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1 **Title:**

2 Uptake of eye care services in South India: retrospective mapping of self-reported
3 barriers using the Theoretical Domains Framework.

4 **Running title:** Barriers to uptake of eye care in South India.

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52 **Abstract:**

53 **Introduction:**

54 Understanding barriers to seeking eye care and providing evidence-based theory-
55 informed solutions can improve the uptake of eye care services. Therefore, in this cross-
56 sectional study, we aim to report and analyse barriers to seeking eye care services among
57 individuals with vision impairment in the Akividu region of Andhra Pradesh, India.

58 **Methods:**

59 Out of the 3,000 enumerated participants, a total of 2,587 were examined. All participants
60 with vision impairment were asked to report barriers for not seeking eye care despite
61 noticing reduced vision using a validated questionnaire. The reported barriers were
62 mapped to the Theoretical Domains Framework (TDF), to explore potential individual
63 and environmental influences on the uptake of eye care services.

64 **Results:**

65 Barriers to seeking eye care services are most frequently mapped to the ‘beliefs about
66 capabilities’, ‘environmental context and resources’, and ‘social influences’ domains of
67 the TDF. The most frequently reported barrier was “aware of the problem but can
68 manage” (beliefs about capabilities), expressed by 43.4% (n=156) and, 55.7% (n=337) of
69 participants with distance and near vision impairment respectively. “No one to
70 accompany” for an appointment (social influences) was a significant barrier for
71 participants with distance vision impairment (n=44, 12.2%) in comparison to participants
72 with near vision impairment (n=19, 3.1%). Additionally, fear of losing eyesight or
73 operation or consultation (emotion) was a major deterrent for seeking eye care services
74 particularly among participants with distance vision impairment (n=31, 8.6%) when
75 compared to near vision impairment (n=17, 2.8%).

76 **Conclusion:**

77 The uptake of eye care services is influenced by a complex set of interacting factors.
78 Identification of potentially modifiable target behaviours provides an opportunity to
79 develop theory-informed solutions to improve uptake of services and prevent avoidable
80 vision loss.

81 **KEY WORDS:** Barriers to eye care, eye care, eye health seeking behavior, theoretical
82 domains framework, access to eye care

83

84 **Key Points:**

- 85 ○ This study enhances understanding of barriers to seeking eye care among
86 adults with vision impairment by employing the Theoretical Domains
87 Framework (TDF).
88
- 89 ○ The findings emphasize the significant role of personal, environmental
90 factors and social influences on eye care-seeking behaviour.
91
- 92 ○ The study suggests that eye care providers should develop evidence-
93 based targeted interventions to improve the uptake of eye care services.
94
95

97 **INRODUCTION**

98 Globally, over a billion people have a vision impairment, with a significant proportion
 99 being treatable or avoidable.¹ Despite global and national initiatives to reduce vision
 100 impairment, it continues to be a significant public health challenge, particularly in low
 101 and middle-income countries.^{2, 3} Health care-seeking behaviour is crucial for the uptake
 102 of eye care services but a range of interacting barriers, such as economic, socio-cultural
 103 and personal barriers significantly impact service uptake.^{2, 3}

104 The Grand Challenges in Global Eye health prioritisation exercise identified 16 major
 105 global challenges, with three focussing on improving access to care and promoting
 106 equity.⁴ The report on these challenges highlighted the need to develop and implement
 107 eye care services that reach vulnerable groups, reduce out- of-pocket expenses and
 108 barriers to accessing services.⁴ In addition to availability, cost, awareness of services,
 109 attitudinal barriers (“able to manage”) and social barriers (“no one is willing to
 110 accompany”) also play a key role in determining the accessibility of eye care.⁵⁻⁷ Barriers
 111 can also vary with geographical location, population demographics, and the eye
 112 condition under investigation.⁷⁻⁹

113 Despite initiatives by public and charitable organizations, untreated cataracts and
 114 uncorrected refractive errors continue to pose a significant challenge to reducing vision
 115 impairment in India.^{10, 11 12}. While previous studies have explored barriers to accessing
 116 eye care for various ocular diseases across different regions of India, they have not used
 117 a theory driven framework to get a better understanding of what influences behaviour.^{7,}
 118 ¹³⁻¹⁶ The Theoretical Domains Framework (TDF) is gaining momentum and is widely
 119 used to report determinants of behaviour change holistically.¹⁷ The TDF was originally
 120 developed to understand the determinants of behaviour change among health care
 121 professionals in implementation research.¹⁸ It has also been used to understand patient
 122 behaviours in different health care settings.¹⁹ The determinants for seeking health care
 123 identified through the Theoretical Domains Framework (TDF) can inform evidence-
 124 based behaviour change techniques designed to enhance the uptake of health care
 125 services.²⁰ However, only a limited number of studies have used a theory-guided
 126 approach to study the determinants of uptake of eye care.²¹⁻²⁵

127 LV Prasad Eye Hospital, a World Health Organization collaborating centre for the
128 prevention of blindness, has been working towards reducing preventable vision
129 impairment in South India and improving access to eye care for almost 40 years. The
130 hospital employs a pyramidal model of eye care delivery that offers primary, secondary,
131 and tertiary levels of eye care through a sustainable permanent infrastructure.^{26, 27} It is
132 important to understand whether this model works in terms of overcoming barriers to
133 accessing eyecare services. A number of studies have been carried out particularly in the
134 region of Akividu, in Andhra Pradesh to understand accessibility barriers but these
135 studies are over a decade old and need updating. In this study, we report on the barriers
136 to seeking eye care services among individuals with distance and near vision
137 impairments in the Akividu region of Andhra Pradesh, a region with access to primary,
138 secondary and tertiary eye care centres. We used the TDF, to better understand the
139 factors influencing behaviour change, such as the uptake of eye care services and to
140 move beyond traditional descriptive analysis of the barriers. The TDF also provides
141 actionable insights into the specific domains which need to be addressed to facilitate
142 behaviour change. The aim of this study therefore was to map eye care barriers to their
143 respective TDF domains to identify determinants of behaviour and to signpost to
144 suitable behaviour change strategies to increase the uptake of eye care services.

145 **METHODS**

146 The Akividu Vision Impairment Study (AVIS) protocol was approved by the
147 Institutional Review Board of the Hyderabad Eye Research Foundation, Hyderabad,
148 India. The study adhered to the tenants of the Declaration of Helsinki. Written informed
149 consent was obtained from all participants before enrolling into the study.

150 The AVIS methodology has been published previously.^{28, 29} In brief, 3000 individuals
151 aged 40 years and above were selected for the study using a multi-stage cluster random
152 sampling in the Akividu region of Andhra Pradesh. Three teams collected the data, each
153 comprising a vision technician, a field investigator, and a field worker. All study teams
154 were trained on the study protocol. A study optometrist regularly visited each site to
155 ensure quality control and to address any queries arising from the data collection. The
156 clinical examination was conducted as per the Rapid Assessment of Visual Impairment
157 (RAVI) protocol published elsewhere.²⁸

158 In line with WHO definitions, distance vision impairment was defined as presenting
159 visual acuity worse than 6/18 in the better eye.^{1, 30} Near vision impairment was defined
160 as presenting binocular near visual acuity worse than N8 at a testing distance of 40
161 cm.³⁰ Both the distance and near vision impairment groups were mutually exclusive.
162 The field investigator asked participants with distance and near vision impairment why
163 the eye care services were not sought despite having reduced vision using a validated
164 questionnaire.^{7, 31} This questionnaire was initially developed and used in the Andhra
165 Pradesh Eye Disease Study (APEDS) to report the barriers to seeking eye care.^{32, 33} The
166 reason for not seeking eye care services was asked in the local language (Telugu), the
167 participants responses were matched with a pre-populated list of barrier responses,
168 including other reasons in the data collection form.^{7, 31} In this study, the participant
169 responses were matched to a predefined list of 12 barrier responses listed in the table 1.
170 If the barrier response did not match a category on the questionnaire, it was recorded
171 under “other reasons”. In instances where multiple barriers were reported, participants
172 were asked the primary reason for not seeking eye care, which was termed the ‘primary’
173 barrier. If the primary barrier was matched to other reasons, the participant was asked
174 the secondary barrier.

175 Primary barriers (including other reasons) were quantified separately for participants
176 with distance and near vision impairment. The barrier categories listed in the
177 questionnaire were then mapped to the relevant domains of the TDF to quantify barriers
178 based on potential determinants of behaviour. Initially, the first author (VKY)
179 undertook the task of mapping the 12 pre-identified barrier responses, including the
180 actual responses recorded under ‘other’ reasons, to the corresponding domains of the
181 TDF. This mapping process involved in-depth discussions among team members (JGL,
182 AS and SM) to ensure accuracy and relevance of the categorization of barriers. Any
183 discrepancies or disagreements in the mapping exercise were resolved through these
184 discussions, leading to a consensus-based final decision on the mapping of each barrier
185 response to the relevant TDF domains.

186 **Statistical Analysis**

187 The study data was managed in a central database in Microsoft Access. Data analysis
188 was performed using the Stata 14.0 software package (Stata Corp.,

189 <https://www.stata.com/stata14/>). Descriptive statistics were used to report the results
190 from the questionnaire and TDF mapping.

191 RESULTS

192 A total of 2587 (86.2% response rate) participants were examined out of the 3000
193 enumerated for the study. The mean age $\pm$ SD of the total examined participants was
194 55.7 $\pm$ 11.4 years. Over half of the examined participants were women (n= 1406, 54.4%)
195 and had no formal education (n= 1224, 47.3%). The prevalence of distance and near
196 vision impairment were 12.8% (95% CI: 11.5–14.1) and 27.1% (95% CI: 25.2% to
197 29.0%), respectively.^{28, 29}. Mean age of the participants with distance vision impairment
198 (66.0 $\pm$ 11.4 versus 55.7 $\pm$ 11.3; p<0.01) and near vision impairment (55.7 $\pm$ 10.9 versus
199 54.0 $\pm$ 10.4; p<0.01) was higher compared to those without VI. Among the participants
200 with distance vision impairment (n=359), 57.6% were female, while among those with
201 near vision impairment (n=604), 57.4% were female. All participants (n=963) with
202 distance and near vision impairment responded to the survey questionnaire. Primary
203 barriers to seeking eye care for participants with distance and near vision impairment
204 (mutually exclusive groups) are shown in Table 1.

205 Table 1. Barriers reported by participants with distance vision impairment (DVI) and
206 near vision impairment (NVI) to seek eye care services.

<i>Barriers</i>	<i>Participants with DVI (n=359)</i>	<i>Participants with NVI (n=604)</i>
	<i>n (%)</i>	<i>n (%)</i>
Aware of the problem, but can manage	156 (43.4%)	337 (55.7%)
Unaware of the problem	0(0%)	52 (8.6%)
No one to accompany	44 (12.2%)	19 (3.1%)
Other health reasons	26 (7.2%)	16 (2.6%)
Services are not available or very far	0(0%)	1 (0.1%)

Old age and need not felt	41 (11.4%)	35 (5.7%)
Fear of losing eyesight/operation/consultation	31 (8.6%)	17 (2.8%)
No time available/other priorities	16 (4.4%)	44 (7.2%)
One eye adequate vision	11 (3.0%)	20 (3.3%)
Waiting for cataract to mature	5 (1.3%)	3 (0.5%)
Cannot afford consultation fee	3 (0.8%)	21 (3.4%)
Cannot afford cost of spectacles or surgery	15 (4.1%)	0 (0%)
Other reasons	11 (3.0%)	39 (6.4%)

207 Among participants with distance vision impairment, a total of 11 participants cited
 208 “other reasons” (n = 11). Of these, only five participants had their actual responses
 209 recorded; the remaining 6 participants' responses were not recorded in the data
 210 collection form. Similarly, among the near vision impairment participants, 39
 211 participants cited “other reasons” (n = 39). Of these, only 22 participants had their
 212 actual responses recorded in the data collection form. Therefore, the total barrier
 213 responses available for TDF (Theoretical Domains Framework) mapping was 353
 214 participants with distance vision impairment and 587 participants with near vision
 215 impairment. The barriers mapped to the TDF domains are shown in Table 2. The
 216 barriers were most frequently mapped to the following TDF domains: ‘beliefs about
 217 capabilities’, ‘environmental context and resources’, and ‘social influences’ (Table 3).
 218 A total of 9 domains out of a total of 14 TDF domains were mapped. TDF domain
 219 definitions were provided in supplementary file.

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223 Table 2. Barriers mapped to the Theoretical Domains Framework (TDF).

Theoretical Domains Framework	Barriers mapped to domains
Domain names	
1. Beliefs about Capabilities	“Aware of the problem but can manage”, “Old age and need not felt”, “Other health reasons”, “One eye has adequate vision”, “Not required near vision or glasses” and “Eyes are fine”
2. Environmental Context & Resources	“Cannot afford consultation fee”, “Cannot afford cost of spectacles or surgery”, “No time or other priorities”, “Services are not available or very far” and “Waiting for camp”
3. Social Influences	“No one to accompany”, “Doctor said vision never come back”, “Doctor said not improved after surgery” and “Family problems”
4. Emotion	“Fear of losing eyesight or operation or consultation”
5. Knowledge	“Unaware of the problem”
6. Beliefs about Consequences	“Waiting for cataract to mature”, “No improvement even after surgery” and “Using eye drops and comfortable”
7. Intentions	“Planning to go”, “Taken appointment to visit hospital”
8. Optimism	“No use”
9. Memory, Attention and Decision Processes	“Forgot somewhere”

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228 Table 3. Barriers to distance vision impairment (DVI) and near vision impairment
 229 (NVI) mapped to the Theoretical Domains Framework.

<i>Theoretical Domains Framework</i>	<i>Participants with DVI(n=353) n (%)</i>	<i>Participants with NVI(n=587) (%)</i>
Beliefs about Capabilities	234 (66.2%)	419 (71.3%)
Social Influences	46 (13.0%)	20 (3.4%)
Environmental Context and Resources	34 (9.6%)	67 (11.4%)
Emotion	31 (8.7%)	17 (2.8%)
Knowledge	NA	52 (8.8%)
Beliefs about Consequences	6 (1.6%)	4 (0.6%)
Intentions	1 (0.2%)	7 (1.1%)
Optimism	1(0.2%)	0 (0 %)
Memory, Attention and Decision Processes	0 (0%)	1(0.17%)

230 The most salient TDF domain was ‘beliefs about capabilities’ (reported by 66.2% of
 231 participants with distance and 71.3% with near vision impairment). The common
 232 barriers within this domain were “aware of the problem but can manage” and “old age”
 233 and “need not felt”. Economic barriers, including direct and indirect treatment costs,
 234 and competing time demands were the commonly reported barriers relating to the TDF
 235 domain ‘environmental context and resources’ (reported by 9.6% with distance and
 236 11.4% with near vision impairment). “No one to accompany” (social influences) was
 237 commonly reported by participants with distance vision impairment (12.2%) when
 238 compared to individuals with near impairment (3.1%). However, “unaware of the
 239 problem” (knowledge) was reported by participants with near vision impairment alone.
 240 Less salient TDF domains included ‘belief about consequences’ and ‘emotion’. “Fear of
 241 losing eyesight or operation or consultation (emotion) and waiting for cataract to mature
 242 (belief about consequences) were not major barriers to seeking eye care in this
 243 population. Overall, barriers to seeking eye care were mapped to nine out of the
 244 fourteen TDF domains.

246 **DISCUSSION**

247 Universal Eye Health Coverage (UEHC) represents an equitable system where eye care
248 services are accessible and affordable to all individuals without any discrimination.³⁴

249 Barriers to seeking eye care need to be investigated in different geographical locations
250 to understand factors that might help or hinder the implementation of UEHC. To the
251 best of our knowledge, this is the first study to categorise the barriers to seeking eye
252 care among adults with vision impairment using the TDF. The key barriers to uptake of
253 eye care services in adults with vision impairment mapped to the TDF domains of
254 'beliefs about capabilities', 'social influences' and 'environmental context and
255 resources'.

256 'Beliefs about capabilities' was the most salient domain influencing eye care seeking
257 behaviour among individuals with distance (66.2%) and near vision impairment
258 (71.3%). The barrier "aware of the problem but can manage" (43.4%) was the leading
259 barrier that mapped to this domain in patients with distance vision impairment. These
260 findings are similar to a previous study where able to see adequately (69.4%) was the
261 major reason why individuals who had no formal education and lived in a tribal region
262 of Andhra Pradesh refused cataract surgery.³⁵ Another important barrier that mapped to
263 the 'beliefs about capabilities' domain was "old age and need not felt" (reported by
264 11.4% of participants with distance vision impairment). However, this barrier was less
265 commonly reported in Andhra Pradesh compared to the neighbouring state of
266 Telangana, where over half the elderly participants over 60 years (63.5%) reported a
267 lack of felt need, despite noticing a decrease in vision.⁷ This could be because of the
268 difference in visual requirements, as participants in the Telangana study were older with
269 a higher average mean age (67.7 ± 6.9 years). Therefore, they were less likely to be
270 involved in active work. Amongst individuals with near-vision impairment, "aware of
271 the problem but can manage" (55.7%) was the leading barrier to seeking refraction
272 services. These results were consistent with a study conducted in a rural Northern
273 Indian population (58.7%).¹⁵

274 Among individuals with distance vision impairment 'social influences' were the second
275 leading TDF domain (13.0%) in determining eye care seeking behaviour. "No one to
276 accompany" (12.2%) was also a leading barrier that mapped to this domain. Similar
277 findings were found in a study investigating a rural Chinese population, where the lack
278 of family support was a major barrier (29.9%) to seeking low-cost cataract surgery

279 services.⁵ However, no one to accompany (2.9%) was not a major barrier reported in a
280 previous study conducted between 1996 and 2000 in the state of Andhra Pradesh.³⁶ No
281 one to accompany was a major barrier in this study, possibly because of a rise in nuclear
282 families, with many working individuals who have moved out of traditional joint-family
283 homes to find jobs elsewhere. Moreover, an increased life expectancy has led to many
284 individuals who require eye care to also have mobility-related issues, which necessitates
285 additional support in getting to appointments when compared to previous studies.^{37, 38}

286 The ‘environmental context and resources’(9.6%) were the third most important domain
287 influencing eye care seeking behavior in those with distance vision impairment. “No
288 time available” or “other priorities” (4.4%) and “cannot afford the cost of spectacles
289 and surgery” (4.1%) were the two (out of five) major barriers that mapped to this
290 domain. Financial barriers (4.9%) were not major determinants for seeking eye care in
291 this study. In contrast, a report published from Andhra Pradesh in 2007 found that
292 “don’t have money to pay for an eye check-up” (37%) was a major barrier among
293 individuals with vision impairment.³⁶ The study was conducted in the Krishna and West
294 Godavari districts of Andhra Pradesh, which are financially stable districts with a much
295 higher per capita income than the average of the state. A general rise in the economic
296 strength of India in the past decade might also be a contributing factor.³⁹ Cost is a major
297 deterrent to seeking cataract surgery for many individuals in low-income and middle-
298 income countries.^{40, 41} The ‘environmental context and resources’ were the second most
299 salient domains associated with near vision impairment. The major individual barrier
300 associated with this domain was no time available or other priorities (7.2%).

301 None of the participants in this study reported cost of spectacles as an issue, whereas the
302 cost of spectacles was a barrier to seeking near vision correction among the rural
303 population in a study in Northern India (16.7%).¹⁵ The cost of spectacles for near vision
304 correction has been reported as a major barrier in studies carried out in Ghana (21%),
305 rural Nigeria (39.3%), and Ethiopia (42.0%).⁴²⁻⁴⁴ In this study population, the cost of
306 consultation did not appear to be a barrier for individuals with distance vision
307 impairment compared to near vision impairment. This might be due to an initiative by
308 the government of India called Vision 2020: the Right to Sight- India, which provides
309 free cataract surgeries both in non-governmental organisations (NGOs) and government
310 hospitals. Other initiatives, such as the Ayushman Bharat and Prime Minister Jan
311 Arogya Yojna (PMJAY), allow individuals to access free eye care in existing primary

health centres.¹⁰ In addition, many NGOs offer free or subsidised cataract surgery services, including L V Prasad Eye Institute.²⁷

“Fear of surgery” was identified as a barrier (8.7%) among participants with distance vision impairment, which mapped to the TDF domain of emotion. A report from South India found that “fear of surgery” (1.8%) was an uncommon barrier among individuals over 40 years.¹³ Among the North Indian population, “fear of surgery” (34%) and “fear loss of eye sight” (33%) due to surgery were the major reasons for not seeking cataract surgery.¹⁶ In India, fear of surgery has not been reported consistently.^{13, 16} It is essential to systematically investigate the reasons behind this inconsistent reporting of fear related to seeking eye care services. Understanding these factors can help identify barriers to accessing care and ultimately increase the uptake of services by addressing the fear associated with seeking eye care. However, in a study from Ethiopia, “fear of cataract surgery complications” (18.7%) was the leading barriers to seek cataract surgery.⁴⁵ To overcome ‘emotion’ related barriers the study authors recommended increasing the quantity and quality of cataract campaigns and using patients with good surgical outcomes as motivators for others to have surgery.^{16, 45} However, the literature provides limited evidence, and the only behaviour change technique (BCT) that was mapped to the emotional domain of the TDF was the reduction of negative emotions.⁴⁶ “Unaware of the problem” (8.6%), which mapped to the TDF domain of ‘knowledge’, was a barrier to seeking near vision correction services. However, “unaware of the problem” was a dominant barrier in North Indian rural population (23.3%), Ghana (22%), Nigeria (23.4%), and Ethiopia (63.9%).^{15, 42-44} Barriers to seeking eye care services are often influenced by a range of interrelated factors, reflecting the complex nature of challenges that individuals face. For example, financial burden often results in postponing seeking eye care services as individuals prioritise other essential needs over eye health. For individuals with financial difficulties, the costs associated with surgery and transportation (environmental context and resources) can be a significant barrier. Moreover, if patients require someone to accompany them (social influences), this adds another layer of complexity to their situation. This need for social support not only impacts their willingness to seek care but also amplifies the financial burden.

A key strength of the TDF is that it provides a theoretical lens to identify influences on behaviour and facilitate the development of theory informed intervention strategies.⁴⁷ Behaviour change techniques that address specific barriers in terms of TDF-domains have

345 been identified and are available via the online, Human Behaviour Change Project-
346 Theory and Techniques Tool.⁴⁶ This tool clarifies which behaviour change techniques
347 (BCTs) may be best suited to address which TDF-informed barriers (and which are not
348 well suited or have inconclusive links). This approach provides a basis for selecting which
349 BCTs should be prioritised in intervention development. The most frequently reported
350 barriers mapped to the TDF domain ‘beliefs about capabilities’. The BCTs that have the
351 strongest link to this domain include ‘verbal persuasion about capability’ and ‘problem
352 solving’. Interventions that prompt the person to analyse, factors influencing their
353 behaviour and develop strategies to overcome these barriers are more likely to be
354 successful.⁴⁶

355 Major strengths of this study include the large population based representative sample
356 size, and the fact that the study findings can potentially be generalised to other regions
357 in India with similar a demographic profile. We used a methodologically robust
358 approach, including a validated questionnaire, which is a quick and cost-effective way
359 in determining the frequency of barriers to seeking eye care, combined with the
360 mapping of barrier responses to TDF domains to provides a theory-informed and
361 replicable strategy to understand behaviour. Future studies can map all identified TDF
362 domains to suggest a suitable BCTs using a theory-based approach to increase the
363 uptake of eye care services.⁴⁶

364 **CONCLUSION**

365 Eye health-seeking behaviour in the Akividu region of India is influenced by a complex
366 set of interacting factors. This study successfully mapped a single-questionnaire barrier
367 response to the TDF. Future work, using in-depth qualitative interviews, will provide a
368 deeper understanding of these barriers to confirm potential behavioural targets that
369 could be incorporated into interventions to address modifiable barriers and enhance
370 enablers to seeking eyecare.

371 **CONFLICT OF INTEREST STATEMENT**

372 None of the authors have any potential conflict of interest in this study.

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376 **DATA AVAILABILITY STATEMENT:**

377 No additional data is available to share.

378 **AUTHORS CONTRBUTION**

379

380 **Vijay Kumar Yelagondula (VKY):** Conceptualization (equal); data curation (equal)
381 formal analysis (lead); investigation (equal); methodology (equal); writing –original
382 draft (lead); writing –review and editing (equal).

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384 **Srinivas Marmamula (SM):** Conceptualization (lead); data curation (lead); formal
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391 writing –review and editing (equal).

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