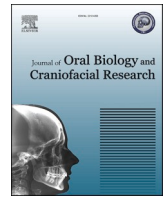




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## Journal of Oral Biology and Craniofacial Research

journal homepage: [www.elsevier.com/locate/jobcr](http://www.elsevier.com/locate/jobcr)Development and validation of dental visiting behavior among adults based on health belief model<sup>☆</sup>Jagadeeswara Rao Sukhabogi, Dolar Doshi<sup>\*</sup>, Bhavyatha Vaggala, Aishwarya Lakshmi Billa

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## ABSTRACT

**Aim:** This study aimed to develop and validate an instrument, Dental Visiting Behavior Based on Health Belief Model among Adults (DVBHBM), and to assess factors influencing adults' dental visiting behavior based on Health Belief Model.

**Materials and methods:** This cross-sectional study was conducted among 277 adults in Hyderabad, India. The DVBHBM instrument, based on Health Belief Model, was developed, validated, and distributed among participants. Exploratory factor analysis, reliability analysis, descriptive analysis, independent t-tests, and path analysis were conducted to explore construct validity, internal consistency, attitudes, and relationship among variables. **Results:** Participants with discomfort exhibited higher perceived susceptibility ( $3.70 \pm 1.15$ ) compared to those with regular dental visits ( $2.84 \pm 1.26$ ,  $p < 0.05$ ). Conversely, individuals with regular dental visits demonstrated significantly greater perceived benefits ( $22.32 \pm 2.5$ ) than those experiencing discomfort ( $19.76 \pm 3.36$ ,  $p = 0.001$ ). Perceived barriers were lower among individuals with regular dental visits ( $11.01 \pm 4.61$ ) compared to those experiencing discomfort ( $12.71 \pm 4.26$ ,  $p = 0.001$ ). Participants with regular dental visits also perceived the severity of not visiting a dentist ( $3.87 \pm 0.95$ ) more strongly than those experiencing discomfort ( $2.91 \pm 1.03$ ,  $p = 0.000$ ). Cues to action were more pronounced in individuals with discomfort ( $3.34 \pm 1.06$ ) compared to those with regular dental visits ( $2.98 \pm 1.07$ ,  $p < 0.05$ ).

**Conclusion:** Participants exhibiting discomfort in dental visits had significantly higher perceived susceptibility, perceived barriers, cues to action and self-efficacy towards dental visits. However, factors such as age, gender, marital status, income, brushing, flossing and tobacco use did not impact dental visiting behaviour of adults.

## 1. Introduction

Oral health is a crucial, fundamental, and essential component of overall health and well-being.<sup>1</sup> Good oral health enables critical functions such as eating, breathing, and speaking while contributing to psychological aspects like self-confidence and well-being. It allows adults to socialize and work without experiencing pain, discomfort, or embarrassment.<sup>2</sup>

Despite being largely preventable, oral diseases remain highly prevalent and contribute significantly to many public health issues, reflecting pervasive social and economic inequality.<sup>3</sup>

A significant portion of Indian adults frequently neglect their oral health, exacerbating the global burden of oral diseases.<sup>4</sup> The existing

patterns of oral diseases are closely linked to oral health behaviors,<sup>5,6</sup> highlighting a notable disparity between the actual dental needs, utilization, and the demand for dental care.<sup>7</sup> Oral health behavior encompasses the intricate relationship between an individual's oral hygiene habits, dietary preferences, and patterns of dental care utilization, all of which influence oral health.<sup>8</sup> Among these factors, dental visiting behavior stands out as highly individualized and influential in determining an individual's current risk of oral diseases.<sup>9</sup> Moreover, regular dental visits have been shown to positively influence one's quality of life.<sup>10</sup> Therefore, it is believed that a thorough understanding of dental visiting behavior, the utilization of oral health services, and the factors that predict this behavior are essential prerequisites for improving health-related behaviors and enhancing oral health outcomes.

<sup>☆</sup> "All authors have read the manuscript and gave their final approval and agree to be accountable for all aspects of the work. Each author believes that the manuscript represents honest work".

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According to a Swiss study, individuals who visit the dentist frequently have a lower prevalence of edentulism compared to their counterparts.<sup>9</sup> Under using dental services is associated with a higher burden of oral disorders.<sup>11</sup> Understanding the factors that either encourage or prevent dental visits is crucial for the planning and implementing oral health policies and programs aimed at promoting oral health.<sup>12</sup>

It is worth emphasizing that addressing subjective beliefs is crucial when attempting to modify individual behaviors rather than solely focusing on the objective world. The Health Belief Model (HBM), proposed by Rosenstock, is among several theories used to modify psychological behaviors and promote health.<sup>13</sup> It comprises six key concepts: perceived susceptibility, perceived benefits, perceived severity, perceived barriers, cues to action, and self-efficacy.<sup>14</sup> Few studies have applied the HBM theory to predict and improve oral health behaviors.<sup>15–19</sup> However, to date, no standardized instrument has been validated to assess dental visiting behavior based on the HBM in adults. Therefore, the present study aimed to develop and validate a specific instrument “Dental Visiting Behavior based on the HBM (DVBHBM)” among adults. The objectives of the study include assessing the factors impacting adults’ Dental Visiting Behavior using the HBM and investigating the correlation between Dental Visiting Behavior and oral health beliefs.

## 2. Materials and methods

### 2.1. Participants

This cross-sectional study was conducted among adults residing in Hyderabad city. Approval from the Institutional Review Board of Osmania Medical College and Hospital, Hyderabad (IEC-BHR/OMC/M.NO(05)/P-63) was obtained. Explicit written consents were procured from the participants, ensuring the utmost confidentiality of their privacy. The study meticulously adhered to the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

### 2.2. Sample size

The sample size for the study was determined using data from a meta-analysis conducted by Talukdar et al., which examined the prevalence of dental service utilization among Indian adults.<sup>20</sup> The anticipated percentage frequency of dental service utilization was established at 23.96 %, with a precision of 5 % at a 95 % confidence interval. Consequently, the determined sample size for the study was 277 subjects.

### 2.3. Data collection

Initially, eight Information Technology (IT) companies were approached; however, only six granted permission for data collection. Approval was secured from the Human Resources department of these companies. Participants native to Hyderabad were selected through simple random sampling, with eligibility contingent upon their willingness to provide written consent. Subsequently, a questionnaire was distributed to all 277 participants, who were instructed to select the appropriate responses.

### 2.4. Instrument development

The devised instrument was structured in accordance with the HBM, focusing on individuals’ health beliefs related to dental visiting behaviors. It incorporated the six fundamental concepts of the HBM, namely perceived susceptibility, perceived benefits, perceived barriers, perceived severity, cues to action, and self-efficacy. Data collection entailed participants providing responses on a 5-point Likert scale,

ranging from “Strongly Disagree” to “Strongly Agree,” conducted in two phases.

In the initial development phase, an 18-item questionnaire assessing dental visiting behavior, grounded on the HBM, was formulated using inputs from existing literature. To ensure its face validity, feedback was sought from ten experts who were well-versed in the questionnaire domain. They were consulted to offer input on item placement, scaling accuracy, grammatical structure, and potential item modifications. Moreover, content validity was assured by consulting ten domain experts, who evaluated items for relevance, clarity, simplicity, and necessity. The Waltz and Basel method was utilized to calculate the Content Validity Index (CVI), with all items surpassing the minimum threshold of 0.79. Reliability analysis confirmed the questionnaire’s robustness, with all 18 items exhibiting satisfactory corrected item-total correlations ( $>0.3$ ) and factor loadings ( $>0.4$ ) alongside a Cronbach’s alpha coefficient of 0.7, indicating strong internal consistency. No modifications were deemed necessary, and thus, all items were retained.

### 2.5. Variables

A survey questionnaire, comprising sections on socio-demographic characteristics, insurance availability, oral health behaviors, and a newly developed instrument tailored to document dental visiting behavior, was distributed to all the participants for path analysis.

### 2.6. Statistical analysis

An exploratory factor analysis was performed using the principal components method with promax rotation to explore the construct validity of the questionnaire. This analysis revealed the interrelations among the items and identified potential latent factors. Additionally, Cronbach’s alpha analysis was employed to assess the internal consistency of the scales derived from the questionnaire. To gain deeper insights into the health beliefs of adults, a descriptive analysis categorized each item into positive, non-committal, or negative attitudes. Positive attitudes were defined as scores of 1 (strongly disagree) or 2 (disagree) on the scales for susceptibility, benefits, barriers, severity, cues to action, and self-efficacy. Non-committal attitudes corresponded to a score of 3 (neutral), while negative attitudes were indicated by scores of 4 (agree) or 5 (strongly agree) across all scales. The independent *t*-test was employed to evaluate the relationship between health beliefs and dental visiting behavior. All the analyses were performed using the Statistical Package for Social Sciences (SPSS, version 26). The level of significance was set at  $p \leq 0.05$ .

Meanwhile, to explore the interrelationships among dental visiting behavior, health beliefs, and socio-demographic characteristics, a path analysis model was constructed and examined using SPSS Amos 23. Rigorous evaluation criteria were employed to ensure an adequate model fit. The goodness-of-fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) were utilized for this purpose. Adequate model fit was determined based on the predetermined cutoff values: GFI  $>0.90$ , CFI  $\geq 0.95$ , TLI  $\geq 0.95$ , and RMSEA  $<0.05$ .

## 3. Results

**Table 1** provides insights into the socio-demographic characteristics, oral health status, and dental visiting behaviors of adults. This study included participants with a mean age of 25.71 years (standard deviation, SD = 2.85) and were predominantly unmarried (80.9 %). Regarding insurance coverage, 64.3 % reported having insurance. Monthly income distribution varied, with the majority falling within the range of 27,883–46,474 (33.2 %). All participants reported practicing tooth brushing, while 35.6 % engaged in flossing. A subset of participants (11.2 %) admitted to tobacco use. Approximately half of the respondents (48 %) had a history of dental visits, with 34.6 % visiting

**Table 1**  
Demographics, oral health and dental visiting behaviors among study participants.

Variables	n (%)
Age in years (Mean ± SD)	25.71 ± 2.85
Marital status	
Married	53 (19.1 %)
Unmarried	224 (80.9 %)
Availability of insurance	
Yes	178 (64.3 %)
No	99 (35.7 %)
Monthly income	
<9307	0 (0 %)
9308–27,882	37 (13.4 %)
27,883–46,474	92 (33.2 %)
46,475–69,534	52 (18.8 %)
69,535–92,950	43 (15.5 %)
92,951–1,85,894	22 (7.9 %)
>1,85,895	31 (11.2 %)
Tooth brushing	
Yes	277 (100 %)
No	0 (0 %)
Flossing	
Yes	93 (35.6 %)
No	184 (66.4 %)
Tobacco use	
Yes	31 (11.2 %)
No	246 (88.8 %)
History of dental visit	
Yes	133 (48 %)
No	144 (52 %)
Last dental visit	
≤12 months	96 (34.6 %)
>12months	37 (13.4 %)
Not applicable	144 (52 %)
Reason for last dental visit	
Regular check up	84 (30.3 %)
Treatment	49 (17.7 %)
Not applicable	144 (52 %)

within the last 12 months. The reasons cited for the last dental visit included regular check-ups (30.3 %) and treatment (17.7 %), while 52 % indicated no applicable reason.

The Kaiser-Meyer Olkin measure of sampling adequacy resulted in a

value of 0.853, and Bartlett’s test of sphericity yielded acceptable results with  $p = 0.000$ . These two measures of psychometric adequacy suggested that the correlation matrix was suitable for factor analysis. Additionally, all pattern coefficients (factor loadings) for each factor exceeded 0.5. The factor structure and corresponding factor loadings revealed the strength of association between each belief and its respective attitude. Meanwhile, perceived susceptibility factors include the likelihood of developing oral diseases in the absence of regular dental visits (Factor 1 loading: 0.521). Perceived benefits are highlighted through beliefs in the positive impacts of regular dental visits on oral health and disease prevention (Factor 2 loadings ranging from 0.799 to 0.897). In addition, perceived barriers encompass fears, financial concerns, and perceptions of inconvenience related to dental visits (Factor 3 loadings in the range of 0.838–0.894). The severity of irregular dentist visits is indicated by Factor 4 loading (0.668). Besides, cues to action, such as reminders from family and friends, are denoted by Factor 5 loading (0.681). Lastly, self-efficacy factors, including tendencies to visit a dentist only when problems arise and the impact of work/home pressures on dental neglect, are represented by Factor 6 loadings (0.565 and 0.817, respectively) (Table 2).

Table 3 provides a comparative analysis of health beliefs between two groups categorized by Dental Visiting Behavior—individuals experiencing discomfort and those with regular dental visits. Significant differences were observed in various health belief categories. Participants experiencing discomfort exhibited higher perceived susceptibility to oral diseases ( $3.70 \pm 1.15$ ) compared to those with regular dental visits ( $2.84 \pm 1.26$ ,  $p < 0.005$ ). Conversely, individuals with regular dental visits demonstrated significantly higher perceived benefits ( $22.32 \pm 2.5$ ) than those experiencing discomfort ( $19.76 \pm 3.36$ ,  $p = 0.001$ ). Perceived barriers were lower among individuals with regular dental visits ( $11.01 \pm 4.61$ ) compared to those experiencing discomfort ( $12.71$

**Table 2**  
Attitude towards each item, factor structure of health beliefs and corresponding factor loadings.

Sl. No	VARIABLES	FRACTION STRUCTURE						ATTITUDE		
		F1	F2	F3	F4	F5	F6	Positive	Non-committal	Negative
<b>PERCEIVED SUSCEPTIBILITY</b>										
1.	If I don't visit a dentist, there's a chance I could develop oral diseases.	0.521						164 (59.2)	86 (31.1)	27 (9.7)
<b>PERCEIVED BENEFITS</b>										
2.	Regular visits to the dentist can greatly improve oral health		0.799					210 (75.8)	11 (4)	56 (20.2)
3.	Regular visits to the dentist can help prevent the progression of oral diseases.		0.871					242 (87.4)	35 (12.6)	0 (0)
4.	Regular visits to the dentist helps in the early detection of oral diseases		0.871					233 (84.1)	35 (12.6)	9 (3.3)
5.	Regular dental visits can prevent the need for more costly and time-consuming treatments in the future		0.883					220 (79.4)	51 (18.4)	6 (2.2)
6.	Regular dentist visits can lead to a positive prognosis for oral health		0.897					236 (85.2)	35 (12.6)	6 (2.2)
<b>PERCEIVED BARRIERS</b>										
7.	I'm afraid to visit a dentist.			0.894				92 (33.2)	92 (33.2)	93 (33.6)
8.	I'm worried that I don't have enough money to visit a dentist			0.838				98 (35.4)	104 (37.5)	75 (27.1)
9.	I think a regular dental visit is waste of time, money, and is troublesome			0.858				95 (34.3)	89 (32.1)	93 (35.6)
10.	I think the clinic is too far away to visit a dentist			0.847				110 (39.7)	71 (25.6)	96 (34.7)
<b>PERCEIVED SEVERITY</b>										
11.	Not visiting dentist regularly can progress oral diseases to an advanced stage				0.668			171 (61.7)	77 (27.8)	29 (10.5)
<b>CUES TO ACTION</b>										
12.	Family members and friends remind me to visit dentist regularly					0.681		119 (43)	107 (38.6)	51 (18.4)
<b>SELF-EFFICACY</b>										
13.	I tend visit dentist only when I experience problems						0.565	176 (63.5)	83 (30)	18 (6.5)
14.	I often neglect dental health due to pressures at work/home						0.817	116 (41.9)	98 (35.4)	63 (22.7)
15.	My schedule is very busy, which makes it difficult to find time to visit the dentist						0.741	129 (46.6)	89 (32.1)	59 (21.3)

**Table 3**  
Comparison of health beliefs according to dental visiting behavior.

HBM	DENTAL VISITING BEHAVIOR		T-VALUE	P-VALUE
	DISCOMFORT	REGULAR		
Perceived susceptibility	3.70 ± 1.15	2.84 ± 1.26	9.72	<0.005 <sup>a</sup>
Perceived benefits	19.76 ± 3.36	22.32 ± 2.5	-17.93	0.001 <sup>a</sup>
Perceived barriers	12.71 ± 4.26	11.01 ± 4.61	6.99	0.001 <sup>a</sup>
Perceived severity	2.91 ± 1.03	3.87 ± 0.95	-12.04	0.000 <sup>a</sup>
Cues to action	3.34 ± 1.06	2.98 ± 1.07	7.57	<0.005 <sup>a</sup>
Self-efficacy	10.97 ± 2.94	9.03 ± 2.66	6.60	0.001 <sup>a</sup>

<sup>a</sup> p ≤ 0.05 – Statistically Significant.

± 4.26, p = 0.001). Furthermore, participants with regular dental visits perceived the severity of not visiting a dentist (3.87 ± 0.95) more strongly than those experiencing discomfort (2.91 ± 1.03, p = 0.000). Cues to action were more pronounced in individuals with discomfort (3.34 ± 1.06) compared to those with regular dental visits (2.98 ± 1.07, p < 0.005). Lastly, self-efficacy was also higher among participants experiencing discomfort (10.97 ± 2.94) in contrast to those with regular visits (9.03 ± 2.66, p = 0.001).

Path analysis revealed that perceived susceptibility (β = 1.13; p = 0.02), perceived benefits (β = -9.76; p = 0.01), perceived barriers (β = 18.89; p = 0.01), perceived severity (β = -0.98; p = 0.05), cues to action (β = 1.11; p = 0.03), and self-efficacy (β = 8.14; p = 0.05) are significantly associated with Dental Visiting Behavior. However, socio-demographic factors, insurance availability, and oral health behaviors do not impact the same (Fig. 1).

**4. Discussion**

Understanding the factors that shape individual health behaviors is essential for developing effective interventions to modify behavior in health promotion efforts. To accomplish this, behavior change theories and models are often used, with the HBM standing out as one of the oldest and most widely utilized frameworks for predicting health behaviors. This model not only facilitates comprehending the fundamental factors that influence health behaviors but also acts as a valuable tool for devising interventions to promote health by identifying potential predictors of behavior change. To the best of our knowledge, this is the first study to use the HBM to investigate the association between Dental Visiting Behavior and oral health beliefs among adults. Given the importance of regular dental visits in maintaining excellent oral health, this research examines the associated factors comprehensively. The

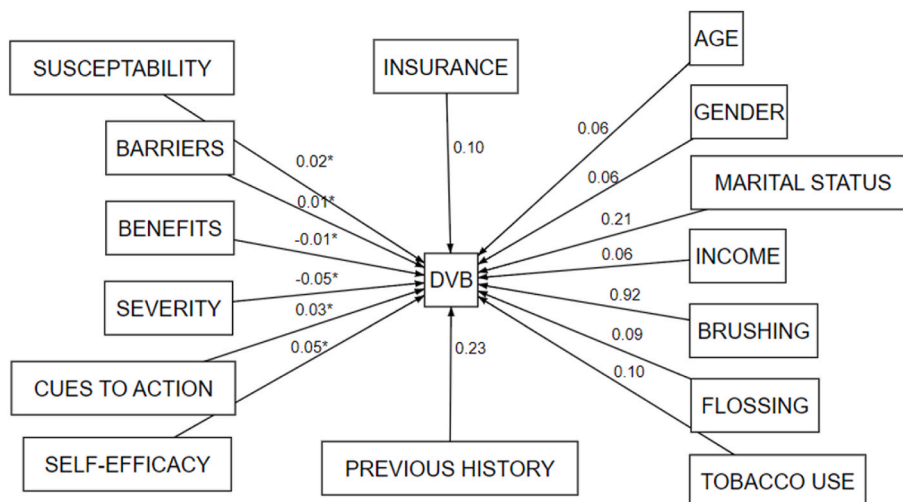
cohort of IT professionals was chosen for this study because they possess a basic educational qualification, which enables them to understand and comprehend the importance of dental health and the instructions provided to answer the questionnaire during the study. Additionally, most IT professionals have a provision to utilize dental services through their employment benefits, which can positively influence the Dental Visit Behavior (DVB) of the participants.

This study devised a comprehensive questionnaire based on the HBM to assess six key concepts—susceptibility, severity, benefits, barriers, cues to action, and self-efficacy—affecting Dental Visiting Behavior among adults. The questionnaire demonstrated strong internal consistency and construct validity, as evidenced by correlations among the six factors established through factor loadings. The findings of the study offer support for the suitability of the HBM method in elucidating adherence to Dental Visiting Behavior among the participants.

In this study, 48 % of the participants reported prior dental visits, among whom 30.3 % attended regular dental check-ups. This figure contrasts with the findings of Nagarjuna P et al., who reported a lower rate of 36 %.<sup>21</sup> However, Appukkuttan D et al. noted a higher percentage at 75.9 %, and Mohd FN et al. found an even higher rate of 97 %, with only 16.5 % attending routine dental check-ups.<sup>22,23</sup> This observed pattern of Dental Visiting Behavior among IT professionals in the current study may be attributed to their demanding schedules and sedentary lifestyles, factors that elevate the likelihood of dental problems due to stress and their awareness of the significance of oral health. Nonetheless, certain individuals may opt for proactive dental care to prevent potential issues despite their hectic schedules.

Socio-demographics, oral health behaviors, and the availability of dental insurance did not show a significant association with Dental Visiting Behavior among adults in this study. Similarly, a study by Appukkuttan et al. found that age, gender, income, and marital status did not display significant correlations with Dental Visiting Behavior.<sup>22</sup> In contrast, several studies have indicated significant associations between age and gender with Dental Visiting Behavior.<sup>21,23–25</sup> In this direction, Santoso and team examined the correlation among age, gender, marital status, and the availability of health insurance.<sup>26</sup> The study suggests that these factors may not play a substantial role in determining the likelihood of visiting the dentist among adults. Instead, other factors, such as work-related stress, time constraints, and individual attitudes toward oral health maintenance, may exert a more pronounced influence on DVB in this population.

Perceived susceptibility pertains to the chance of contracting a disease or experiencing a painful condition, while perceived severity refers to one’s belief in the impact and psychological distress associated with the disease. According to the HBM theory, sufficient self-efficacy,



**Fig. 1.** Path analysis.



perceived benefits over barriers, and cues to action enhance the likelihood of performing a particular behavior.<sup>27</sup> In the current study, individuals who visit the dentist due to discomfort exhibit higher levels of susceptibility to dental issues, encounter more barriers to seeking care, respond more readily to cues for action, and possess greater self-efficacy compared to those who maintain a regular attendance schedule. Conversely, individuals who attend dental check-ups regularly tend to perceive higher levels of severity and benefits compared to those who only visit when experiencing discomfort.

The study's robust questionnaire development, firmly rooted in the HBM, was a notable strength. This was underscored by its demonstration of face validity through expert feedback, content validity via consultation with domain experts, and the presence of strong internal consistency. However, like any study, certain aspects warrant consideration. For instance, the cross-sectional design, alongside the focused sample of IT professionals and reliance on self-reported data, may affect the generalizability of the findings. Nevertheless, these insights provide crucial guidance for health planners and policymakers, facilitating the formulation of targeted programs to encourage adults to seek dental care more regularly.

## 5. Conclusion

Participants experiencing discomfort exhibited significantly higher perceived susceptibility, perceived barriers, cues to action, and self-efficacy toward dental visits. However, factors such as age, gender, marital status, income, brushing, flossing, and tobacco use did not impact DVB among adults. Future research endeavors could delve into longitudinal designs, diverse samples, objective measures, and intervention studies, aiming to achieve a more comprehensive understanding and devising effective strategies for promoting regular dental visits.

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## Conflicts of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Authors' contributions

Dr. Jagadeeswara Rao Sukhabogi and Dr. Dolar Doshi contributed to conception, design, data acquisition, analysis and interpretation, drafted the manuscript. Dr. Bhavyatha Vaggala, Dr. Billa Aishwarya Lakshmi and Dr. Dolar Doshi critically revised and gave final approval for the manuscript. Dr. Bhavyatha Vaggala and Dr. Dolar Doshi contributed to design, data analysis and interpretation and gave final approval for the manuscript. Dr. Bhavyatha Vaggala and Dr. Billa Aishwarya Lakshmi contributed to data interpretation and drafted manuscript.

## Informed consent form

The contents of the information sheet provided have been read carefully by me/explained in detail to me, in a language that I comprehend, and I have fully understood the contents. I confirm that I have had the opportunity to ask questions. The nature and purpose of the study and its potential risks/benefits and expected duration of the study, and other relevant details of the study have been explained to me in detail. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal right being affected.

I understand that the information collected about me from my participation in this research and sections of any of my medical notes

may be looked at by responsible individuals from Osmania medical college or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records.

I agree to take part in the above study.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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