**Scientific rationality, adoption and perceived effectiveness of ethnomedical practices on diabetics in Idukki District, Kerala, India**

**Abstract**

Idukki district, located in Kerala, is home to nine distinct ethnic groups residing within the interior forest areas, each possessing unique cultural practices, religious rites, food traditions, and social structures that distinguish them from one another. These communities maintain a strong awareness and practice of indigenous medicine, particularly in the management of diabetes. The aim of the study is to identify the significant role of ethnomedical practices (EMPs) in managing diabetes among tribal communities in Idukki District, Kerala, India. The study was carried out among tribal farmers of Idukki district, Kerala. Forty gramapanchayats were selected for the study. A total of 90 tribal healers cum old age farmers and 452 tribal farmers were the respondents of this study. Ethno Medical Practices (EMPs) provide a vital medical precedent for chronic conditions such as diabetes, offering a wide array of phytochemical compounds with various pharmacological activities of therapeutic interest. The study recorded twenty-three EMPs on Diabetics. Of the twenty-three EMPs, nine were assessed for their scientific rationality and adoption, of which nine were studied for their perceived effectiveness among tribal farmers. Of the nine practices, all nine were found to be rational. In this study, the scientific rationale behind the nine rational EMPS was also explained. Nine practices were adopted by 56.19 to 99.33 per cent of the respondents. Of the nine EMPS studied for effectiveness, all were perceived as effective by the tribal farmers, and this revealed that many EMPS for Diabetics were found to be both rational and effective. This requires more clinical and pharmacological interference to validate and standardise EMPs, which will consecutively pave the way for the development of a low-cost and effective alternative health care system.

**Key words:** Ethnomedical practices, adoption, perceived effectiveness, Diabetics, medical systems

1. **Introduction**

The existence of medical systems in India can be said to date from the time of the earliest civilisation in the subcontinent. The systems evolved with time, as foreign invaders, travellers, and missionaries came, and they brought with them practices being followed in their countries. These got assimilated into the culture of the local inhabitants (Roy, 2019). “The indigenous systems of medicine continue to serve many inhabitants, particularly in rural and tribal areas, for the treatment of various ailments despite the advent of modern medicine. Among these health concerns, envenomation remains a significant, dangerous, and often neglected issue, constituting a major occupational hazard, especially among agricultural communities. Many of these communities typically have inadequate access to modern health care systems and face poor availability of specific treatments, owing to insufficient health services and medical infrastructure in rural regions. Ethno Medical Practices (EMPs) provide a vital medical precedent for chronic conditions such as diabetes, offering a wide array of phytochemical compounds with various pharmacological activities of therapeutic interest. EMPs have been integral to the health and cultural identity of indigenous communities worldwide, encompassing holistic approaches such as the use of medicinal plants, rituals, and traditional healing methods” (Awoke & Cosendey, 2025; Asharaf et al.2021).

“During the past few decades, the use of medicinal plants has been significantly increased due to the side effects of synthetic and modern medicine. Additionally, the high cost of modern medicine leads the developing countries to go for cheap, efficient and safe traditional herbal medicine” (Tamang et al., 2023). Idukki district, located in Kerala, is home to nine distinct ethnic groups residing within the interior forest areas, each possessing unique cultural practices, religious rites, food traditions, and social structures that distinguish them from one another. These communities maintain a strong awareness and practice of indigenous medicine, particularly in the management of diabetes. The aim of the study is to identify the significant role of EMPs in managing diabetes among tribal communities in Idukki District, Kerala, India.

1. **Objectives:**
2. To survey and document ethno-medical practices related to diabetic treatment among the tribal farmers of Idukki;
3. To scientifically evaluate selected EMPs for their therapeutic validity
4. To determine the level of adoption and perceived effectiveness of these selected EMPs within the community.
5. **Methodology**

“In the first phase of the study, nine major different tribal groups of the Idukki district were selected, and they were Muthuvan, Mannan, Malayaraya, Ullada, Hill Pulayan/ Mala Pulayan, Paliyan, Malavedan and Malapandaram. The local health care system includes EMPs, and the sampling procedure was designed to cover tribal healers from all major tribal groups. All eight blocks in the district were purposively selected based on the high percentage and scattered population of the tribal farmers after discussing with officers from the Integrated Tribal Development Project (ITDP), Todupuzha. Ten tribal healers and farmers aged more than 60 years and with experience of more than 30-40 years from each tribal group were identified through judgment sampling, in consultation with the tribal promoter workers of each village panchayat office, making a total of 90 respondents for elucidating EMPS on diabetics. The information has been gathered on diabetics through the participatory informal interview method. Nine focus group discussion sessions were also conducted (one per tribal group) to confirm the authenticity and refine the information gathered, in which a total of 111 healers and farmers participated. A total of twenty-three items of EMPS on diabetics were documented through this method. In the second phase, after excluding the tribal group and block-specific EMPs, a rationality analysis on the remaining 9 EMPS was performed. The collection of 9 EMPs chosen was administered using a four-point continuum to experts who were asked to judge the rationality or otherwise. The response categories were rational based on scientific evidence, rational based on experience, irrational based on experience, and irrational based on scientific evidence with a scores of 4, 3, 2, and 1, respectively” **(Somasundaram, 1995; Husain, 2011)**. The respondents were drawn from among the Agadathanthra (Toxicology) scientists of various Ayurveda and Siddha medical colleges from Kerala and Tamil Nadu.

 A total of 64 experts belonging to Agadathanthra were approached, and 52 responded by returning the filled-out questionnaires. The mean score was calculated for each EMPS, and those with a mean score of 2.5 and above were identified as rational, and those below 2.5 were considered irrational.

With experts' guidance, the underlying principles of the rational EMPS were also articulated during data collection on rationality using open-ended questions. For validating the EMPS, 43 experts from the Dravyaguna (Ayurvedic Pharmacology) department were contacted.

 In the third phase, the extent of adoption and perceived effectiveness of the EMPs among tribal farmers were assessed using a structured interview schedule. Two or more villages in each of the eight blocks, viz., Adimali, Devikulam, Nedumkandam, Elamdesam, Idukki, Kattappana, Todupuzha and Azhutha, were selected. Thus, a total of forty village panchayats spread over the blocks were selected. The following formula, published by the National Education Association, was used to determine the sample size **(Krejcie and Morgan, 1970).**

$$s=\frac{X^{2}NP(1-P)}{d^{2}\left(N-1\right)+X^{2}P(1-P)}$$

Where:, {s = required sample size, X² = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.8416) (1.96 X1.96 = 3.8416), N = the population size, P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size), d= the degree of accuracy expressed as a proportion (0.05)}.

Thus, a total of 452 tribal farmers were selected through a proportionate random sampling technique.

In this study, adoption was operationalised as whether an individual respondent had ever practised the selected EMPs. For this purpose, the collection of selected EMPs was extensively described to the tribal farmers, discussing whether the EMP in question had ever been followed in the past. If the answer was "Yes," a score of one was assigned, and zero was given if the answer was "No." The scores allocated to a specific EMP by all respondents were summed up, and an adoption index was established to determine the degree of adoption.

$$Adoption index of EMPs=\frac{Number of farmers adopted}{Number of farmers having applicability}X 100$$

Perceived effectiveness of the EMPs, i.e., the degree of the relative usefulness of the EMP as perceived by the farmers in resolving the health issues in diabetics, was measured using the Perceived Effectiveness Index (PEI) methodology developed by **Sundaramari (2001) and followed by Sakeer Husain (2011).**

A mean perceived effectiveness index (MPEI) of 3 was assumed to be the most effective, and the most ineffective was found to be an MPEI of 1. An average effective EMP would get an MPEI of 2.0. Hence, EMPs with MPEI of greater than 2 were considered effective, as per farmers' perception and others as less effective. EMPs on diabetics adopted by more than 50 per cent of farmers were alone selected for assessing their perceived effectiveness.

**Result and Discussion**

**Scientific rationale behind the rational EMPs for Diabetics**

Diabetic’ mellitus, a chronic metabolic disease, is characterised by elevated blood glucose levels and insufficiency in insulin production and action. In the present study, nine indigenous herbal formulations, which consist of diverse plant ingredients, were evaluated in terms of rationality. In the case of diabetics, nine EMPs were selected for the study, and all these practices were found as rational by the scientists.

It could be observed from the Table 1 that almost all the plants used in the rational EMPs were found to contain various phytochemicals such as flavonoids, marmeline, coumarin, glycosides, vitamins, ascorbic acid, terpenoids, steroids, alkaloids, saponins, etc. in different combinations as indicated against each medical practices in the above Table. These phytochemicals are indicated to possess hypoglycaemic, antioxidant, and hypolipidemic activities, which would cure diabetics and related issues.

This inference drives support from the study of **Gaikwad et al., (2014),** who reported that various natural products like alkaloids, glycosides, flavonoids, terpenoids, and polyphenols have their activity in the management of diabetes and its associated complications.

**Table 1. Practice-wise rationality, adoption and perceived effectiveness of EMPs on Diabetes**

There are nine EMPs for diabetics, consisting of nine medical plant species. The detailed results are explained in the Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl.No** | **Ethno-Medical Practices** | **Rationality** | **Adoption** | **MPEI** |
| **Number** | **%** |
| 1 | EMP 1Black catechu (*Acacia catechu (L.) Willd., Oliv./ sundra*) 200 ml decoction prepared by boiling 5 gm sun-dried wood shavings in 400 ml water, shelf life of 1 day, taking twice a day on an empty stomach for 33 days to cure diabetes. | 3.17R | 445 | 98.45 | 2.57E |
| 2 | EMP 2Bael (*Aegle marmelos (L.) Corrêa*) 30 ml leaf extract with a shelf life of 1 hour, taken on an empty stomach for 21 days to cure diabetes. | 3.35R | 449 | 99.33 | 2.52E |
| 3 | EMP 3Winter melon/ Ash gourd (*Benincasa hispida (Thunb.) Cogn.*) 30 ml fresh fruit extract taken on an empty stomach to cure diabetes. | 2.65R | 254 | 56.19 | 2.32E |
| 4 | EMP 4Ivy gourd (*Coccinia indica*) Whole plant paste (a plant having seven days old) mixed in 100 ml tender coconut water and a pinch of burned garlic with a shelf life of 1 day, taking once a day on an empty stomach for 47 days to cure diabetes. | 3.12R | 280 | 61.94 | 2.25E |
| 5 | EMP 5Insulin plant (*Costus igneus*) 10 ml fresh leaf extract with a shelf life of 1 hour, taken once a day on an empty stomach tocure diabetes. | 2.55R | 422 | 93.36 | 2.67E |
| 6 | EMP 6Cow plant (*Gymnema sylvestre*) 3 gm leaf powder mixed with a few drops of sour gruel taken twice a day on an empty stomach to cure diabetes. | 3.00R | 357 | 78.98 | 2.51E |
| 7 | EMP 7Touch me not (*Mimosa pudica L*.) 10 ml whole plant extract mixed with a pinch of turmeric powder, taken twice a day on anOur diabetes. | 2.52R | 435 | 96.23 | 2.41E |
| 8 | EMP 8Gooseberry (*Phyllanthus emblica*) Formulation prepared by mixing 10 ml fruit extract, 5 ml Tinospora cordifolia extract, and 1 gm turmeric powder with a shelf life of 1 day, taken once on an empty stomach to cure diabetes. | 2.87R | 326 | 72.12 | 2.58E |
| 9 | EMP 9Heart-leaved moon-seed (*Tinospora cordifolia*) 20 gm whole plant powder and 5 gm koduveli leaf powder mixed with boiled water, with a shelf life of 1 day, taken twice a day for 60 days to cure diabetes. | 3.00R | 363 | 80.30 | 2.33E |

It could be observed from Table 1 that all nine EMPs had been rated as rational, and none were found irrational. Five EMPS (1, 2, 5, 7, and 9) were found adopted by more than 80 percent of the respondents, three EMPs (4, 6 and 8) were found adopted by more than 60 to 80 percent of the respondents, and one (EMP-3) was adopted by 56.19 percent of the respondents.

In general, all the EMPs were adopted by more than fifty (56.19%) per cent of the respondents.

People with diabetes are among all the older tribal farmers, and they have adopted the EMPs for better curing through various formulations; they perceive it as time-tested through thousands of farmers; hence, their adoption is high. It is evident from the table that all the practices are found to be effective. The following EMPs, which were perceived as effective by the tribal farmers, had a rationality score of more than three, 1, 2, and 4. EMP 1 was adopted by 98.45 per cent of the respondents with an MPEI of 2.57. The major ingredient of the practice is Acacia catechu. The phytochemicals present in the plant extract possess an insulin-like effect, probably through peripheral glucose consumption or enhancing the sensitivity of beta cells to glucose, resulting in increased insulin release **(Jarald et al., 2009).** These might be the reasons for the wider adoption of this EMP.

EMP 2 was adopted by 99.33 per cent of the respondents with an MPEI of 2.52. Aegle marmelos extract effectively reduced oxidative stress and produced a reduction in blood sugar. Leaf extract of A. marmelos also possesses antioxidant and hypoglycemic activity (**Upadhya et al., 2004).** Its leaf extract significantly influenced the diabetic pancreas and showed an improved functional state of pancreatic beta cells. It also indicates the hypoglycemic nature of the leaf extract, helping in the regeneration of the damaged pancreas.

The leaf extract of A. marmelos is effective as insulin in restoring blood glucose and body weight to normal levels. The leaf extract can reduce oxidative stress and affect antioxidant levels to diminish the elevated level of blood sugar**.** It was found that the marmalosin possessed the highest significant reduction in blood glucose level **(Ram et al., 2012).** Hence, the EMP might have been rated as rational. EMP 4 was adopted by 61.94 per cent of respondents with an MPEI of 2.25. Coccinia indica contains terpenoids, which are found to be responsible for antidiabetic activity **(Deokate and Khadabadi, 2011)**. Phytochemicals present in C. indica act like insulin, which corrects the elevated enzymes G-6-P (ase), LDH in the glycolytic pathway, and restoration of the LPL activity, lipolytic pathway, with the control of hyperglycemia in diabetes **(Kuriyan et al., 2008).** This may be the reason for the adoption of this EMP.

From the above, it could be seen that nine EMPS were selected for the study in diabetics, of which all nine EMPS were judged as rational by the scientists. All nine EMPs were adopted by more than fifty per cent of the respondents and perceived as effective.

**Conclusion**
 The study underscores the significant role of ethnomedical practices (EMPs) in managing diabetes among tribal communities in Idukki District, Kerala. All nine EMPs evaluated were scientifically rational, demonstrating phytochemical constituents like flavonoids, terpenoids, and alkaloids with proven hypoglycemic, antioxidant, and insulin-mimetic properties. These practices exhibited high adoption rates (56.19% to 99.33%) and were perceived as effective by tribal farmers, reflecting their deep-rooted trust in traditional knowledge and its experiential validation over generations.

The findings highlight the convergence of indigenous wisdom and scientific rationale, offering a promising foundation for low-cost, accessible diabetes management in resource-limited settings. However, clinical and pharmacological studies are imperative to standardise dosages, validate efficacy, and ensure safety. Such efforts could integrate these EMPs into mainstream healthcare, bridging gaps in rural medical access while preserving cultural heritage. Policymakers and healthcare stakeholders must prioritise interdisciplinary collaboration to harness this potential, fostering sustainable, culturally sensitive health solutions for diabetic care.

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Details of the AI usage are given below:

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