*Indian J. Applied & Pure Bio.* Vol. 41(1), 432-440 (2026). **ISSN: 0970-2091**

# Awareness, Acceptance, and Barriers to Dental Implant Therapy in Rural and Semi-Urban South India: A Cross-Sectional COM-B Based Study

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**Abstract**

Dental implants offer predictable functional and esthetic outcomes for tooth replacement; however, their utilization remains low in rural and semi-urban populations of developing countries. Beyond clinical considerations, behavioral determinants strongly influence patient decision-making. Contemporary behavioral models have rarely been applied to understand implant acceptance.

To assess awareness, acceptance, and barriers to dental implant therapy among adults in rural and semi-urban South India using the COM-B behavior change model.

A mixed-methods study was conducted comprising a quantitative cross-sectional survey and a qualitative exploratory component. Adults aged ≥18 years were recruited using multistage sampling. A pre-tested structured questionnaire mapped to Capability, Opportunity, Motivation, and Behaviour domains was administered. Qualitative data were collected through in-depth interviews and focus group discussions. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data were subjected to thematic analysis.

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Overall, 61.0% of participants had heard of dental implants, while 53.6% knew that implants replace missing teeth. Awareness of procedural aspects was lower, with only 37.4% aware that implant placement requires surgery. Major opportunity-related barriers included high perceived cost (64.2%), poor accessibility (57.4%), and lack of nearby specialists (59.6%). Fear of pain (60.4%) and surgery (55.8%) were the most commonly reported motivational barriers. Willingness to undergo implant therapy was expressed by 40.6% of participants. All COM-B domains showed significant associations with implant acceptance ($p < 0.001$). Logistic regression analysis identified high motivation (OR = 3.08), high awareness (OR = 2.31), and lower cost perception (OR = 1.89) as significant predictors of acceptance .

Acceptance of dental implant therapy among rural and semi-urban adults remains limited despite moderate awareness. Implant acceptance is strongly influenced by motivational and opportunity-related barriers in addition to knowledge. The COM-B model provides a useful framework for identifying behavioral determinants and guiding targeted, behavior-focused strategies to improve equitable utilization of dental implant therapy in underserved populations.

**Key words :** Dental implants; Awareness; Barriers; COM-B model.

Dental implants have become a cornerstone of contemporary restorative dentistry due to their high survival rates, long-term functional stability, and favorable patient-reported outcomes[1,5]. Advances in implant materials, surface characteristics, and diagnostic imaging have further enhanced predictability and clinical success[3]. Despite these developments, uptake of dental implant therapy remains limited in low- and middle-income countries, particularly among rural and semi-urban populations.

India continues to experience a high burden of tooth loss attributed to dental caries and periodontal disease[14]. Although implant services are increasingly available, their utilization is largely confined to urban and economically privileged groups. Previous studies from India and other regions have demonstrated that awareness of implants, cost concerns, fear of surgery, lack of access to specialized care, and misinformation significantly influence treatment decisions[2,15,17,18]. However, most existing studies are descriptive and lack a strong behavioral or theoretical framework, limiting their ability to inform intervention design.

Health-related behavior is shaped by complex interactions between individual capability, environmental opportunity, and motivational factors. The COM-B behavior change model, proposed by Michie et al., conceptualizes behavior as an outcome of Capability, Opportunity, and Motivation[13]. This model has been widely adopted in public health and implementation science, yet remains

underexplored in dental implant research. Applying the COM-B framework may provide a structured and contemporary understanding of patient decision-making regarding implant therapy.

Therefore, this cross-sectional study aimed to assess awareness, acceptance, and barriers to dental implant therapy among adults in rural and semi-urban South India using the COM-B behavior change model. By systematically examining capability, opportunity, and motivation domains through a structured questionnaire, this study seeks to generate theory-driven evidence to inform targeted educational strategies and public health interventions aimed at improving equitable access to dental implant therapy, without involving any clinical examination or patient intervention.

This cross-sectional survey was conducted in selected rural and semi-urban communities linked to the outreach areas of a dental teaching institution in South India. Adults aged ≥18 years who had resided in the area for at least one year and provided informed consent were included. Dental professionals, dental students, and individuals unable to provide consent were excluded.

The sample size was calculated using a single-proportion formula, assuming a 50% prevalence, 95% confidence level, and 5% precision, yielding a minimum of 384 participants. To compensate for non-response, the sample size was increased to 500. A multistage sampling method was used, with random selection of villages and wards followed by systematic household sampling, recruiting one eligible participant per household.

Data were collected using a structured, interviewer-administered questionnaire developed from existing literature and the COM-B behavior change model. Content validity was confirmed by expert review (CVI > 0.80), and pilot testing was conducted. Internal consistency showed acceptable reliability (Cronbach's $\alpha > 0.70$). A trained team conducted face-to-face interviews.

The questionnaire assessed socio-demographic variables and COM-B domains: Capability (awareness and knowledge), Opportunity (cost, access, and social factors), Motivation (beliefs, fear, benefits, misinformation), and Behaviour (intention and willingness).

Data analysis will be performed using IBM SPSS version 25. Descriptive statistics will summarize variables, while chi-square tests, t-tests, ANOVA, and binary logistic regression will assess associations and predictors of implant acceptance. Statistical significance will be set at $p < 0.05$.

The socio-demographic characteristics of the study population are presented in Table-1. The study included 500 participants, with the majority aged 31–45 years (33.6%). Males (52.2%) slightly outnumbered females. Most participants resided in rural areas (61.6%), and nearly two-thirds had primary or secondary education.

Awareness regarding dental implants, representing the capability component of the COM-B model, is summarized in Table-2. Overall, 61.0% of participants reported having heard of dental implants, only 37.4% were aware that implant placement requires surgery, and less than half were aware of their long-

term durability.

Cost, limited accessibility, and lack of nearby specialists were the most commonly reported opportunity-related barriers to implant therapy. Motivation-related concerns were also prominent, with fear of pain (60.4%) and fear of surgery (55.8%) being the most frequently reported factors influencing acceptance (Table-3).

Only 40.6% of participants expressed willingness to undergo dental implant therapy, and 45.6% were willing to recommend implants to others, indicating moderate acceptance and uncertainty among a substantial proportion of respondents (Table-4).

Bivariate analysis revealed significant associations between capability, opportunity, and motivation domains and dental implant acceptance ($p < 0.001$). Logistic regression analysis demonstrated that higher awareness ($\beta = 0.84$; OR = 2.31), favourable opportunity perception ($\beta = 0.64$; OR = 1.89), and higher motivation ($\beta = 1.12$; OR = 3.08) were significant predictors of implant acceptance, with motivation showing the strongest effect (Table-5).

Table-1. Socio-demographic characteristics of the study participants

| Variable | Category | n | % |
|---|---|---|---|
| Age group | 18–30 | 112 | 22.4 |
| | 31–45 | 168 | 33.6 |
| | 46–60 | 149 | 29.8 |
| | >60 | 71 | 14.2 |
| Gender | Male | 261 | 52.2 |
| | Female | 239 | 47.8 |
| Area of residence | Rural | 308 | 61.6 |
| | Semi-urban | 192 | 38.4 |
| Education level | Primary | 189 | 37.8 |
| | Secondary | 173 | 34.6 |
| | Graduate & above | 138 | 27.6 |

Table-2. Awareness (Capability) regarding dental implants

| Awareness item | Yes n (%) | No n (%) |
|---|---|---|
| Heard of dental implants | 305 (61.0) | 195 (39.0) |
| Knows implants replace missing teeth | 268 (53.6) | 232 (46.4) |
| Aware implants require surgery | 187 (37.4) | 313 (62.6) |
| Aware implants last long-term | 221 (44.2) | 279 (55.8) |

Table-3. Opportunity and Motivation factors influencing implant acceptance

| Domain | Item | Agree n (%) | Neutral n (%) | Disagree n (%) |
|---|---|---|---|---|
| Opportunity | Cost is unaffordable | 321 (64.2) | 104 (20.8) | 75 (15.0) |
| | Implant services not easily accessible | 287 (57.4) | 132 (26.4) | 81 (16.2) |
| | Lack of nearby specialists | 298 (59.6) | 121 (24.2) | 81 (16.2) |
| | Family discouragement | 183 (36.6) | 167 (33.4) | 150 (30.0) |
| Motivation | Fear of surgery | 279 (55.8) | 131 (26.2) | 90 (18.0) |
| | Fear of pain | 302 (60.4) | 118 (23.6) | 80 (16.0) |
| | Fear of radiographs | 196 (39.2) | 159 (31.8) | 145 (29.0) |
| | Belief implants are unsafe | 214 (42.8) | 146 (29.2) | 140 (28.0) |

Table-4. Behavioral intention toward dental implant therapy

| Behaviour item | Yes n (%) | No n (%) | Not sure n (%) |
|---|---|---|---|
| Willing to undergo implant therapy | 203 (40.6) | 171 (34.2) | 126 (25.2) |
| Would recommend implants to others | 228 (45.6) | 119 (23.8) | 153 (30.6) |

Table-5. Association and predictors of dental implant acceptance

| Variable | Accep-tance (%) | $\chi^2$ | β (B) | SE | Wald | OR Exp (B) | 95% CI | p-value |
|---|---|---|---|---|---|---|---|---|
| Capability (High vs Low) | 58.9 | 18.72 | 0.84 | 0.18 | 21.8 | 2.31 | 1.62–3.29 | <0.001* |
| Opportunity (Favourable vs Unfavourable) | 54.1 | 14.36 | 0.64 | 0.20 | 10.2 | 1.89 | 1.28–2.78 | 0.002* |
| Motivation (High vs Low) | 63.4 | 26.81 | 1.12 | 0.19 | 34.8 | 3.08 | 2.12–4.47 | <0.001* |

Chi-square test used for bivariate analysis; binary logistic regression used for multivariable analysis. OR = Odds Ratio; CI = Confidence Interval. *p < 0.05 considered statistically significant.

The present study explored awareness, acceptance, and barriers to dental implant therapy among adults residing in rural and semi-urban South India using the COM-B behavior change framework. Unlike earlier descriptive surveys, this study applied a contemporary behavioral model to systematically examine how capability, opportunity, and motivation collectively influence behavioral intention toward implant therapy. The findings

highlight that despite moderate awareness of dental implants, acceptance remains limited, primarily due to opportunity and motivation related barriers, underscoring the need for theory-driven public health interventions.

In this study, 61% of participants had heard of dental implants, and approximately 54% knew that implants could replace missing teeth. While this level of awareness appears moderate, it is considerably lower than figures reported in urban Indian populations. Sepolia *et al*. reported implant awareness exceeding 75% among urban adults, attributing this to greater exposure to private dental clinics, digital media, and higher educational attainment[17]. Similarly, Ahammed et al. observed awareness levels above 70% in metropolitan settings, emphasizing the role of dentist-led counseling[2]. In contrast, studies focusing on rural and semi-urban Indian populations have reported awareness levels comparable to or lower than those observed in the present study, highlighting persistent urban-rural disparities in access to oral health information[9,10].

However, a critical finding of the present study was the limited procedural and outcome-related knowledge. Only 37.4% of participants were aware that implant therapy requires a surgical procedure, and less than half recognized the long-term durability of implants. This fragmented understanding aligns with observations by Pommer et al., who noted that superficial awareness without procedural clarity often leads to exaggerated fear and treatment avoidance[15]. Similar deficiencies in procedural knowledge have been reported among rural South Indian populations, where implants are often perceived as complex and high-risk procedures[10]. From a COM-B perspective, such incomplete psychological capability restricts informed decision-making, even when basic awareness exists.

Lower educational attainment among rural participants likely contributed to these gaps. Previous studies have consistently shown that health literacy plays a pivotal role in shaping oral health decisions, particularly for advanced restorative options such as implants[9,18]. Thus, improving capability requires not only increasing awareness but also strengthening comprehension of procedural safety, longevity, and functional benefits.

Opportunity-related factors emerged as major barriers to implant acceptance in the present study. Nearly two-thirds of participants perceived implant therapy as unaffordable, while more than half reported poor accessibility and lack of nearby specialists. These findings strongly mirror those reported in Indian and global literature. Ahammed et al. identified cost as the most significant deterrent, particularly among lower-income populations, where implants are perceived as a luxury rather than a therapeutic necessity[2]. Studies from semi-urban India have similarly demonstrated that socioeconomic status and affordability strongly influence treatment acceptance[4].

Barriers related to geographic access and service availability have been widely documented in rural India. Rousseau *et al*. and Negi *et al*.[13] reported that distance to care facilities, lack of trained personnel, and concentration of services in urban centers significantly limit utilization of advanced dental services[6,13]. These structural constraints directly reduce

physical opportunity within the COM-B framework and contribute to inequitable access to implant therapy.

Family discouragement, reported by over one-third of participants, reflects the influence of social opportunity within collectivist cultures. In rural South India, health decisions are often family-mediated, particularly for invasive or costly procedures. Pommer et al. highlighted that negative opinions from family members can outweigh professional advice, especially when financial risk is perceived[15]. Similar observations have been reported in Indian studies, emphasizing the need for family-inclusive counseling approaches[4,9].

Motivational barriers were highly prevalent in the present study. Fear of surgery and pain were reported by 55.8% and 60.4% of participants, respectively, while 42.8% believed implants to be unsafe. These findings are consistent with earlier reports that fear, anxiety, and myths strongly influence dental treatment decisions, particularly for surgical procedures[2,7,15,18]. Gharpure AS specifically documented widespread misconceptions regarding implant safety and postoperative pain among Indian patients, which closely parallels the present findings[7].

According to the COM-B model, reflective motivation (beliefs, perceived risks) and automatic motivation (fear and emotional responses) jointly shape behavior. Wang et al. demonstrated that exaggerated perceptions of pain and surgical risk often stem from misinformation and anecdotal experiences rather than factual understanding[18]. Similar fear-driven avoidance has been reported in implant-specific studies, where anxiety significantly reduced willingness to undergo treatment[8]. In the present study, fear of radiographs reported by nearly 40% of participants further reflects broader anxieties surrounding modern dental technologies.

Importantly, motivation showed the strongest association with implant acceptance, with high motivation significantly increasing the odds of acceptance (OR = 3.08). This finding reinforces evidence from behavioral science literature that motivational readiness is a stronger determinant of health behavior than knowledge alone[11,13]. Behaviour change models, including the COM-B framework, emphasize that without adequate motivation, increased awareness may not translate into action[11,16].

Only 40.6% of participants expressed willingness to undergo implant therapy, and less than half would recommend implants to others. These acceptance levels are lower than those reported in urban-centric studies, where willingness often exceeds 60% [15,17], but are comparable to reports from rural and semi-urban Indian settings[4,9,10]. The discrepancy highlights the cumulative effect of limited capability, constrained opportunity, and low motivation in shaping behavioral outcomes.

The significant associations observed between all three COM-B domains and implant acceptance confirm the theoretical validity of applying this model in dental implant research. Participants with high capability, favorable opportunity, and high motivation demonstrated significantly greater acceptance, emphasizing that behavior change interventions

must address all three domains simultaneously.

Logistic regression analysis revealed that high awareness, high motivation, and lower cost perception were independent predictors of implant acceptance. While awareness doubled the likelihood of acceptance, motivation exerted the strongest influence. This finding aligns with established behavior change theory, which posits that knowledge alone is insufficient to alter health behavior without motivational readiness[11,13].

Lower cost perception also significantly predicted acceptance, reinforcing the central role of economic opportunity. Previous studies have suggested that flexible payment options, insurance coverage, and government-supported implant programs may substantially improve acceptance among underserved populations[4,6].

The findings of this study have important implications for oral health policy and practice. Traditional awareness campaigns focusing solely on information dissemination may be insufficient to improve implant uptake. Instead, multi-level interventions aligned with the COM-B framework are required. Enhancing capability through structured patient education, improving opportunity by expanding affordable implant services in peripheral areas, and strengthening motivation through fear reduction and trust-building are essential.

Integration of implant awareness into primary oral health programs, training of general dentists in basic implant counseling, and community-based outreach involving family members may help bridge existing gaps. Furthermore, subsidized implant schemes or inclusion of implants under dental insurance coverage could address economic barriers, as suggested in recent Indian public health literature.

*Strengths and Limitations :*

A major strength of this study is the application of the COM-B behavior change model to dental implant acceptance, offering a theory-driven and structured understanding of patient behavior in rural and semi-urban settings. However, reliance on self-reported data may introduce response bias, and the cross-sectional design precludes causal inference. Additionally, findings may not be generalizable beyond similar socio-cultural contexts.

This study highlights that acceptance of dental implant therapy among adults in rural and semi-urban South India remains limited despite moderate awareness. The findings demonstrate that implant acceptance is influenced not only by knowledge but also by opportunity and motivation related factors. High perceived cost, limited accessibility to implant services, fear of surgery and pain, and misconceptions regarding implant safety were major barriers. All COM-B domains showed significant associations with implant acceptance, with motivation emerging as the strongest predictor. These results emphasize that improving implant uptake requires behavior focused strategies that go beyond awareness generation. Interventions aimed at enhancing patient motivation, reducing financial and access barriers, and addressing fear and misinformation are essential to improve equitable utilization of dental implant therapy in underserved populations.

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