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Archiving Indigenous technical knowledge (ITK) based ethnomedicinal practices among tribal communities in the Nilgiris : A perception analysis

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Abstract

Ethnomedical practices of the tribal community in the Nilgiris district were documented and analyzed to assess their knowledge and perception of Indigenous Technical Knowledge (ITK) and to understand the constraints faced in utilizing the same. This study, in doing so, presents a discussion of the interface of socioeconomic variables with indigenous traditional knowledge to highlight the determinants that facilitate the retention and transmission of traditional medicine knowledge in these communities. The present study adopted an exploratory research design. Data were collected from six tribal communities through snowball sampling, with a total of 120 respondents in two blocks of the Nilgiris district. While analyzing the relationships, the socio-economic characteristics were correlated with the knowledge levels and constraints on traditional medicinal practices. Some of the other tools that were applied to these studies included rank-based quotients and multiple regression analysis. Findings indicate that a major section of the tribal population has a medium to low level of knowledge of ITK, with perception varying due to age, income, and information availability. Superstitions, extraction of scientific principles involved in allopathic science, and most of all, lack of interest shown by the younger generation are major factors inhibiting the spread of the practices. Diagnosing these challenges with specified community engagement strategies, education, and access to traditional medicine is thus the highway to sustaining this invaluable cultural heritage. The research suggests a holistic approach to conserve ITK and traditional medicine by marrying modern healthcare with traditional practices to maintain their relevance for posterity.

Keywords

constraints; knowledge; perception; PVTGs; traditional medicine

Introduction

Indigenous Technical Knowledge (ITK) provides levels of wisdom accumulated by indigenous people over generations. This knowledge has been deeply embedded in various fields, including agriculture, natural resource management, health, and education. What was once considered archaic today is cited as lying at the crux of sustainable development because it influences specific cultural and environmental settings (1). Here, in a country with so much cultural background as India, the medical traditions of the

aboriginals have flourished for over four millennia with millions still banking on them for health care (2). For instance, the Nilgiris district offers part of ethnomedicines primarily because the use of medicinal plants is deeply rooted in ancient traditions of Ayurveda, Siddha, and Unani (3). However, rapid changes in society and environmental exploitation have put this knowledge in peril, underscoring the urgency of documenting it (4). Safeguarding ITK is not just a matter of preserving cultural heritage but of addressing contemporary societal challenges with locally relevant solutions (5).

Tamil Nadu is home to 36 tribes with a population of 794697 according to the 2011 Census, accounting for 1.1% of the state's population. Of the recognized tribes, six have been accorded status as Particularly Vulnerable Tribal Groups (PVTGs) and are predominantly found in the Nilgiris district (6) (Table 1) . Each of them namely, the Todas, Kotas, Kurumbas, Irulas, Paniyas, and Kattunayakas have differences in cultural practices, language, and traditional knowledge of ethnomedicine (7,8). Despite the availability of modern health facilities, these tribes still largely depend on traditional medication, such as the use of medicinal plants against several health afflictions (9,10). However, the shift to modern medicine and issues such as poverty, illiteracy, and lack of access to health facilities are taking their toll. An ethnobotanical study of the association of plants and humans is essential in the conservation of traditional knowledge together with biodiversity (11). This study in the Nilgiris thus focuses on the analysis and documentation of ethno-medicinal practices of tribal communities for the documentation of their submerged heritage in sustainable healthcare through the roots of indigenous wisdom.

Keeping the above facts in view, the present study was taken up with the following specific objectives:

1. To assess the knowledge and perception of the tribal people in practicing traditional medicine.
2. To understand the constraints in the usage of medicinal practices and to formulate strategies to overcome the constraints.

Table 1. Total PVTGs population in Nilgiris District.

S. No	Name of the PVTGs	Male	Female	Total
1	Todas	698	725	1423
2	Kotas	1063	1107	2170
3	Kattunayakas	1097	1026	2123
4	Irulars	5101	5175	10276
5	Kurumbas	2948	3136	6084
6	Paniyas	5621	5741	11362
Total		16528	16910	33447

Source: 2023-2024 Census – The Nilgiris.

Materials and Methods

Study area

The name 'Nilgiris' translates to 'Blue Hills,' derived from the Tamil words "Neelam" (blue) and "Giri" (hill or mountain), with its earliest mention found in the Silappadikaram, a work of Sangam literature. The Nilgiris district, originally part of Coimbatore District, was established as a separate district in August 1868, covering an area of 2545 km^2. Located at the junction of the Western and Eastern Ghats, the district's elevation ranges from 900 to 2636 m above mean sea level (MSL), and its geographic coordinates extend from 11° 30'N to 19° 30'N (latitude) and from 76° 29'E to 76° 36'E (longitude) (12,13).

The Nilgiris district consists of four blocks: Ooty, Coonoor, Gudalur and Kotagiri. According to the District Diagnostic Study (DDS), in the Nilgiris district, the concentration of tribal communities is as high as 50% in Gudalur, followed by Kotagiri with 25% of the tribal population. Udhagamandalam and Coonoor have 16% and 9% of the tribal population, respectively (14,15). Hence, two blocks, namely Kotagiri and Gudalur, were selected for the study. The map showing the blocks of the Nilgiris district is given in Fig. 1.

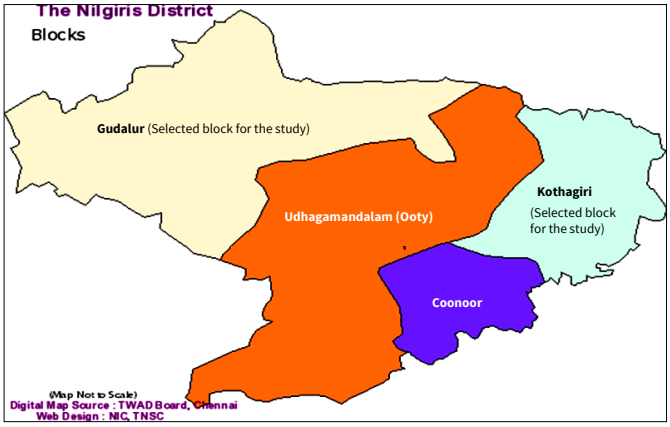

Fig. 1. Map showing the blocks.

Study design

The research design being used is Ex-post, which is well suited to examining the relatively underexplored field in this area, the traditional medicinal practices of the tribal communities (16). This design can adequately and profoundly measure the knowledge and perceptions of people concerning using traditional medicine and, therefore, properly understand their constraints in accessing these practices (17). Insights to be brought from this exploration would help to design strategies for overcoming these constraints and to ensure that the indigenous knowledge created and built up will be preserved and further used (18).

Data collection

The knowledge and perception were studied among six tribal communities from the Nilgiris district by snowball sampling (19). Since random population details of the tribes were unavailable, the identified traditional healers recommended specific areas for the survey to analyze the knowledge and perceptions among the tribes (20). Accordingly, 120 tribe members were selected from six villages across two blocks. This is presented in Fig. 2.

A structured interview schedule was developed in alignment with the study's objectives, scope, and defined variables to facilitate effective information gathering. Five knowledge-based questions were tailored for each of the six different communities. Additionally, fifteen perception

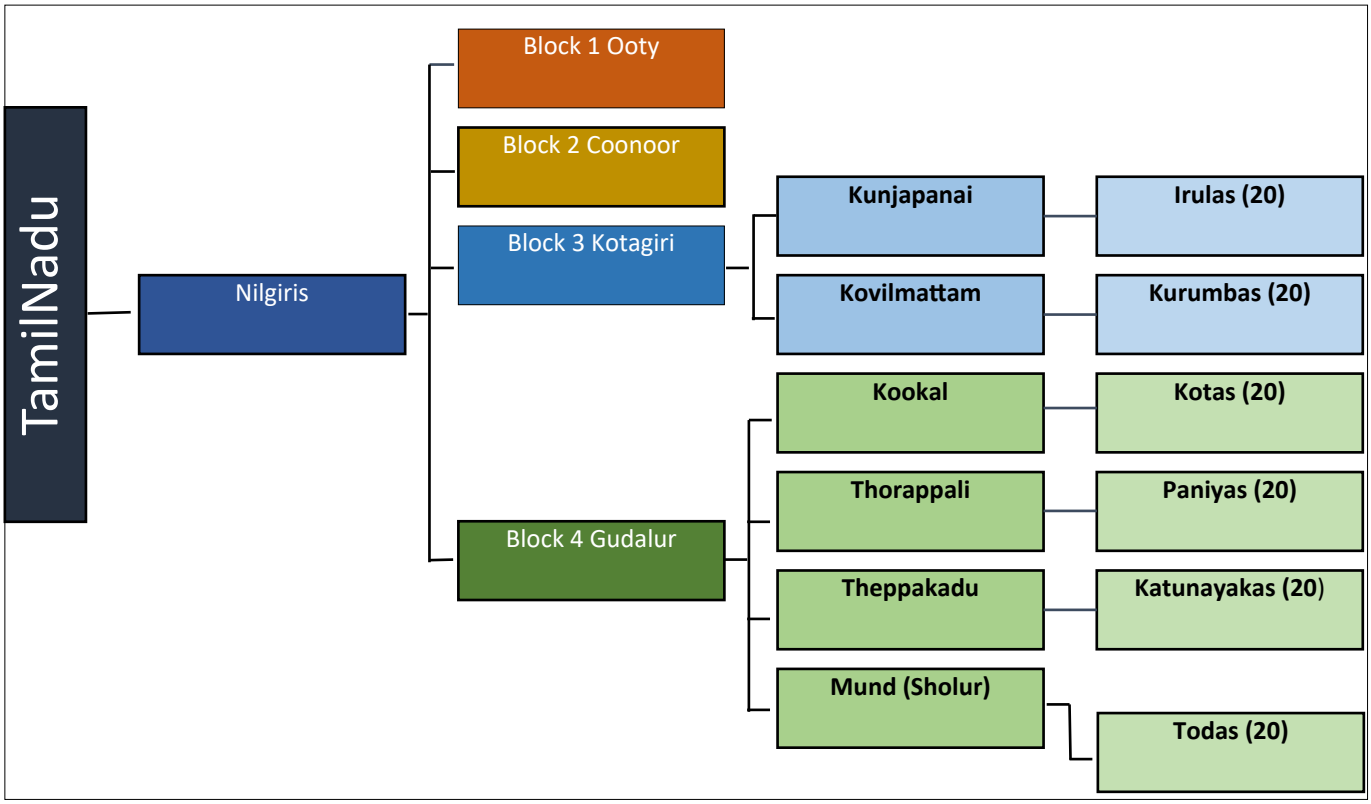

Fig. 2. Sampling procedure employed for the study.

statements were designed to capture insights from tribal respondents. It consisted of clear and practical questions that were amply suited to all categories of respondents. Information regarding the perceptions and knowledge of the tribal communities on traditional medicine was collected through personal interviews, and group discussions with the traditional healers during April and May added more insight and documentation on the same.

Statistical tools

Various statistical and analytical tools have been worked out to assess the knowledge and perceptions of the tribal communities regarding traditional medicinal practices. These methods include arithmetic mean, standard deviation, percentage analysis, SPSS Software for correlation, and multiple regression analysis for measuring the relationship between variables. Mean Scale Value and Rank-Based Quotient were used to rank preferences for perception and constraints respectively.

Mean scale value (MSV)

Perceptions of tribals towards traditional medicinal practices are analyzed using the Mean Scale Value (MSV) score. The MSV represents the sum of the expected scores, obtained by multiplying the frequency with the respective category's scores, divided by the total number of participants (21). This calculation transforms the frequency of each preference into a relative level of comparison. The formula used for determining the mean scale value is as follows:

$$Mean\ Scale\ Value\ (MSV) = \frac{P1 \times 3 + P2 \times 2 + P3 \times 1}{N}$$

Where, $P1$, $P2$, and $P3$ denote the frequency of respondents indicating the preferences respectively, N represents the total number of respondents.

Rank–based quotient

The collected data were analyzed using the Rank-Based Quotient (RBQ) method, a tool employed to draw definitive conclusions regarding the constraints that have the most and least significant impact on the collection and usage of medicinal plants and traditional medicine respectively. The RBQ calculation adhered to the provided formula (22).

$$RBQ = \frac{\sum_{i=1}^{n}(Fi)(n+1-i)}{N \times n} \times 100$$

Where, Fi = Frequency of respondents for ith rank, N = Number of respondents, n = Number of ranks, $\sum n\ i{=}1$ = it directs to sum multiple factors, $\sum (Fi)\ (n + 1 - i)\ n\ i{=}1$ = F1 × n + F2 × n – 1 + F3 × n – 2 Fn × 1

Results

The key findings reveal how various socio-economic factors influence the understanding and practice of traditional medicine within tribal communities. Respondents' perceptions regarding the effectiveness and accessibility of traditional medicine are examined, supported by statistical analyses and Mean Scale Values.

In Table 2, based on age, 38.33% of the respondents in the older age group preferred traditional medicine due to cultural familiarity and trust in these practices. Among younger respondents, 36.66% favored traditional medicine, while 25.00% in the middle-aged group expressed a similar preference. In terms of gender, 56.66% of female respondents showed a greater inclination towards traditional medicine, often due to their role in managing family health.

Table 2. Socio-economic profile characteristics of tribes. (n=120).

S. No	Socio-Economic Profile Characteristics	Category	Percentage (%)
1.	Age	Old	38.33
		Young	36.66
		Middle	25.00
2.	Gender	Female	56.66
		Male	43.33
3.	Education status	Illiterate	27.50
		Secondary and high school (XI to XII std)	25.00
		Functionally Illiterate and Middle School (VI to XII std)	15.83
		Primary School (I to V std)	11.66
		Graduate	4.16
4.	Nature of Family	Nuclear family	77.50
		Joint family	22.50
		Small family size	77.91
		Large family size	20.83
5.	Occupational status	Wage work (Coolie)	62.50
		Horticulture	25.83
		Animal Husbandry	2.50
		Others	9.16
6.	Annual Income	Medium Income (Rs. 60,000 to Rs. 1,20,000)	75.83
		Low Income (Below Rs. 60,000)	14.16
		High Income (Above Rs. 1,20,000)	10.00
7.	Mass media exposure	Medium exposure	65.83
		Low exposure	18.33
		High exposure	15.83
8.	Extension contact	Medium level	74.17
		High level	21.67
		Low level	4.17
9.	Extreme Climatic Event Experienced*	High Heat Wave	100.00
		Low to Medium Heavy Rainfall	89.16
10.	Migration pattern	Return migration	70.00
		Skilled migration	30.00
11.	Food habits	Non- Vegetarian	74.16
		Vegetarian	25.83
12.	Access to Medicinal Facilities**		
	Traditional medicine	Regularly	65.00
		Occasionally	28.33
		Never	6.66
	NGO	Regularly	45.83
		Occasionally	50.83
		Never	3.33
	Government hospital	Regularly	0.83
		Occasionally	26.66
		Never	72.50
13.	Source of information*	Family members	76.66
		Friends	35.83
		Neighbors	10.00

*Multiple responses.

Educationally, 27.50% of the respondents were illiterate, and tribal taboos, poverty, and inadequacy of educational facilities highly influenced this factor. Family structure-wise, 77.50% of the respondents lived in nuclear families, possibly due to their traditional preference for smaller family sizes. Occupationally, 62.50% were wage workers, and only a few of them were involved in horticulture and animal husbandry. Annual income data showed that 75.83% of the respondents had a medium annual income, reflecting low-paid occupations.

Mass media exposure was medium for 65.83% of the respondents, driven by the availability of sources such as television and WhatsApp. The extension contract was medium for 74.17%, an indication of low exposure to government programs caused by the low education levels among the respondents. All the respondents were exposed to extreme climatic events, with heat waves affecting horticulture and the availability of medicinal plants.

Migration was predominantly return migration, accounting for 70%, with a significant portion involving skilled migration amongst the youth. Dietary preferences indicated that 74.16% were non-vegetarians, which was influenced by cultural traditions and resource availability. Concerning access to medicinal facilities, 65% regularly accessed traditional medicine; Non-Government Organization (NGO) services were accessed by 45.83% regularly; government hospitals were minimally accessed. Information sharing remained mostly within families, 76.66%, thereby showing the role of the family in knowledge transmission.

Knowledge of ITK

Results on knowledge and perception regarding ITK in Table 3 revealed that 45.83% of the tribal respondents had medium knowledge, followed by 31.66% with low knowledge, and 22.50% with high knowledge about traditional medicine. The medium and low knowledge levels were due to the tribal impatience over the slow results of traditional medicine, lack of documented knowledge, the influence of modernization shifting preference towards quicker allopathic treatments, reduced knowledge due to migration of the younger generation, and declining biodiversity.

Perception of tribal respondents in practicing traditional medicine

Regarding perceptions of traditional medicine, 70% of the respondent's moderate views, recognizing both its value and limitations. A high perception was observed in 5% of respondents driven by cultural pride, while 25% with low perception favoring modern medical alternatives.

Perception based on mean scale value (MSV)

The analysis of the 15 perception statements is presented here with supportive insight into the views of the tribal respondents. The highest MSV of 2.80 indicates that the most perceived ethnomedicine has no side effects, showcasing strong trust in its safety. This is followed closely by the perception that traditional medicine is accessible at the local community level with an MSV of 2.76, and it is

Table 3. Knowledge and perception level among tribes on traditional medicine.(n=120)

S. No	Section	Details	
1.	**Knowledge of ITK**	**Knowledge Level among tribes**	
		Medium: 45.83 %	
		Low: 31.66 %	
		High: 22.50 %	
		Average Knowledge Score: 7.78	
2.	**Perception of Tribal Respondents in Practicing Traditional Medicine**	**Perception Level among tribes**	
		Medium: 70 %	
		Low: 25 %	
		High: 5 %	
3.	**Perception Based on Mean Scale Value (MSV)**		
	Traditional medicine is considered cost- effective.		2.73
	Traditional medicine is readily accessible within local communities.		2.76
	Traditional medicine is an effective means of treating diseases.		2.63
	Traditional medicine is more effective in curing diseases compared to modern medicine.		2.66
	Traditional medicine is perceived as more accessible or easier to engage with compared to modern medicine.		2.57
	Your preference for Traditional medicine is greater than modern medicine.		2.66
	Ethnomedicine should be recommended for the majority of the population.		2.62
	There is no solution available to effectively treat prevalent lifestyle diseases.		1.45
	Ethnomedicine is suitable for consumption across all age groups.		2.66
	Ethnomedicine is believed to have no side effects.		2.80
	There's a widespread belief in supernatural forces causing illness, leading people to resort to spiritual rituals for both prevention and treatment		2.70
	More than one therapeutic use is exhibited in single medicinal plant.		2.56
	Urbanization, deforestation, drought, and overgrazing collectively threaten medicinal plant populations.		2.61
	Tribal youth possess a broad knowledge of traditional medicine.		2.41
	Tribal youth use traditional medicine to address health issue.		2.42
4.	**Relationship & Contribution of Socio-Economic Profile with Knowledge**	**Significant Positive Association with Knowledge of ITK**	
		Age (X_1)	
		Annual Income (X_7)	
		Extension Agency Contact (X_9)	
		Source of Information (X_{14})	
		Significant Positive Contribution with Knowledge of ITK	
		Age (X_1) (0.581 units increase per 1 unit change)	
		Source of Information (X_{14}) (0.504 units increase per 1 unit change)	
		Extension Agency Contact (X_9) (0.497 units increase per 1 unit change)	
		Significant Positive Association (at 5 per cent level)	
		Occupational Status (X_6)	
		Significant Negative Association (at 5 per cent level)	
		Food Habits (X_{12})	
		Non-Significant Associations	
		Negative: Gender (X_2), Education Status (X_3), Migration Pattern (X_{11})	
		Positive: Family Type (X_4), Family Size (X_5), Mass Media Exposure (X_8), Extreme Climatic Events (X_{10}), Access to Medicinal Facilities (X_{13})	
5.	**R^2 Value**	0.544 (54 per cent variation in ITK knowledge explained by selected variables)	
6.	**F Value**	8.942 (Significant at 1per cent level)	

*Multiple responses.

perceived as cost-effective with an MSV of 2.73, pointing out the practical and economic advantages of traditional healing practices. Confidence in their efficacy is demonstrated by statements such as traditional medicine is effective in curing diseases (MSV of 2.66) and that it is more effective than modern medicine (MSV of 2.66).

Yet another positive observation concerning ethnomedicine is the belief that it is suitable for all ages, with an MSV of 2.66, underlining its broad applicability. This confidence does not suggest obliviousness to the challenges posed by urbanization, deforestation, and threats to medicinal plant populations -concerns still felt within the people, as would be asserted by the MSV of 2.61. Likewise,

the statements regarding the youth's knowledge and use of traditional medicine have been rated relatively low at MSVs of 2.41 and 2.42, respectively, suggesting a probable breakdown in passing on ethnomedical knowledge to the younger generations. The lowest MSV-1.45 represents a kind of general belief that there is no effective solution for prevalent lifestyle diseases, possibly insinuating limitations toward addressing modern health concerns through traditional means.

Overall, the responses reflect strong confidence in the accessibility, cost-effectiveness, and safety of traditional medicine while acknowledging challenges in its sustainability and generational transmission.

Relationship & contribution of socio-economic profile with knowledge

Multiple regression analysis returns the key findings: age, source of information, and extension agency contact as variables significantly contributing to ITK. Older age and more frequent sharing of information were positively related to higher ITK knowledge, while extension contact was also important, therefore underscoring the role of generational knowledge and support in sustaining traditional practices.

Discussion

Constraints faced by the tribals while using traditional medicine

In Table 4, superstitious beliefs held by traditional healers, with a perception level of 81.04, are viewed as a significant factor undermining the credibility and effectiveness of traditional medicine within tribal societies. The preference for modern medicine, perceived at 74.48, reflects its appeal due to faster and more visible outcomes. Youth disengagement, measured at 68.54, exacerbates the issue by limiting the transmission and practice of traditional medicinal knowledge. The time-intensive nature of traditional treatments scores 60.94, while a general disinterest registers at 55.73, further diminishing their appeal. Additionally, limited awareness about traditional medicine, with a perception level of 52.60, leaves people uncertain about its effectiveness. Challenges are compounded by the lack of accessible shops, rated at 41.56, and the lengthy preparation times for traditional remedies, at 33.44. Collectively, these factors pose significant barriers to the ongoing practice and acceptance of traditional medicine.

Table 4. Constraints faced by the tribals while using traditional medicine (RBQ). (n=120)

S. No	Constraints	RBQ Value	Rank
1	Influence of superstitious beliefs among traditional healers	81.04	I
2	Increased intervention of modern medicine	74.48	II
3	Insufficient participation from the younger generation	68.54	III
4	Prolonged time required for traditional medicine to cure ailments	60.94	IV
5	Growing disinterest in traditional medicinal practices	55.73	V
6	Limited awareness about traditional healing methods	52.60	VI
7	Lack of availability of dedicated shops for traditional medicine	41.56	VII
8	Time-consuming preparation process for traditional remedies	33.44	VIII

Strategies to overcome constraints in traditional medicine

A collaborative approach is essential to address the challenges in practicing traditional medicine within tribal communities. Key steps include organizing workshops on remedy preparation, setting up community herb gardens, and creating cooperative centers, which would simplify and improve access to traditional medicine.

To engage youth, traditional medicine could be added to school curricula, along with cultural programs and youth clubs to foster interest. This balanced approach would help bridge traditional and modern health practices through joint health programs and workshops.

Efforts to document and mentor, along with open discussions, are also crucial to dispel superstitions that may weaken trust in traditional medicine. Increased awareness through educational campaigns and materials can further enhance understanding of its value and effectiveness.

Lastly, establishing local markets and cooperatives would ease access and promote the availability of traditional medicine. Together, these steps create a sustainable system that preserves and promotes traditional health practices in tribal communities.

Conclusion

Tribal communities in the Nilgiris district heavily use ITK and traditional medicine in their healthcare practices. At the same time, their biggest rival is modern medicine. The balm for cultural shifts and environmental changes is hard to find, yet these rituals are imbibed in the tribal communities. The results, hence, bring out a complex interplay of various factors such as socio-economic factors, levels of knowledge, and perception about ITK. Superstitions, lack of involvement by the youth, inaccessibility, and other related issues place major constraints on the preservation and use of traditional medicine. Addressing these factors would mean designing a mitigation strategy to focus directly on these issues through increasing education, community sensitization, and access to sustain this invaluable heritage for the future.

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Authors' contributions

PBM carried out the survey, formulated the manuscript and analyzed the data. NA guided the research by formulating the research concept and approved the final manuscript. CF contributed by developing the ideas, reviewing the manuscript and helping in procuring research grants. PB helped in summarizing and revising the manuscript. GS helped in summarizing and statistical analysis of data.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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