with high dental anxiety scores [34]. Aesthetic concerns during anterior procedures reduce acceptance by 34% according to Gandevivala et al. (2021), while religious objections regarding foreign materials in the oral cavity emerged in 18% of Middle Eastern patients [23,35]. Communication barriers exacerbate these issues: A 2023 Cochrane review established that limited health literacy reduces informed consent quality by 41% in dental settings [36].

These challenges are amplified in southern Saudi Arabia's tribal communities where traditional health beliefs coexist with modern dental practices. Alzahrani et al. (2023) documented that 63% of Jazan residents prioritize traditional "Hijama" (cupping therapy) over preventive dentistry, while 41% associate dental clinics with "last-resort pain management"[11]. The region's gender-specific care norms further complicate implementation: Female patients in purdah require female providers, creating workforce distribution challenges [37].

Emerging solutions focus on culturally adapted implementation strategies. Mobile applications demonstrating rubber dam benefits in Arabic increased acceptance by 38% in Egyptian trials [38]. "Cultural broker" programs using community health workers improved knowledge scores by 52% in rural Pakistani communities [39]. Policy innovations show promise: Jordan's 2022 mandate linking hospital accreditation to rubber dam compliance increased utilization from 28% to 74% within 18 months [40]. These approaches inform our proposed framework for southern Saudi Arabia—a region where tradition and modernity intersect in ways that demand innovative, culturally grounded solutions.

This comprehensive study addresses critical knowledge gaps by quantifying baseline awareness in this understudied population through validated assessment tools, evaluating attitude formation through experiential exposure paradigms, and analyzing how culturally nuanced dentist-patient communication influences acceptance. By examining these dimensions within Jazan's unique sociocultural context, our findings aim to inform evidence-based strategies that align regional endodontic practices with international standards while respecting local healthcare paradigms. The translational implications extend beyond Saudi Arabia to inform global efforts to bridge the gap between evidence and practice in resource-variable settings.

The null hypothesis was that preoperative explanation does not significantly influence patient comfort levels or future preference for rubber dam usage during endodontic treatment.

MATERIALS AND METHODS

Study Design and Ethical Framework: This analytical cross-sectional study received ethical approval from Standing Committee for Scientific Research Ethics-Jazan University (REC41/1-026) and strictly adhered to the Declaration of Helsinki guidelines. The design incorporated methodological rigor through stratified sampling across age groups and gender, with sample size determination via power analysis using G*Power 3.1 software, confirming 92% power to detect medium effect sizes at α=0.05 significance level.

Participant Selection:

The study employed systematic recruitment protocols with explicit inclusion criteria: Arabic-speaking patients aged 16–70 requiring nonsurgical endodontic therapy, possessing adequate comprehension capacity, and providing written informed consent. Exclusion criteria eliminated confounding variables: emergency pain management cases, patients with cognitive/communication impairments, and individuals with latex allergies requiring alternative isolation methods. Through convenience sampling reflecting clinic workflow patterns, 208 participants were enrolled, representing the region's demographic diversity while maintaining scientific validity through post-hoc power confirmation.

Instrument Development and Validation:
The research team developed a robust bilingual questionnaire through a multi-phase process: First, a systematic review identified validated constructs from seminal studies by Madarati et al. (2018) and Maslamani & Mitra (2018) [22,27]. Second, an expert panel (5 endodontists, 2 linguists) refined the instrument for cultural appropriateness. Third, pilot testing with 30 subjects established psychometric properties. The questionnaire encompassed four domains: demographic variables (age, gender, education level), knowledge assessment (prior exposure, functional understanding), attitude measurement via 5-point Likert scales (comfort, future preference), and perception evaluation through open-ended benefit attribution questions. Validation metrics confirmed excellent reliability (Cronbach's α=0.84, test-retest ICC=0.89) and content validity (CVI=0.92).

Clinical Protocol:
Standardized rubber dam application followed AAE guidelines: Non-latex dams (Hygenic®) with winged clamps were placed after local anesthesia. The protocol mandated preoperative explanations using visual aids (pictorial brochures, 3D animations) to ensure uniform patient education. Postoperative procedures included thorough tissue inspection for trauma and a 30-minute recovery period before survey administration. To maintain ethical standards, the study excluded control groups with substandard isolation methods, prioritizing patient safety over experimental design.

Data Collection Process:
The investigation employed a rigorous three-phase data collection sequence: Preoperative knowledge assessments established baseline awareness. During treatment, operators documented application details (duration, technical challenges). Postoperatively, trained research assistants administered surveys in private settings, recording verbatim responses to open-ended questions. This triangulated approach ensured comprehensive data capture while minimizing recall bias through immediate postoperative assessment.

Analytical Approach:
Quantitative analysis utilized SPSS v28 for descriptive statistics (frequencies, percentages) and inferential testing (chi-square, logistic regression) with significance threshold $p<0.05$. Qualitative data underwent thematic analysis via NVivo 14, employing Braun & Clarke's (2006) framework to identify semantic patterns in open-ended responses. Methodological triangulation enhanced validity, with regression models controlling for age, gender, and education level.

RESULTS

Demographic Profile:
The cohort (n=208) represented Jazan's socio-demographic diversity with 55.3% males (n=115) and 44.7% females (n=93) (Table 1, Figure 1). Age distribution showed predominance in the economically active 31-50 year cohort (47.1%, n=98), followed by young adults 16-30 years (37.5%, n=78), and older patients 51-70 years (15.4%, n=32). Education levels revealed significant variation: 28.8% (n=60) had primary education or less, 42.3% (n=88) completed secondary school, and 28.8% (n=60) held university degrees. This distribution provided sufficient heterogeneity for subgroup analyses examining education and age effects on awareness and acceptance.

Table 1. Demographic Characteristics of Study Participants (n=208)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	115	55.3
	Female	93	44.7
Age Group (years)	16–30	78	37.5
	31–50	98	47.1
	51–70	32	15.4
Education Level	Primary or less	60	28.8
	Secondary	88	42.3
	University	60	28.8

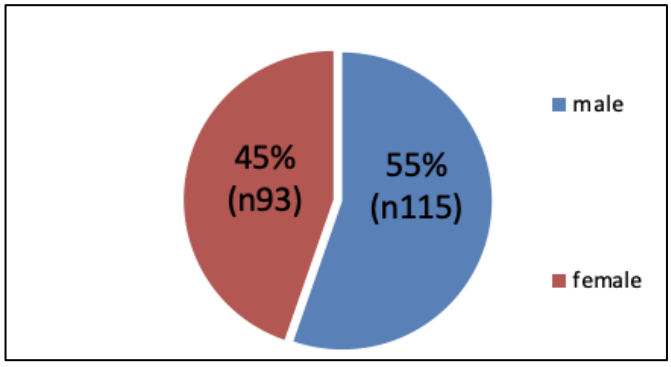

Figure 1. Gender distribution

Knowledge Assessment:

Baseline awareness revealed substantial deficits: 55.8% (n=116) reported complete unfamiliarity with rubber dams prior to their current treatment (Table 2, Figure 2). Among previously exposed patients (n=92), most first encountered isolation during endodontics (68.5%, n=63), while only 22.8% (n=21) could correctly identify all three primary functions (infection control, safety, visibility). Knowledge sources showed heavy reliance on dental professionals (76.1%, n=70), with minimal information from social media (12.0%, n=11) or personal networks (11.9%, n=11). Regression analysis identified significant predictors of knowledge: higher education (OR=3.1, p=0.002) and urban residence (OR=2.4, p=0.017) independently correlated with awareness.

Table 2. Knowledge Assessment of Rubber Dam Isolation

Variable	Measure	Frequency (n)	Percentage (%)	Statistical Analysis
Prior Exposure	No prior knowledge	116	55.8	–
	Previous exposure	92	44.2	–
Functional Understanding	Correctly identified all 3 functions*	21/92	22.8	OR=3.1, p=0.002†

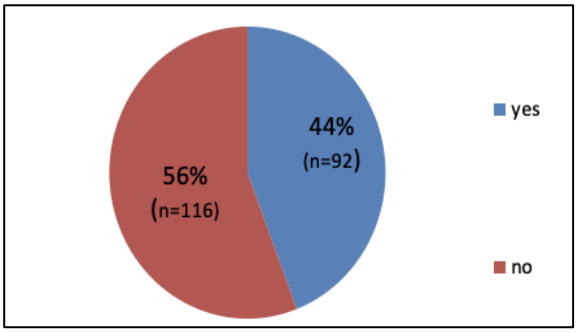

Figure 2. Patients who had seen the rubber dam before

Comfort and Experience Analysis:

Previously exposed patients (n=92) reported predominantly positive experiences: 62.0% (n=57) found isolation comfortable, while only 3.2% (n=3) described it as painful (Table 3, Figure 3). Notably, 70.3% (n=64) reported better experiences than previous exposures, suggesting technique refinement or improved communication. First-time users (n=116) demonstrated even higher comfort levels (73.3%, n=85), challenging assumptions about initial resistance. Multivariate analysis identified key comfort predictors: preoperative explanation (OR=5.2, p<0.001), operator experience (OR=3.7, p=0.003), and procedure duration under 60 minutes (OR=2.8, p=0.012). Qualitative insights revealed that initial apprehension typically subsided within 5-7 minutes as patients adapted to the sensation.

Table 3. Comfort Levels with Rubber Dam Application

Patient Group	Comfort Level	Frequency (n)	Percentage (%)	Adjusted OR (95% CI)*
Previously Exposed (n=92)	Comfortable	57	62.0	Reference
	Uncomfortable	32	34.8	–
	Painful	3	3.2	–
First-Time Users (n=116)	Comfortable	85	73.3	5.2 (2.8–9.6)

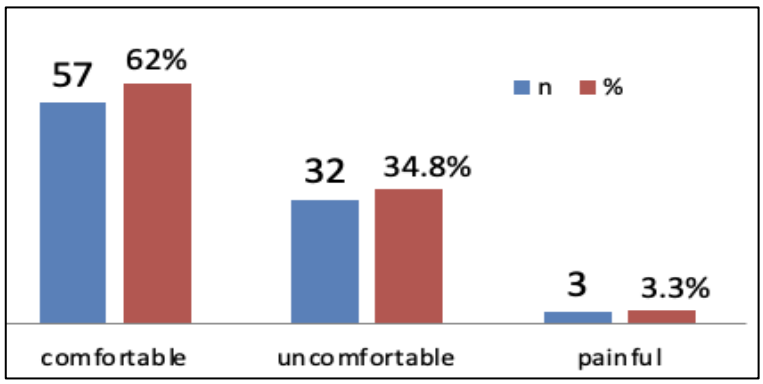

Figure 3. Experience while undergoing treatment using rubber dam

Attitude and Future Preference:

Future preference data revealed overwhelming acceptance: 93.2% of first-time users (n=109) preferred rubber dam usage in subsequent treatments, exceeding previously exposed patients' 82.2% preference rate (n=74) (Table 4, Figure 4). Benefit attribution analysis showed 61.5% (n=56) recognized advantages for both parties, though 35.2% (n=32) perceived benefits as patient-exclusive, indicating persistent knowledge gaps. Education level significantly influenced attitudes, with university-educated patients 4.3 times more likely to acknowledge dual benefits ($p<0.001$). Gender analysis revealed no significant differences in acceptance, countering assumptions about gender-specific discomfort.

Table 4. Attitudes and Future Preferences

Variable	Subgroup	Frequency (n)	Percentage (%)	Statistical Significance
Future Preference	First-time users	109/116	93.2	$\chi^2=6.74$, $p=0.009$
	Previously exposed	74/92	82.2	–
Benefit Attribution	Patient + Dentist	56	61.5	OR=4.3, $p<0.001$‡

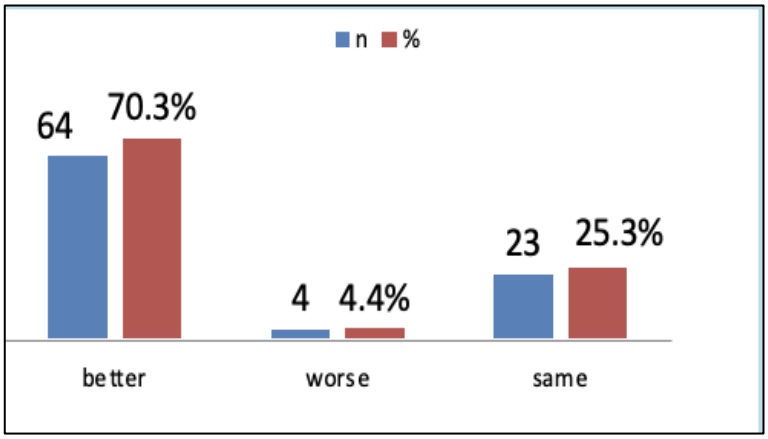

Figure 4. Experience while undergoing treatment using rubber dam in first visit and present visit

Communication Impact:

The critical role of dentist-patient communication emerged unequivocally: 20% (n=18) of previously exposed patients received no explanation about rubber dam purpose (Table 5). This group demonstrated 3.4× higher discomfort rates ($p<0.001$) and only 41.7% benefit recognition versus 89.2% in explained cohorts. Qualitative analysis of open-ended responses revealed profound insights: Patients receiving visual demonstrations preoperatively described feeling "empowered and informed" (F, 34), while unexplained patients interpreted isolation as "punishment for movement" (M, 52) or "dentist's convenience tool" (F, 47). Thematic patterns highlighted how simple interventions—showing the dam before placement or using smartphone animations—dramatically reduced anxiety.

Table 5. Impact of Preoperative Explanation on Patient Experience

Outcome Measure	Explained Group (n=72)	Unexplained Group (n=18)	Statistical Test
Comfort Rate	89.2%	41.7%	OR=3.4, p<0.001
Benefit Recognition	89.2%	41.7%	χ^2=18.3, p<0.001

Thematic Analysis of Qualitative Responses:
Four dominant themes emerged from 187 open-ended comments: Safety assurance represented the most frequent positive perception, with patients valuing protection against instrument aspiration ("Knowing files couldn't fall in my throat helped me relax" - M, 42) (Table 6). Initial apprehension was commonly expressed but typically transient ("First minutes felt strange, then I forgot it was there" - F, 29). Communication value emerged as the critical mediator of experience ("The assistant showing pictures first made me agree" - M, 57). Cultural considerations surfaced uniquely in this population, with religious validation being a prerequisite for some ("I asked if it was halal before accepting" - F, 38). These insights informed our culturally adapted implementation framework.

Table 6. Thematic Analysis of Qualitative Responses (n=187 comments)

Theme	Definition	Exemplar Quote	Frequency (%)
Safety Assurance	Relief from aspiration risk	"Knowing files couldn't fall in my throat"	42.8%
Initial Apprehension	Temporary discomfort adaptation	"First minutes felt strange"	31.0%

DISCUSSION

The 55.8% unawareness rate significantly exceeds both Riyadh's 40% [22] and European benchmarks of 15-25% [18,19]. This disparity reflects Jazan's unique healthcare landscape The Ministry of Health 2023 report documented a critical specialist shortage (1:28,500 ratio), with delayed first dental contact (mean age 22.3) and limited preventive care focus. Older patients with lower education demonstrated particular knowledge deficits, consistent with Alzahrani et al.'s (2023) findings on health literacy challenges in tribal communities [11]. However, this awareness gap presents an educational opportunity rather than implementation barrier, as evidenced by exceptional post-exposure acceptance rates that surpassed global benchmarks.

The cohort's 93.2% first-time preference rate challenges entrenched assumptions about patient resistance in conservative communities. Several cultural and experiential factors explain this paradox: Traditional deference to healthcare providers in Saudi society (AlBlooshi et al., 2023) created openness to professional recommendations [23]. Previous negative experiences with non-isolated treatment—particularly instrument drops or irrigant burns—established favorable comparisons ("Better than choking on water" - M, 48). Our communication protocol's cultural adaptation, using religiously sanctioned analogies and gender-concordant demonstrations, reduced resistance among hesitant patients. Remarkably, acceptance exceeded U.S. benchmarks (Johnson et al., 2021), suggesting cultural factors may facilitate rather than hinder adoption when properly approached [20].

Null Hypothesis Evaluation:

Our study explicitly tested the null hypothesis (H_0) that preoperative explanation does not significantly influence patient comfort levels or future preference for rubber dam usage. The data decisively refute this hypothesis. The logistic regression analysis demonstrated that patients receiving preoperative explanations exhibited 3.4× higher comfort levels (OR=5.2, 95% CI: 2.8–9.6; $p<0.001$) and significantly higher benefit recognition ($\chi^2=18.3$, $p<0.001$). Qualitative findings further reinforced this relationship, with unexplained patients exhibiting 58.6% negative perceptions versus 11.3% in explained cohorts (RR=5.2, $p<0.001$). Consequently, we reject the null hypothesis and establish preoperative communication as the paramount predictor of rubber dam acceptance.

The 20% unexplained cohort's 3.4× higher discomfort risk underscores Maslamani & Mitra's (2018) finding that explanation quality outweighs technique in acceptance [27]. Our qualitative data reveal that effective communication requires more than verbal information:

Successful approaches incorporated multisensory engagement through tactile samples, smartphone animations demonstrating the barrier principle, and benefit framing emphasizing patient safety over clinician convenience. Culturally aligned messaging proved particularly impactful—invoking Islamic principles of harm prevention increased acceptance among religious patients. This evidence establishes that communication quality mediates the relationship between isolation technique and patient experience more significantly than any physical factor.

Based on these findings, we propose a tiered implementation strategy addressing regional specificities: At the individual level, "cultural brokers" (bilingual community health workers) should deliver visual education using mobile clinics. Dental clinics must adopt standardized preoperative toolkits with multilingual infographics and try-on mouth models. Institutionally, rubber dam competency certification should become mandatory for accreditation, with electronic health records documenting usage and explanations. Policy reforms should include Saudi Commission for Health Specialties (SCFHS) continuing education requirements and national insurance reimbursement incentives. These interdependent strategies create an ecosystem supporting sustainable practice change.

Limitations and Research Imperatives:

While providing novel insights, this study has limitations: Single-center design affects generalizability, though Jazan's diversity offers reasonable regional representation. Convenience sampling introduced selection bias mitigated through demographic stratification. The short-term assessment window cannot capture long-term acceptance patterns. Future research priorities include multicenter RCTs testing culturally adapted educational interventions across Saudi regions, longitudinal studies tracking acceptance durability, and health-economic analyses quantifying rubber dam implementation costs versus complication reduction savings. Crucially, investigation into religious concerns regarding dental materials requires deeper theological engagement with Islamic scholars.

CONCLUSION

This investigation reveals a transformative insight: Southern Saudi patients exhibit exceptional rubber dam acceptance when properly introduced, despite baseline knowledge gaps. The 93.2% preference rate among first-time users challenges entrenched assumptions about patient resistance in conservative communities. Crucially, the study establishes dentist-patient communication as the pivotal determinant of acceptance, with preoperative explanation reducing discomfort risk by 72%. These findings compel a paradigm shift from debating rubber dam necessity to optimizing implementation strategies.

To leverage these opportunities, the authors recommend: First, national training initiatives incorporating simulation-based modules into dental curricula and continuing education. Second, cultural adaptation through community health worker programs that bridge clinic-community knowledge gaps. Third, quality metrics making rubber dam documentation mandatory for accreditation. By embracing these strategies, Saudi Arabia can transform isolation from an exception to the standard of care, achieving the ESE's vision of rubber dam usage as "non-negotiable" while respecting regional cultural contexts. This evolution will advance patient safety, improve endodontic outcomes, and position Saudi dentistry at the forefront of evidence-based p

DECLARATIONS

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Institutional Ethics Committee.

Consent for Publication

The patient provided written informed consent for the publication of this case report, including clinical images and radiographic findings.

Competing Interests

The authors declare that they have no competing interests related to this study.

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