

# Acceptance of Staff and Students of a Private Dental College for a Novel Diagnostic Tool to Replace the Dental Probe: A Cross-sectional Study

Ashwin M Jawdekar<sup>1</sup>, Abhishek D Walhekar<sup>2</sup>, Laresh N Mistry<sup>3</sup>, Amar N Katre<sup>4</sup>

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## ABSTRACT

**Aim and background:** The dental probe is a commonly used instrument for the visuotactile examination of teeth in the diagnosis of caries, periodontal conditions, etc., and also for the removal of debris. Due to its sharp end and invasive nature, its use is controversial in children. A study was conducted to assess the acceptance of dental college staff and students for a novel diagnostic tool to replace the dental probe.

**Materials and methods:** A questionnaire was developed and validated to record the responses pertaining to several considerations for the replacement of the dental probe and acceptance of the novel tool from the staff and clinical students of two departments (Oral Medicine and Pediatric Dentistry) of a private dental college and hospital.

**Results:** Both staff and clinical students of two departments indicated acceptance for the use of the novel diagnostic tool to replace the dental probe with reference to several parameters. In the interdepartmental comparison, the staff and students of pediatric dentistry preferred the novel tool compared to those of Oral Medicine, and in the interdesignational comparison, students preferred the novel tool to replace the dental probe more than the staff [assessed using the mean and standard deviation (SD) acceptance using t-test with significance <0.05].

**Conclusion:** In conclusion, the novel diagnostic tool to replace the dental probe has potential for acceptance and can be recommended for further use and more research.

**Clinical significance:** The novel diagnostic tool to replace the dental probe can help dentistry present in a less invasive and more attractive manner.

**Keywords:** Dental examination, Dental explorer, Dental probe, Detection of caries, Diagnosis of dental conditions, Visuotactile method.

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## INTRODUCTION

Visuotactile examination of teeth using a dental probe is well known for the detection of dental caries and periodontal disease.<sup>1,2</sup> It, however, has a few objections. Being a sharp instrument, the dental probe can pose danger to the operator as well as the patient of unintentional injuries (including the possibility of breaking the enamel in the event of a white spot or intact demineralized areas).<sup>3,4</sup> The probe is considered invasive and is often not liked by children.<sup>5,6</sup> The tip of the probe is not disposable and therefore carries a risk of contamination or cross-infection.<sup>5</sup> To overcome such limitations, a novel diagnostic tool was designed and is being patented.

A cross-sectional study was aimed to assess the acceptance of staff and students of two departments of a private dental college for a novel diagnostic tool to replace the dental probe with the following objectives:

- Assess the acceptance of staff of two departments of a private dental college for a novel diagnostic tool replacing the dental probe.
- Assess the acceptance from students of two departments of a private dental college for a novel diagnostic tool replacing the dental probe.
- Comparison of the acceptance from staff to students of two departments of a private dental college for a novel diagnostic tool that replaces the dental probe.

The dental probe considered here was any dental probe—straight, sickle, or explorer—with a sharp point at the end, and is used in visuotactile examination of sound and decayed teeth.

<sup>1-3</sup>Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Navi Mumbai, Maharashtra, India

<sup>4</sup>Department of Pediatric and Preventive Dentistry, YMT Dental College and Hospital, Kharghar, Maharashtra, India

**Corresponding Author:** Ashwin M Jawdekar, Department of Pediatric and Preventive Dentistry, Bharati Vidyapeeth Dental College and Hospital, Mumbai, Maharashtra, India, Phone: +91 9821009615, e-mail: jawdekar.ashwin@gmail.com

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**Conflict of interest:** None

## MATERIALS AND METHODS

This was an observational study based on a self-administered questionnaire using a Google form. The STROBE checklist was followed for reporting the study. It was carried out among the staff and students attending the Outpatient Department (OPD) of Oral Medicine and Pediatric and Preventive Dentistry.

The clearances were obtained from the SRC and the Institutional Ethics Committee (IEC). Permission to conduct the study was obtained from both department heads. All participants were

informed about the study, and consent was obtained from each participant. Participation was voluntary, with each participant able to withdraw consent at any time.

## Eligibility

### Inclusion Criteria

- Dental staff and students who work in the departments of Oral Medicine and Pediatric Dentistry and who perform OPD examinations were included.

### Exclusion Criteria

- Those who did not sign the consent form and did not use the dental probe as a diagnostic tool were excluded.

The novel diagnostic tool to replace the dental probe was designed to have the following features:

- Noninvasive nature with a soft tip.
- Multiple uses such as assessing surface texture, removal of debris, application of agents, etc.
- Superior infection control owing to the tip being disposable and the handle autoclavable.
- Attractive: Multi-color choices can make it attractive.
- Child-friendly: The characteristics of the probe described above make it safe, useful, and practical for use in pediatric dentistry (however, its scope is not limited to pediatric dentistry).

Although the tool was not revealed to participants, for the purpose of understanding the readers, it is shown in Figure 1. The IP rights for the design are underway, and the design is the sole property of the first author (AMJ) of this publication.

## Study Tool

The study tool comprising all variables of interest, such as demographic, independent, dependent, and confounding, was used. A self-designed, structured, validated English language questionnaire was used for the study as below. Before administration, it was validated by two experts and tested on 10 participants.

The questionnaire was administered through a Google form circulated on the WhatsApp groups of students and staff. The completed forms were received in a week from the date of administration. Reminders were given in person and on the respective WhatsApp groups. Participants answered questions related to points such as whether they use the dental probe as routine practice on sound and carious surfaces; whether

they consider it as an invasive/sharp/hurting instrument; how child-friendly the probe is; and finally, how they would accept its replacement with a novel instrument having a removable, disposable, nonsharp, noninvasive, nonhurting soft and colorful tip. Their responses were recorded on a graded scale (a transformed numerical scale) for analysis purposes.

## Variables of Interest

Both the demographic and outcome variables were identified and are listed in Table 1.

All variables were used for exploratory analyses except age and gender.

## Sample Size

This being a preliminary study, about 80 participants were found to be adequate. The sample size was calculated considering a response rate of 80% among a possible 100 staff and students available in each department.

## Statistical Plan

A master sheet of all variables was prepared and checked for errors and discrepancies. After evaluating the normality of the variables, appropriate descriptive and inferential statistical methods were applied to the data (Chi-squared and the *t*-test as appropriate), and the findings are reported.

## RESULTS

The distribution of the sample (department-wise and designation-wise) is shown in Tables 2 and 3. At baseline, the data included more participants from the Department of Oral Medicine, and the number of students exceeded the number of staff in the sample.

A graded scale was used for the assessment of acceptance variables. The responses were recorded as STRONGLY DISAGREE, DISAGREE, NEUTRAL, SOMEWHAT AGREE, STRONGLY AGREE, with corresponding numerical scores of 1, 2, 3, 4, 5 for the purpose of the analyses. The mean and SD of each parameter were calculated, and



Fig. 1: The Novel Diagnostic Tool to replace dental probe

Table 1: Study variables

Variable	How it was recorded	How it was measured
Demographic		
Age	In completed years	Quantitative continuous
Gender	M/F/TG/Do not wish to disclose	Categorical
Designation	Staff/PG student/UG student	Categorical
Department	Oral Medicine/Pediatric and Preventive Dentistry	Categorical
Acceptance variables	The questionnaire will record different acceptance parameters on a graded numerical scale	Quantitative continuous

Table 2: Distribution of study participants according to department

Departments	Frequency (n)	Percentage (%)	Statistical significance
Oral Medicine	48	60%	Chi-square statistic = 6.4 p-value = 0.011412 (significant)
Pediatric Dentistry	32	40%	
Total	80	100%	

**Table 3:** Distribution of study participants according to designation

Participants	Frequency (n)	Percentage (%)	Statistical significance
Staff	6	7.5%	Chi-square statistic = 115.6 p-value = <0.00001 (significant)
Students	74	92.5%	
Total	80	100%	

**Table 4:** Comparison of acceptance with the novel tool between two dental departments

Sr. no.	Questions	Oral Medicine Mean (SD)	Pediatric Dentistry Mean (SD)	Unpaired t-test	p-value, significance
1	Do you use a dental probe for OPD examination?	4.89 (0.3)	4.43 (1.07)	$t = 2.792$	$p = 0.007^*$
2	Do you use a dental probe on sound enamel?	3.56 (1.33)	3.18 (0.85)	$t = 1.405$	$p = 0.164$
3	Do you use dental probe on noncavitated (e.g. white spot) carious enamel?	3.81 (0.98)	3.4 (1.07)	$t = 1.746$	$p = 0.085$
4	Do you use a dental probe on a cavitated carious surface?	4.54 (0.68)	4.62 (0.79)	$t = -0.501$	$p = 0.618$
5	Do you consider a dental probe an invasive instrument for the patient?	3.08 (1.1)	3.65 (1.2)	$t = -2.186$	$p = 0.032^*$
6	Do you consider a dental probe a sharp (potentially injurious) instrument for the dentist?	3.68 (1.22)	4.18 (1.11)	$t = -1.743$	$p = 0.085$
7	Do you consider a dental probe a child-friendly instrument?	2.33 (1.03)	1.78 (1.15)	$t = 2.226$	$p = 0.029^*$
8	Have you ever been hurt by the dental probe?	3.25 (1.43)	2.75 (1.56)	$t = 1.471$	$p = 0.145$
9	Have you used any other instrument as a replacement for the dental probe? (Specify which in the last column)	2.72 (1.18)	1.96 (1.14)	$t = 2.852$	$p = 0.006^*$
10	How likely are you to consider a novel diagnostic tool to replace the dental probe?	3.31 (0.92)	3.34 (0.97)	$t = -0.145$	$p = 0.885$
11	Will you accept a novel diagnostic tool to replace the dental probe with a removable tip?	3.72 (0.98)	3.56 (1.07)	$t = 0.715$	$p = 0.477$
12	Will you accept a novel diagnostic tool to replace the dental probe with a disposable tip?	3.41 (1.26)	3.71 (1.19)	$t = -1.067$	$p = 0.289$
13	Will you accept a novel diagnostic tool to replace the dental probe with a soft tip?	3.41 (1.04)	3.81 (1.11)	$t = -1.61$	$p = 0.111$
14	Will you accept a novel diagnostic tool to replace the dental probe with a noninvasive tip for the patient?	3.54 (1.05)	4.15 (1.19)	$t = -2.426$	$p = 0.018^*$
15	Will you accept a novel diagnostic tool to replace the dental probe with a tip that will not hurt the dentist?	4.04 (0.98)	3.84 (1.52)	$t = 0.705$	$p = 0.483$
16	Will you accept a novel diagnostic tool to replace the dental probe with a colorful tip?	3.7 (1.25)	4.68 (0.53)	$t = -4.164$	$p < 0.001^*$

N = 80; \*p < 0.05 as significant

intergroup comparisons are reported in Table 4 (department-wise) and Table 5 (designation-wise).

It can be observed from Table 4 that statistically significant differences were seen in the two groups with respect to questions 1, 5, 7, 9, 14, and 16, with participants from the Department of Pediatric Dentistry scoring higher acceptance of the novel tool to replace the dental probe than those from Oral Medicine.

It can be seen from Table 5 that statistically significant differences were observed in the two groups with respect to questions 3, 4, 5, 12, 14, and 15, with student participants scoring higher acceptance of the novel tool to replace the dental probe than staff.

## DISCUSSION

Visuotactile examination of teeth is recommended using a dental probe with a ball-ended tip (periodontal probe).<sup>7</sup> However, the use of a sharp probe is commonplace. The dental probe helps remove debris and assess the surface texture of a lesion.<sup>8</sup> Diagnostic LASER tools have also been used for caries detection; however, these are expensive.<sup>9</sup> Minimal invasion is becoming a new paradigm in dentistry with a focus on patient comfort and respect for tissues.<sup>10,11</sup> Therefore, tools used for dental examination must facilitate this.

The current study evaluated the feasibility of replacing the dental probe with a noninvasive tool. The need and features of such a tool were the parameters included in the questionnaire. The OPDs of Oral Medicine and Pediatric Dentistry of a dental school were identified as the settings because dental examinations on the first visits of the patients occur in these clinics. Interns and postgraduate students are usually the first to examine the patients, while the staff either supervises or examines the patients themselves. Therefore, the study recruited both the staff and the students as research participants.

The results of the study indicate the willingness of the staff and students of the OPDs of Pediatric Dentistry and Oral Medicine; the staff and students of the former department accept the idea of a novel tool to replace the dental probe more than the staff and students of the latter department. Moreover, the students have responded with scores higher than the staff for certain aspects related to the acceptance of the novel tool; possibly, as the seniors have a little higher resistance to change.

Reconsidering or replacing the dental probe for various purposes has been mentioned by several authors. According to Hamilton and Stookey (2005), the validity of the dental probe/explorer can be questioned regarding its uses such as caries

**Table 5:** Comparison of acceptance with the novel tool between staff and students

Sr. no.	Questions	Staff Mean (SD)	Students Mean (SD)	Unpaired t-test	p-value, significance
1	Do you use a dental probe for OPD examination?	4.83 (0.4)	4.7 (0.77)	$t = 0.408$	$p = 0.684$
2	Do you use a dental probe on sound enamel?	3.83 (0.4)	3.37 (1.21)	$t = 0.910$	$p = 0.366$
3	Do you use dental probe on noncavitated (e.g. white spot) carious enamel?	2.66 (1.63)	3.72 (0.94)	$t = -2.506$	$p = 0.014^*$
4	Do you use a dental probe on a cavitated carious surface?	4.0 (0.0)	4.62 (0.73)	$t = -2.06$	$p = 0.043^*$
5	Do you consider a dental probe an invasive instrument for the patient?	2.66 (0.51)	3.36 (1.2)	$t = -2.186$	$p = 0.032^*$
6	Do you consider a dental probe a sharp (potentially injurious) instrument for the dentist?	3.83 (1.83)	3.89 (1.23)	$t = -1.408$	$p = 0.163$
7	Do you consider a dental probe a child-friendly instrument?	2.0 (1.26)	2.12 (1.1)	$t = -0.108$	$p = 0.915$
8	Have you ever been hurt by the dental probe?	3.16 (1.47)	3.04 (1.51)	$t = -0.256$	$p = 0.799$
9	Have you used any other instrument as a replacement for the dental probe? (Specify which in the last column)	2.16 (1.16)	2.44 (1.22)	$t = 0.197$	$p = 0.844$
10	How likely are you to consider a novel diagnostic tool to replace the dental probe?	2.83 (0.4)	3.36 (0.95)	$t = -0.537$	$p = 0.593$
11	Will you accept a novel diagnostic tool to replace the dental probe with a removable tip?	2.83 (0.75)	3.72 (1.01)	$t = -1.341$	$p = 0.184$
12	Will you accept a novel diagnostic tool to replace the dental probe with a disposable tip?	2.83 (0.98)	3.59 (1.24)	$t = -2.12$	$p = 0.037^*$
13	Will you accept a novel diagnostic tool to replace the dental probe with a soft tip?	3.16 (0.75)	3.6 (1.1)	$t = -0.955$	$p = 0.342$
14	Will you accept a novel diagnostic tool to replace the dental probe with a noninvasive tip for the patient?	2.66 (0.81)	3.87 (1.12)	$t = -2.583$	$p = 0.012^*$
15	Will you accept a novel diagnostic tool to replace the dental probe with a tip that will not hurt the dentist?	2.83 (1.47)	4.05 (1.16)	$t = -2.415$	$p = 0.018^*$
16	Will you accept a novel diagnostic tool to replace the dental probe with a colorful tip?	3.83 (1.47)	4.12 (1.1)	$t = -0.598$	$p = 0.552$

$N = 80$ ;  $*p < 0.05$  as significant

detection, assessment of soft and hard dentin, identifying deposits, and checking the integrity of the margins of restorations. Furthermore, the instrument can lead to misdiagnoses and damage remineralizing lesions.<sup>12</sup> Caries diagnosis methods should have adequate sensitivity and specificity and good reliability.<sup>13</sup> The use of magnification and electronic devices can facilitate caries detection and monitoring.<sup>14</sup> In a recent article by Warreth (2023), the dental probe is termed as “controversial and debatable because it provides no further benefits” and may indicate only a catch in the fissure and not caries per se. The author reiterates the possibility of physical damage and spread of infection with the use of the probe and its low sensitivity.<sup>15</sup> Thus, the need for the use of a dental probe for the various uses it is indicated for can be questioned, and its replacement is due.

The present study has a few limitations, such as a small and nonprobabilistic sample, a cross-sectional design, and a distribution of the sample having a higher proportion of students. However, this study, which is the first and only to have explored the acceptance of a novel tool to replace the dental probe, has laid the foundation for future research with a larger sample size in multicentric settings.

## CONCLUSION

The new diagnostic tool to replace the conventional dental probe appears to be receiving good acceptance in both staff and students, with participants from the department of Pediatric Dentistry scoring higher acceptance of the novel tool to replace the dental probe than those from Oral Medicine, and the student participants

scoring higher acceptance of the novel tool to replace the dental probe than the staff.

## DECLARATION

The design of a novel diagnostic tool to replace the dental probe is being patented; the IP rights are protected.

## ORCID

Ashwin M Jawdekar  <https://orcid.org/0000-0002-9948-9007>

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