ISSN 0973-2063 (online) 0973-8894 (print)

Bioinformation 22(10): 6570-6575 (2026)

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BIOINFORMATION
Discovery at the interface of physical and biological sciences

BIOMEDICAL INFORMATICS

www.bioinformation.net

Volume 22(10)

Research Article

Received October 1, 2026; Revised October 31, 2026; Accepted October 31, 2026, Published October 31, 2026

DOI: 10.6026/973206300226570

SJIF 2026 (Scientific Journal Impact Factor for 2026) = 8.478
2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

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Citation: Jain *et al.* Bioinformation 22(10): 6570-6575 (2026)

Vital pulp therapy awareness, practices and perceptions among institutional versus private dental practitioners in Uttar Pradesh, India

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ISSN 0973-2063 (online) 0973-8894 (print)
Bioinformation 22(10): 6570-6575 (2026)
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Abstract:
With the shift toward minimally invasive dentistry, Vital Pulp Therapy (VPT) aims to preserve pulpal vitality by controlling inflammation rather than removing extensive tissue. Therefore, it is of interest to evaluate the awareness, clinical practices and perceptions regarding VPT among 384 dental practitioners in Uttar Pradesh using a validated 32-item questionnaire. Most practitioners correctly identified the primary objective of VPT (90%) and were aware of current guidelines (96.7%), although 75% reported strict adherence. Indirect pulp treatment and direct pulp capping were the most commonly performed procedures. Sodium hypochlorite was the preferred disinfectant (73.3%), while 42.8% favoured immediate restoration. Reversible pulpitis was considered the pulpal status associated with the highest VPT success by 47.8% of respondents, followed by normal pulp (45.0%). Thus, awareness of VPT was high; however, greater standardization and evidence-based training are needed to ensure consistent clinical practice and predictable outcomes.

Keywords: Awareness and perception, pulp vitality, vital pulp therapy

Background:
Dental caries remains one of the most prevalent chronic oral diseases worldwide, characterised by focal demineralisation and breakdown of mineralised tooth tissues resulting from repeated cycles of demineralisation and remineralisation **[1]**. Conventional management typically involves the removal of carious tissue followed by restoration, which, although effective in eliminating infection, can compromise the integrity and strength of the remaining tooth structure **[2]**. In contrast, the philosophy of minimally invasive dentistry emphasises early detection of carious lesions and the promotion of remineralisation rather than tissue removal, thereby preserving natural tooth structure and supporting biological repair **[3]**. Contemporary research emphasises that dental caries should not be managed by the complete elimination of bacteria, but rather as a controllable biofilm-mediated disease, with a focus on regulating the quantity and pathogenicity of the microbial biofilm **[4]**. Evidence indicates that the risk of pulp exposure associated with complete caries removal can be significantly reduced through selective caries removal (SR) techniques **[5]**. A biological approach is therefore advocated, involving either no removal or selective removal of carious tissue, followed by lesion sealing with suitable restorative or remineralising materials **[6]**. This minimally invasive approach supports the preservation of pulp vitality, allowing affected dentin to remineralise while minimising the risk of pulp exposure and maintaining long-term tooth functionality **[7, 8]**. Within this evolving paradigm, Vital Pulp Therapy (VPT) has emerged as a biologically based treatment modality aimed at maintaining the vitality and function of the dental pulp following carious or traumatic exposure. VPT includes procedures such as indirect pulp capping, direct pulp capping, partial pulpotomy and full pulpotomy, all designed to preserve the pulp's innate defence, sensory and regenerative capabilities **[9]**. The introduction of biocompatible bioactive materials, such as mineral trioxide aggregate (MTA) and calcium silicate-based cements, has transformed VPT from a provisional or paediatric approach into a predictable, evidence-based option for mature permanent teeth **[10]**. Recent evidence shows that VPT can achieve outcomes comparable to or superior to those of conventional root canal therapy (RCT) in appropriately selected cases of reversible or early irreversible pulpitis, provided that aseptic protocols and compatible materials are employed **[11]**. Long-term clinical studies have reported success rates ranging from 85% to 95%, reinforcing the reliability of VPT as a pulp-preserving treatment **[12]**. Nevertheless, despite the growing body of supportive evidence, the clinical adoption of VPT remains inconsistent. Many clinicians still prefer conventional RCTs in situations that could be managed successfully with conservative vital pulp procedures **[13]**. Barriers to wider implementation include limited awareness of updated guidelines, inadequate professional training, high material costs and uncertainty regarding long-term outcomes **[14]**. Therefore, it is of interest to evaluate the current level of awareness, clinical application and perceived outcomes of VPT among private and institutional dental practitioners in Uttar Pradesh to highlight critical knowledge gaps.

Materials and Methods:

The present cross-sectional questionnaire-based study evaluated the awareness, clinical practices and perceived success of Vital Pulp Therapy (VPT) among institutional and private dental practitioners in Uttar Pradesh, India. Ethical approval was obtained from the Institutional Ethics Committee, King George's Medical University, and Lucknow (836/Ethics/2025). Registered BDS and MDS practitioners, including postgraduate students, faculty members and private practitioners were recruited. Participation was voluntary, informed consent was obtained and participant confidentiality was maintained throughout the study. Data were collected using a structured, self-administered questionnaire consisting of 32 multiple-choice questions. The questionnaire comprised five sections: (1) demographic and professional details, (2) knowledge and awareness of VPT, (3) disinfection protocols, (4) post-restorative procedures and (5) clinical decision-making criteria. The questionnaire was validated by experts and pilot-tested on 20 participants. Using stratified random sampling, institutional and private practitioners were recruited. The calculated sample size was 384, based on a 95% confidence level and a 5% margin of error and the target sample was increased to 422 to compensate for non-response. The validated questionnaire was distributed online and offline over a period of three months. Participation was voluntary, confidentiality was maintained and the study posed no risk to the participants.

Results:

The findings of the present study were organised into four thematic domains: (1) demographics of the respondents, (2) awareness regarding vital pulp therapy, (3) clinical practice patterns and (4) perception of VPT outcomes. Out of 384 dental practitioners who participated in the survey, the majority were aged between 25 and 35 years (86%, n = 330), followed by those aged 36–45 years (11.1%, n = 43), while only 1.7% (n = 7) and 1.1% (n = 4) belonged to the 46–55 and 56–65-year age groups, respectively. In terms of gender, 65.6% (n = 252) were female, 33.9% (n = 130) were male, while 0.6% (n = 2) preferred not to disclose. Regarding professional characteristics, most participants had <5 years of clinical experience (73.9%, n = 284) and were engaged in private practice (53.9%, n = 207). Endodontists (43.9%, n = 169) constituted the largest speciality group, followed by general dentists (30.0%, n = 115). Most respondents correctly identified the primary objective of VPT (90%) and were aware of current guidelines (96.7%), although only 75% reported strict adherence. Pulp sensibility testing was the preferred diagnostic method (71.7%) and awareness of apexogenesis was high (85%). Sodium hypochlorite was the most commonly used disinfectant (73.3%), with 2.5–5.25% being the preferred concentration (53.3%). Most practitioners preferred VPT for young permanent teeth with open apices and deep carious lesions without spontaneous pain, with reversible pulpitis considered the most favourable indication. Conventional root canal treatment remained the preferred approach for teeth with spontaneous pain. Immediate restoration was favoured by 42.8% of respondents, while glass ionomer cement was the most commonly selected restorative material. A high proportion of respondents (70%, n = 269) believed that cuspal coverage in posterior teeth enhances longevity following VPT, particularly in cases with extensive loss of tooth structure. Approximately 49.4% (n = 190) acknowledged failures due to improper sealing or restoration, with marginal leakage reported most frequently by 58.9% (n = 226). Follow-up after VPT was routinely performed by 73.3% (n = 281) at 3–6 months and by 5.6% (n = 22) at 1 year. Regarding the pulpal status associated with the highest success of VPT, 47.8% (n = 184) of respondents considered reversible pulpitis to have the highest success, closely followed by normal pulp (45.0%, n = 172). Overall, participants showed a strong awareness of biological preservation principles, a preference for minimally invasive pulp therapy and a favourable perception of the long-term success of VPT **(Tables 1–4)**.

Table 1: Demographic characteristics of participant

Variable	Category	Percentage (%)
Age group	25–35 years	**86.1**
	36–45 years	11.1
	46–55 years	1.7
	56–65 years	1.1
Gender	Female	**65.6**
	Male	33.9
	Prefer not to say	0.6
Clinical experience	<5 years	**73.9**
	5–10 years	15.0
	11–20 years	8.3
	>20 years	2.8
Type of practice	Private practice	**53.9**
	Government/Institutional	41.7
	Both	4.4
Specialization	Endodontics	**43.9**
	General dentistry	30.0
	Periodontology/Periodontics*	12.2
	Pediatric dentistry	6.1
	Prosthodontics*	1.7
	Other specialties/trainees	6.1

Table 2: Awareness regarding vital pulp therapy

Parameter	Response	Percentage (%)
Primary goal of VPT	Correctly identified preservation of pulp vitality and function	90.0
Essential diagnostic criterion	Pulp sensibility tests indicating normal/reversible pulpitis	71.7
	Radiographic absence of periapical pathology	17.2
Awareness of guidelines	Aware and follow guidelines	75.0
	Aware but do not strictly follow	21.7
	No idea	0.6
	No response	2.8
Overall awareness of guidelines	Aware (strict + non-strict adherence)	96.7
Meaning of apexogenesis	Correct response	85.0
Disinfectant before biomaterial placement	Sodium hypochlorite	73.3

NaOCl concentration	2.5–5.25%	53.3
Disinfectant application time	30 seconds–1 minute	42.2

Table 3: Clinical practice patterns related to VPT

Parameter	Response	Percentage (%)
Teeth most commonly treated with VPT	Young permanent teeth with open apices	57.2
	Mature permanent teeth with closed apices	16.1
	Traumatized teeth with pulp exposure	12.8
	Primary teeth	10.6
	No response	3.3
Suitable clinical condition	Reversible pulpitis cases	33.3
	Deep carious lesions without spontaneous pain	32.2
	Asymptomatic traumatic pulp exposure	27.8
	Teeth with periapical radiolucency	2.2
	No response	4.4
Pulp status perceived to have highest success	Reversible pulpitis	47.8
	Normal pulp	45.0
	Irreversible pulpitis	3.3
	Necrotic pulp	1.1
	No response	2.8
VPT in teeth with spontaneous pain	VPT only if pulp sensibility indicates vitality	58.3
	Prefer pulpectomy/RCT	31.1
	Always perform VPT	7.2
	No response	3.3
Pulp vitality/sensibility test	Electric pulp testing	56.7
	Cold test	31.1
	Heat test	5.0
	Radiographic evaluation	4.4
	No response	2.8
Time frame for traumatic exposure	Within 24 hours	67.8
	1–7 days	17.8
	Time does not matter if pulp remains vital	7.2
	More than 1 week	2.8
	No response	4.4
Commonly used restorative material	Glass ionomer cement	50.0
	Composite resin	37.8
	Amalgam	5.0
	Full-coverage crown	4.4
	Other	1.1
	No response	1.7
Timing of permanent restoration	After confirming pulp healing at follow-up	47.2
	Immediately in the same visit	20.0
	Within 1 week	19.4
	Within 1 month	11.7
	No response	1.7
Immediate restoration considered effective	Yes	42.8
	No	37.2
	Not sure	18.3
	No response	1.7

Table 4: Perception regarding VPT outcomes and post-restorative management

Parameter	Response	Percentage (%)
Requirement for cuspal coverage in posterior teeth	Only with extensive tooth structure loss	70.0
	Yes, always	17.2
	No, prefer direct restorations	5.0
	No idea	5.0
	No response	2.8
Experience of failures due to improper sealing	Occasionally	49.4
	Yes, frequently	35.0
	No failures noticed	12.2
	No response	3.3
Restoration-related cause of failure	Microleakage due to poor sealing	58.9
	Secondary caries	17.2
	Inadequate bonding	13.3
	Fracture of remaining tooth structure	7.2
	No response	3.3
Follow-up after VPT	After 3–6 months	73.3
	After 1 year	5.6
	Only if patient reports symptoms	14.4
	No routine follow-up	3.3
	No response	3.3
Best post-restorative strategy	GIC base followed by composite overlay	41.1

	Composite restoration with proper bonding	27.2
	Full-coverage crown	26.7
	Other	2.8
	No response	2.2

Discussion:

The present cross-sectional survey assessed the awareness, clinical practices and perceptions of Vital Pulp Therapy (VPT) among institutional and private dental practitioners in Uttar Pradesh. Although participants demonstrated good awareness and positive attitudes toward VPT, variations in guideline adherence and clinical practices highlight a persistent gap between evidence-based recommendations and routine practice. The demographic composition indicated that the majority of respondents were young practitioners aged 25–35 years (86%, n = 330), with less than five years of experience (73.9%, n = 284), which is consistent with previous surveys of dental professionals that also reported predominantly young participants with relatively limited clinical experience **[15]**. This demographic trend could account for the greater awareness of contemporary minimally invasive and biologically driven approaches, as younger practitioners are generally more familiar with modern endodontic education and digital learning tools. The observed female predominance (65.6%, n = 252) aligns with the increasing participation of women in the dental profession throughout India. A high level of VPT awareness was observed, with 90% of respondents correctly identifying its primary objective and 96.7% reporting awareness of current guidelines, consistent with previous studies. However, only 75% strictly adhered to these guidelines, with institutional practitioners demonstrating significantly better compliance than private practitioners. This knowledge–practice gap highlights the need for continuing dental education and greater implementation of evidence-based VPT protocols **[16]**. Clinical practice showed a preference for indirect pulp treatment and direct pulp capping, reflecting the shift toward minimally invasive dentistry. In contrast, pulpotomy was less frequently performed despite growing evidence supporting its effectiveness, consistent with previous reports **[17]**. This suggests a continued clinician preference for conventional root canal treatment in cases suitable for conservative management. Most practitioners performed VPT in young permanent teeth with open apices and in deep carious lesions without spontaneous pain, consistent with current guidelines. Institutional practitioners were more likely to select appropriate cases than private practitioners. However, the preference for root canal treatment in teeth with spontaneous pain indicates continued reluctance to extend VPT to early irreversible pulpitis despite emerging evidence supporting its use **[18]**. Most practitioners preferred bioactive materials and sodium hypochlorite for cavity disinfection, reflecting adherence to contemporary VPT protocols **[19]**. Immediate restoration was also widely favoured. Institutional practitioners were significantly more likely to use the recommended 2.5–5.25% sodium hypochlorite concentration than private practitioners, indicating better compliance with standardized disinfection protocols. Perception analysis revealed that a high proportion of respondents (70%, n = 269) believed that cuspal coverage in posterior teeth enhances longevity following VPT, particularly in cases with extensive loss of tooth structure. These perceptions closely mirror the clinical success rates reported in the literature, where VPT outcomes range from 85% to 95% when appropriate case selection and sealing integrity is ensured **[20]**. However, 49.4% (n = 190) reported failures due to inadequate sealing or restoration, underlining the importance of restorative quality as a determinant of pulp survival **[21]**. Institutional practitioners demonstrated greater awareness and better adherence to evidence-based VPT protocols than private practitioners, highlighting the influence of academic training and continuing education. Overall, the findings support the growing shift toward biologically conservative endodontic care but underscore the need for hands-on training and standardized clinical education to bridge the gap between knowledge and practice **[22]**.

Conclusion:

Awareness of VPT was high, although adherence to guidelines varied. Institutional practitioners showed better compliance with evidence-based VPT protocols. Standardized training is needed to improve clinical practice and treatment outcomes.

Acknowledgement:

The research was supported by Council of Science and Technology, Uttar Pradesh, India.

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