Ethnobotanical approaches to anorectal disorders in tribal communities of Chhattisgarh, Central India

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Research

Abstract

Background: The Indian state of Chhattisgarh, known for its rich forest biodiversity and traditional medicinal knowledge, has a long-standing heritage of using plants to treat various ailments. However, no ethnobotanical study has specifically focused on the treatment of haemorrhoids in this region. This study was conducted to document the medicinal plants used by traditional healers in the Surguja district for haemorrhoid treatment.

Methods: Ethnobotanical data were collected from 22 traditional healers across 11 villages in the Ambikapur, Mainpat, and Udaipur blocks of Surguja district through semi-structured interviews. Use Value (UV), Fidelity Level (FL), and Jaccard Index (JI) were calculated to assess cultural importance, consensus, and regional similarity.

Results: A total of 47 plant species, belonging to 44 genera and 33 families, were recorded for the treatment of haemorrhoids and other ailments. UV values ranged from 0.23 to 1.36, with *Achyranthes aspera* L. and *Aegle marmelos* (L.) Corrêa showing the highest UV (1.36), followed by *Asparagus racemosus* Willd., *Calotropis procera* (Aiton) W.T.Aiton, and *Tinospora crispa* (L.) Hook. f. & Thomson (UV = 1.27). FL ranged from 11.76% to 80%, with the highest value recorded for *Musa × paradisiaca* L. and *Cynodon dactylon* (L.) Pers. (80%). The highest similarity (8.57%) was observed with ethnobotanical data from Manipur.

Conclusion: This study is the first to report medicinal plant use for haemorrhoid treatment in Chhattisgarh. Several species showed high cultural value and are recommended for further phytochemical, pharmacological, and in silico investigations to explore their therapeutic potential.

Keywords: Ethnobotany, Haemorrhoids, Medicinal Plants, Traditional Healers, Use Value

Background

Haemorrhoids, commonly known as piles, are vascular structures located in the anal canal that contribute to maintaining anal continence (Acheson and Scholefield 2008; Hong *et al.* 2022). These structures can become swollen or inflamed, leading to haemorrhoidal disease, which is categorized into three types: (i) internal haemorrhoids, arising above the dentate line and covered by the anal mucosa; (ii) external haemorrhoids, located below the dentate line and covered by the anoderm; and (iii) mixed-type haemorrhoids (American Gastroenterological Association 2004). Internal haemorrhoids are further classified into four grades based on severity (Lohsiriwat 2015). Common symptoms include itching, bleeding, mucosal soiling, and pain (Brisinda 2000).

The average incidence of hemorrhoidal illness in the overall population is estimated to range from thirteen percent to thirty-six percent (Vysloužil *et al.* 2010), with a predicted prevalence of nearly fifty percent among individuals aged 45 to 65 years old (Everhart, 2008). In India, this condition is equally widespread, with approximately 5% of the population suffering from haemorrhoids at any given time, and about 50% expected to develop it by the age of 50 (Agarwal *et al.* 2017). Significant discomfort, incapacity, and a decline in quality of life are caused by hemorrhoidal illness (Hong *et al.* 2022). In addition, it is recognized as a significant socioeconomic and medical issue that places an enormous burden on the medical field (Kibret *et al.* 2021). However, there is little data on the avoidable risk factors for hemorrhoidal illness. Numerous studies have suggested various risk factors, including older age, female gender, poorer socioeconomic position, pregnancy, diarrhoea, lack of physical exercise, non-vegetarian diet, alcohol use, sedentary lifestyle, constipation, prolonged abdominal straining, and obesity; however, the results show inconsistent patterns (Johanson, 1997; Rees *et al.* 2011; Riss *et al.* 2012; Lee *et al.* 2014; Peery *et al.* 2015; Mary *et al.* 2020; Pata *et al.* 2021). Hemorrhoidal illness can be treated with both invasive surgical techniques and non-invasive medicinal therapies, depending on the severity of the condition (Song and Kim, 2011; Cerato *et al.* 2015; Gallo *et al.* 2020; Júnior *et al.* 2020; Van Tol *et al.* 2020; Picciariello *et al.* 2021; Stratta *et al.* 2021). However, all these therapies are expensive (Watson *et al.* 2016), and there is a chance of the disease reappearing (Bove *et al.* 2009). Therefore, it is crucial to search for new traditional or herbal medicinal plants that can be utilized to cure haemorrhoids permanently and naturally.

Given the limitations of conventional treatments, there is a growing interest in exploring traditional and herbal medicines for haemorrhoid management. Various ethnobotanical studies have documented medicinal plants used for treating haemorrhoids in different cultures (Tomba Singh, 2014; Akbulut *et al.* 2019; Karaköse *et al.* 2019; Ariyo *et al.* 2020; Karaköse, 2022; Kacholi and Mvungi Amir, 2022; Şen *et al.* 2022) but existing knowledge remains fragmented, and many regions lack comprehensive documentation. The ethnobotanical knowledge of indigenous communities plays a crucial role in primary healthcare, especially in areas where modern medical facilities are limited. Traditional medicines, derived from various plant parts such as roots, tubers, and leaves, have been widely used for generations due to their cost-effectiveness and minimal side effects (Bhatia *et al.* 2014a, 2014b; Sharma *et al.* 2012). However, this knowledge is rapidly disappearing due to modernization and urbanization (Lu *et al.* 2022). If not recorded systematically, invaluable ethnomedicinal information may be lost.

Chhattisgarh, a state in central India, is rich in biodiversity and home to several indigenous communities, including the Gond and Oraon tribes, known for their deep-rooted traditional knowledge. These tribes rely heavily on plant-based remedies for treating various ailments, including haemorrhoids, in the absence of accessible healthcare services (Chandra & Paswan 2020; Koreti 2016). Surguja, a district in northern Chhattisgarh, is densely forested and inhabited by numerous tribal groups who continue to practice traditional medicine. Previous ethnobotanical studies in India have primarily focused on general medicinal plants rather than specific ailments like haemorrhoids (Kunjam et al., 2013; Kala, 2009; Panda *et al.* 2022). To the best of our knowledge, no comprehensive ethnobotanical study specifically addressing haemorrhoid treatment has been conducted in this region.

Thus, the present study aims to bridge the existing knowledge gap by systematically documenting and analysing the medicinal plants traditionally employed for haemorrhoid treatment among the indigenous communities of Surguja district, Chhattisgarh. By engaging with experienced traditional healers across multiple tribal groups, this research seeks to explore cross-cultural similarities and variations in ethnomedicinal practices, thereby providing insights into culturally embedded healing systems. The study further aims to preserve and scientifically validate this traditional knowledge, contributing to the development of sustainable, community-based, and cost-effective therapeutic alternatives, while supporting future ethnopharmacological and conservation-oriented initiatives.

Materials and Methods

Study area

Surguja, a beautiful district situated in the northern part (lies between latitudes 23° 37' 25'' to 24° 6' 17'' and 81° 34' 40'' north to longitude 84° 4' 40'' east) of Chhattisgarh state, is filled with 9488.22 sq km of forests. Mixed deciduous forest, sal forest, and river forest are mostly seen. Due to these factors, approximately 100 cm - 200 cm of rainfall is received by the Surguja district (https://surguja.gov.in/). Tribes like Oraon, Kanwar, Gond etc., live in or around these forests, with most of them, apart from agriculture, depending on forests for food, timber, and firewood (Bhoi and Ahirwar 2025; Bhoi et al., 2025).

Ethical considerations and data collection

Ethical clearance for the present study was obtained from the Institutional Ethics Committee of Guru Ghasidas Vishwavidyalaya, Bilaspur (Reference No: GGV/IEC/2024/03/012). Prior to initiating fieldwork, official permission was secured from the District Forest Office, Surguja (Ref. No/M.C./3986; Dated: 28-11-2022) to access forested areas and collect botanical specimens for herbarium preparation and taxonomic authentication. The ethnobotanical survey was conducted between January and December 2023, encompassing eleven villages across the Ambikapur, Mainpat, and Udaipur blocks of Surguja district, Chhattisgarh, India (Fig. 1).

The identification of traditional healers was conducted during field visits in consultation with local community members. Selection was not based on age, but rather on the local reputation and long-term practical experience of individuals known for treating haemorrhoids. Those healers whose names were consistently recommended by villagers were approached as key informants (Fig. 2). A purposive sampling method was therefore used to ensure the inclusion of participants possessing authentic ethnomedicinal knowledge. All interviews and discussions were conducted in the Chhattisgarhi and Hindi languages, depending on the comfort and preference of the informants. Before initiating data collection, the aim and academic nature of the research under Guru Ghasidas Vishwavidyalaya were clearly explained. The study purpose was introduced as an effort to document, preserve, and acknowledge indigenous ethnomedicinal knowledge for scientific and cultural recognition. Ethical considerations were strictly followed. Informed consent was obtained before each interview, and participants were reassured of confidentiality, voluntary participation, and the protection of traditional intellectual property rights throughout the research process.

Data collection was conducted through semi-structured interviews, covering three core components: (i) sociodemographic information, including participant names, sex, age, educational background, occupation, years of healing experience, and sources of ethnomedical knowledge (Table 1); (ii) haemorrhoid treatment practices, detailing vernacular plant names, growth forms, plant parts used, dosage, preparation methods, and routes of application (Table 2); and (iii) additional ailments treated using the same plant species (Table 2). To ensure data reliability, information was cross-validated through multiple informants and further triangulated with existing ethnobotanical literature.

Plant Sample collection and identification

Plant samples were collected during guided field walks with traditional healers. Wherever possible, specimens were collected in their flowering or fruiting stages to facilitate accurate identification. Before collection, photographs of each plant were taken in its natural habitat for documentation purposes (Fig. 3). A standard plant collection methodology was followed. Collected specimens were pressed in the field using portable plant presses and later dried and mounted on standard herbarium sheets, with appropriate labels containing scientific name, locality, date of collection, collector name, and voucher specimen number. Herbarium preparation adhered to the protocol described by Alexiades (1996). Plant identification was performed with the assistance of Dr. Ramesh Kumar Ahirwar using available literature and regional floras (Hooker 1885; Murthy and Panigrahi 1999). Scientific names were further verified and updated through World Flora Online (WFO, 2024). The final voucher specimens were assigned collection numbers and deposited in the Herbarium of the Department of Botany, Guru Ghasidas Vishwavidyalaya, Bilaspur (Acronym: DKBS) for long-term reference.

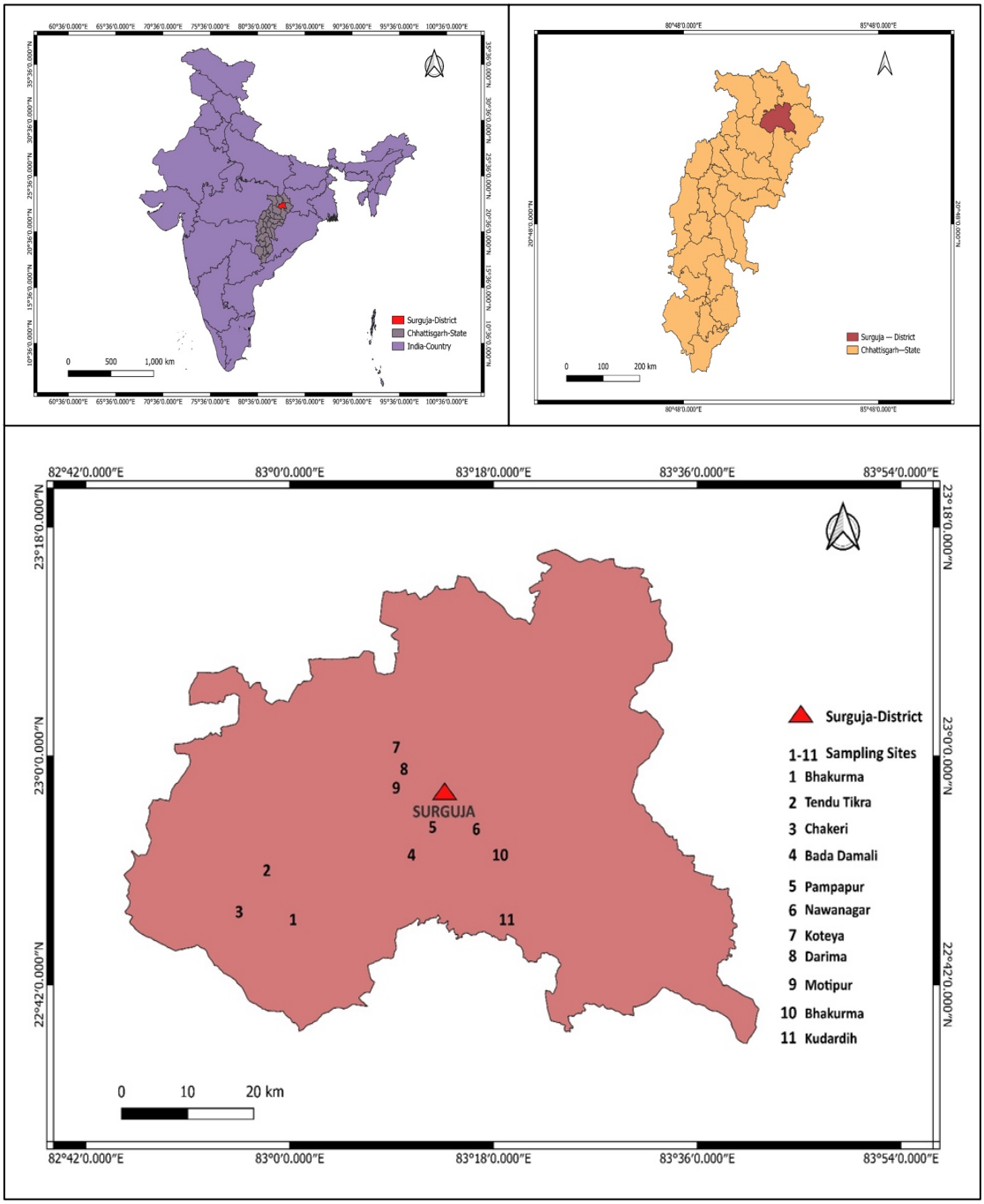

Figure 1. Geographical map of the study area in district Surguja, Chhattisgarh, India (Map has been originally prepared by the authors using QGIS (Version 3.40.8) based on openly available spatial data layers)

Figure 2. Photographs of the traditional healers

Woodfordia fruticosa (L.) Kurz

Leucas aspera (Willd.) Link

Cannabis sativa L.

Azadirachta indica A.Juss.

Figure 3. Photographs of the documented medicinal plant species

Data Analysis

Fidelity level (FL)

The percentage of respondents who use a certain plant species for identical purposes is known as the fidelity level (FL). The FL value is calculated by using the given formula.

$$FL\ (\%) = \frac{Np}{N} \times 100$$

Here, 'Np' = represents the number of those surveyed (participants) who mentioned using the plant to treat a particular ailment, and 'N' = represents the overall number of participants who mentioned using the species to treat any type of illness (Friedman *et al.* 1986).

Use value (UV)

The Use value (UV) represents the relative importance of local vegetation, including medicinal plants. It was computed using the following formula (Phillips *et al.* 1994):

$$UV = \sum \frac{Ui}{N}$$

Where, 'N' =the total number of respondents questioned about a certain plant, 'UV'= the utilisation value for a species, and 'Ui' =the total number of informants identified by each participant for a particular plant species. UV has been utilised to determine which plants are more frequently used. Therefore, UV is high when more traditional healers or informants cite the plant species, and it is low when few citations are made.

Jaccard index (JI)

By contrasting the most recent results with previously published research from the same regions and abroad, the Jaccard index (JI), also known as the novelty index, was calculated using the given formula (Jaccard, 1902):

$$JI = \frac{C \times 100}{A + B - C}$$

Where, 'A' =the number of species of the area 'A', 'B' = the number of species of the area 'B', and 'C' = the number of species common to A and B.

Results and Discussion

Sociodemographic information of the traditional healers

In the present study, a total of twenty-two traditional healers were documented through semi-structured interviews (Table 1). Among them, twenty were males and two were females, with ages ranging from 35 to 90 years, indicating the involvement of both middle-aged practitioners and elderly custodians of traditional knowledge. Most of the male healers were engaged in agriculture, while one was a retired school teacher; the two female healers were homemakers. The healers were identified as belonging to five tribal sub-groups, namely Gond (4), Barge (3), Oraon (8), Kanwar (6), and Manjhwar (1), demonstrating the cultural diversity of the study area. In terms of education, the majority had not received formal schooling, while a few had attained primary to secondary-level education. Only one healer had completed higher secondary education and had previously served as a teacher. The predominance of non-literate healers suggests that ethnomedicinal knowledge continues to be preserved and transmitted outside formal educational systems.

Traditional knowledge was reported to have been acquired primarily through oral transmission. It was learned from gurus (senior healers), fathers, grandfathers, spouses, elder relatives, and through personal experiential practice. This indicates that an informal apprenticeship-based learning system is functioning within the community, wherein knowledge is sustained through observation, memory, and long-term experience rather than written records. The duration of healing practice varied considerably among the participants. Eight healers had practiced for 1-10 years, five for 11-20 years, four for 21-30 years, three for 31-40 years, one for 41-50 years, and one healer had more than 50 years of healing experience. The presence of highly experienced healers reflects the deep-rooted continuity of indigenous healing traditions across generations.

The predominance of male healers may be attributed to cultural norms in which medicinal knowledge and ritual authority are traditionally transmitted through male lineages. Although women may possess knowledge of home-based remedies, their participation as publicly recognized healers appear to be restricted by domestic responsibilities and socio-cultural expectations. The low literacy levels among healers further indicate that traditional healing practices rely more on inherited cultural memory than on formal institutional training. Since agriculture was observed as the primary occupation of most healers, healing is practiced as a parallel activity integrated into daily livelihood rather than as a separate professional identity. Overall, the observations highlight a strong association between cultural identity, ecological knowledge, and community-based healthcare practices. This underscores the necessity of documenting and safeguarding these orally transmitted traditions, particularly in the context of ongoing socio-cultural transitions and modernization, which may pose risks to their continuity.

Anti-haemorrhoidal plant diversity and their growth forms

The study documented 47 plant species belonging to 44 genera and 33 families, traditionally used by healers in Surguja District for the treatment of haemorrhoids (Table 2) and 56 other human ailments (Table 3). Among the recorded families, Lamiaceae emerged as the most represented, comprising five species, followed by Fabaceae, Apocynaceae, and Solanaceae, each with three species. Malvaceae, Moraceae, Poaceae, and Amaranthaceae were represented by two species each, while the remaining 22 families had one species each (Fig. 4).

The dominance of Lamiaceae in the study area can be attributed to its well-documented medicinal properties, including the presence of bioactive compounds such as flavonoids, alkaloids, and essential oils, which exhibit anti-inflammatory, antimicrobial, and analgesic properties (Yayli *et al.* 2014; Nieto, 2017; Uritu *et al.* 2018; Çelik *et al.* 2021). The Lamiaceae family includes approximately 7,173 species across 236 genera, primarily distributed in the Mediterranean region, Central Asia, and parts of South Asia, including India (Thakur *et al.* 2021). Additionally, species of Lamiaceae are widely distributed and easily accessible, making them a preferred choice for traditional healers (Navia *et al.* 2022). The higher representation of this family aligns with findings from other ethnobotanical studies, where Lamiaceae has been frequently reported for its diverse pharmacological activities. This suggests that the prevalence of Lamiaceae in traditional medicine is influenced not only by its availability but also by its well-established therapeutic efficacy.

Herbs represented the highest proportion of medicinal plants (53%), whereas climbers accounted for the lowest (8%). The widespread presence of various herbal species can be attributed to favourable climatic conditions, such as abundant rainfall. Herbs are often chosen for treating illnesses because of their accessibility and proven effectiveness, as highlighted by researchers (Asnake *et al.* 2016; Kassa *et al.* 2020; Liu *et al.* 2023; Meragiaw *et al.* 2016; Tefera and Kim, 2019). Compared to trees, herbs typically exhibit slower growth cycles therefore require less area for cultivation; this property may help with plant conservation initiatives. Their annual availability and resistance to invasive species and environmental stressors could explain their widespread use (Bekele *et al.* 2022). Additionally, evidence suggests that variations in culture, agroecology, geography, and accessibility may influence the diversity in the utilization of medicinal plants. Interestingly, a study by Ariyo *et al.* (2020) in Nigeria also highlighted the use of *Azadirachta indica* A.Juss. and *Allium sativum* L. in managing haemorrhoidal conditions, both of which were similarly recorded in the present investigation. However, a notable difference lies in the plant part utilized: while Nigerian traditional healers reported the use of *A. indica* roots, our study documents the use of its bark for treating haemorrhoids. This variation underscores the rich diversity and regional specificity in ethnomedicinal knowledge, even when the same species are employed.

Plant parts used, and foods avoid during treatment

In the treatment of haemorrhoids, leaves were the most used plant part (33.33%), whereas tubers, bulbs, seeds, and stems were the least used (1.96% each) (Fig. 5). For the treatment of other human ailments, roots were most frequently used (37.8%), while tubers, bulbs, and seeds were the least utilized (1.69% each). Non-vegetarian food was advised against by all traditional healers during the dosage period. Additionally, spicy foods, chilli pakoda, alcohol, tea, oily foods, tapioca sago, milk, and milk products were also advised against by some traditional healers (Table 2).

This is consistent with other research indicating that leaves are often utilized in traditional medicine because of their accessibility, simplicity, and efficacy, which is attributed to a high concentration of secondary metabolites. Nevertheless, the over-harvesting of leaves during dry seasons can pose difficulties and be detrimental to the reproductive cycles of plants. These findings are supported by the research of various scholars and studies conducted in different parts of the world (Chekole, 2017; Jima and Megersa, 2018; Tahir *et al.* 2016; Tuasha *et al.* 2018). In contrast to these findings, several studies have highlighted the predominance of roots, as well as stems and entire plants, in traditional medicine. This data is corroborated by the research conducted by numerous scholars around the globe (Hu *et al.* 2020; Mwaura *et al.* 2020).

Pharmacological effect of anti-haemorrhoidal plants

Interestingly, several plant species recorded in this study not only hold traditional significance but are also pharmacologically supported for treating haemorrhoids due to their therapeutic properties. For instance, *Cannabis sativa* L. has been scientifically proven to exhibit strong anti-nociceptive activity, which aligns with its traditional use in relieving haemorrhoidal pain (Menezes *et al.* 2021). Likewise, *Nerium oleander* L., though toxic in higher doses, shows venotoxic potential that could influence vascular responses involved in haemorrhoidal swelling (Mota, 2016). Equally notable is *Azadirachta indica* A.Juss. (neem), a cornerstone of Indian ethnomedicine, which demonstrates well-established anti-inflammatory effects, helping to reduce pain and inflammation associated with piles (Okpanyi and Ezeukwu, 1981). These scientific validations not only enhance the credibility of traditional knowledge but also point to promising leads for developing plant-based therapeutic interventions for haemorrhoids.

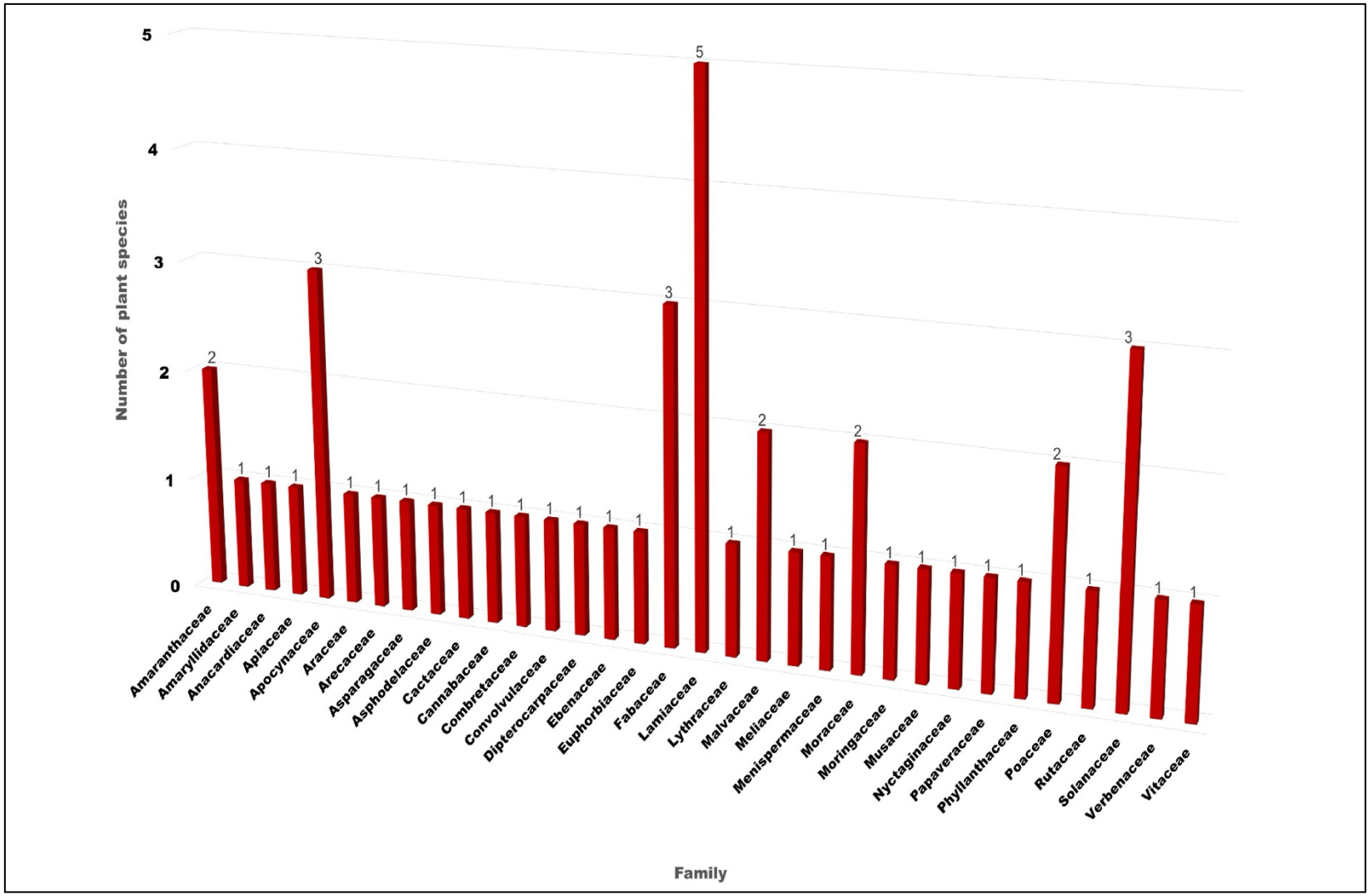

Figure 4. Family details of the medicinal plants in the study area.

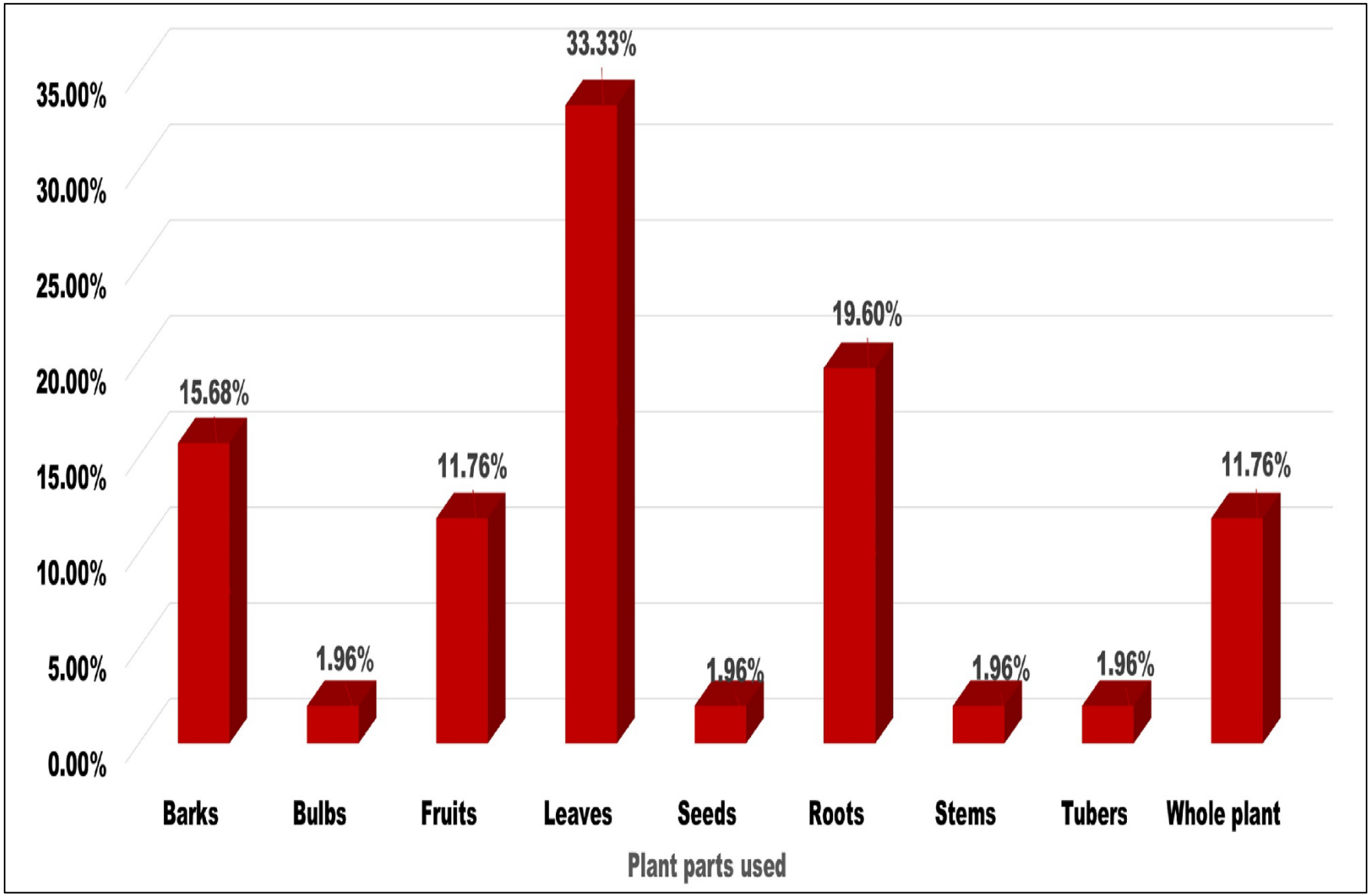

Figure 5. Plant parts used in the treatment of haemorrhoids.

Harmful effects of some anti-haemorrhoidal plants

Traditional healers in Surguja district have stated that *Calotropis procera* (Aiton) W.T.Aiton. and *Nerium oleander* L. plants are considered poisonous. It is advised to keep both plants away from children, and precautions should be taken to ensure that the latex of these two plants does not come into contact with the eyes and mouth. Individuals with allergies are advised to avoid these plants. *Calotropis procera* (Aiton) W.T.Aiton and *Nerium oleander* L. have also been documented as poisonous plants in other regions (Baloch, 2017).

Fidelity level (FL)

In the present investigation, the Fidelity Level (FL) values of 47 medicinal plant species used for treating haemorrhoidal disorders ranged from 11.76% to 80% (Table 3), reflecting varying degrees of cultural importance and perceived efficacy among informants. The highest FL value (80%) was recorded for two widely recognized species: *Musa × paradisiaca* L. (banana) and *Cynodon dactylon* (L.) Pers. (durva grass), both commonly used and highly trusted in traditional haemorrhoid remedies. Following closely, Phoenix dactylifera L. (date palm), *Vitis vinifera* L. (grape), *Withania somnifera* (L.) Dunal (ashwagandha), and *Allium sativum* L. (garlic) exhibited high FL values of 75% and 73.33%, respectively, indicating a strong cultural consensus on their therapeutic relevance for this specific ailment. Conversely, some plant species showed notably low FL values, suggesting limited or less consistent usage for haemorrhoid treatment. The lowest FL was observed in *Solanum virginianum* L. with just 11.76%. Other species with low consensus included *Ocimum basilicum* L. and *Nerium oleander* L. (both at 16.66%), *Coriandrum sativum* L. (17.64%), and *Achyranthes aspera* L. (23.33%). A high FL indicates that a particular plant is predominantly used for one specific purpose, often reflecting its perceived effectiveness and trust in traditional healing practices (Tardío and Pardo-De-Santayana, 2008). These values serve as a valuable ethnobotanical metric to identify culturally significant species, as they reflect the collective knowledge and preferences of the community (Karaköse, 2022). As observed in our study, FL increases with the frequency of use for a specific disease (Rehman *et al.* 2024). While previous ethnobotanical studies on haemorrhoids have documented medicinal plants (Ariyo *et al.* 2020; Kacholi and Mvungi Amir, 2022; Tomba Singh, 2014), they often overlooked a detailed interpretation of FL values. Our research uniquely contributes to this field by offering a more focused exploration of FL in the context of haemorrhoidal treatment, thereby enhancing the understanding of species prioritization and traditional healthcare patterns in the study region.

Use value (UV)

In the present ethnobotanical investigation, the Use Value (UV) of recorded medicinal plants ranged from 0.23 to 1.36, reflecting a wide variation in local therapeutic knowledge and frequency of use. At the lower end of the spectrum, *Woodfordia fruticosa* (L.) Kurz exhibited the lowest UV (0.23), followed by *Colocasia esculenta* (L.) Schott, *Ficus semicordata* Buch. -Ham. ex Sm., and *Hemidesmus indicus* (L.) R. Br., each with a UV of 0.32. These species, though recognized, appear to have limited application in local healthcare systems, potentially due to restricted availability, lesser-known therapeutic effects, or declining transmission of indigenous knowledge (Chaudhary *et al.* 2006).

Conversely, several species demonstrated exceptionally greater UVs, highlighting their dominant role in traditional medicine. *Asparagus racemosus* Willd., *Calotropis procera* (Aiton) W.T.Aiton, and *Tinospora crispa* (L.) Hook. f. & Thomson each recorded a UV of 1.27, indicating their frequent and widespread use. Most notably, *Achyranthes aspera* L. and *Aegle marmelos* (L.) Corrêa emerged as the most valued species, both attaining the greater UV of 1.36. These findings underscore a strong consensus among informants regarding their therapeutic efficacy and cultural importance.

The high UV values suggest that these plants are not only deeply embedded in local healing traditions but are also likely to be easily accessible and versatile in application (Ullah *et al.* 2014). In contrast, low UVs may reflect knowledge erosion, ecological constraints, or narrow ethnomedicinal scope. Importantly, our study reveals that the species with the highest UVs—*Aegle marmelos* (L.) Corrêa*, Achyranthes aspera* L.*, Tinospora crispa* (L.) Hook. f. & Thomson*, Calotropis procera* (Aiton) W.T.Aiton*,* and *Asparagus racemosus* Willd. are commonly utilized in the treatment of haemorrhoids. Although previous studies have reported their ethnomedicinal relevance (Ariyo *et al.* 2020; Kacholi & Mvungi Amir, 2022; Tomba Singh, 2014), the present research is the first to quantitatively highlight their Use Values in this context. This finding provides a new dimension to the understand of their cultural significance and encourages further pharmacological and phytochemical investigation to validate their efficacy and broaden their clinical potential.

Jaccard index (JI)

The Jaccard similarity analysis provided important insights into the cultural specificity and ethnomedicinal uniqueness of haemorrhoid treatments practiced in Surguja. When compared with five earlier documented studies, the Surguja dataset showed the highest similarity with Manipur, India (JI = 8.57), suggesting a relatively closer therapeutic affinity likely shaped

by shared tribal ancestry, similar ecological conditions, and comparable cultural perceptions of disease and healing (Tomba Singh, 2014). In contrast, studies conducted in South-Western Nigeria (JI = 6.11) Soladoye et al., 2010), the Tabora region of Tanzania (JI = 4.28) (Kacholi and Mvungi Amir, 2022), Ede, Nigeria (JI = 3.70) (Israel, 2022), and Ibadan, Nigeria (JI = 2.85) (Ariyo et al., 2020) exhibited markedly lower degrees of similarity (Table 4). This reduced overlap reflects the influence of multiple interacting factors, including ecological differences influencing plant availability, geographical barriers restricting knowledge exchange, and the deeply embedded, lineage-based modes of knowledge transmission characteristic of Surguja's traditional healing culture. Variations in ailment interpretation, ritual-based treatment customs, healer specialization, and cultural symbolism of medicinal plants further contribute to distinctive ethnopharmacological patterns across regions (Ullah et al., 2014). The finding that 91.43 percent of recorded species were unique to Surguja underscores the presence of an exceptionally localized and culturally conserved therapeutic system. This highlights both the richness of regional ethnomedicinal heritage and the urgency of systematic documentation and scientific validation to ensure its continuity amid rapid socio-cultural transitions.

Novelty of the study

This study represents the first comprehensive ethnobotanical investigation specifically focused on the treatment of haemorrhoids in Chhattisgarh, India. The research was conducted in the Surguja district to address a notable gap in the available literature, as no systematic documentation of plant-based remedies for this ailment had previously been reported from the region. The traditional knowledge shared by experienced healers, passed down through generations, was carefully documented and analysed. Most of the reported plant species are being recorded for haemorrhoid treatment in Chhattisgarh for the first time, highlighting their cultural and therapeutic significance. Although certain species have been mentioned in global ethnomedicinal studies for similar uses, detailed dosage information for haemorrhoid treatment was unavailable until now. The present study provides comprehensive information on preparation techniques, modes of administration, and frequency of use. Such detailed ethnopharmacological knowledge is rarely documented in earlier studies and is systematically presented in Table 2. Through this work, a unique therapeutic tradition practiced by tribal communities of Surguja has been brought to light. The ethnobotanical record of Chhattisgarh has been substantially enriched, providing a strong foundation for future phytochemical and pharmacological validation. Moreover, the study underscores the urgent need to preserve this traditional medical wisdom, which is increasingly at risk due to cultural transitions and diminishing knowledge transmission.

Conclusion

This study documented a diverse repertoire of medicinal plants employed by traditional healers of Surguja for the treatment of haemorrhoids, highlighting the region's longstanding ethnomedicinal heritage. Among the recorded species, *Ocimum tenuiflorum* L., *Azadirachta indica* A. Juss., and *Moringa oleifera* Lam. exhibited comparatively higher fidelity values, reflecting their consistent therapeutic relevance and cultural trust within the community. These plants, therefore, represent strong candidates for future scientific examination, including phytochemical characterization, bioactivity assays, and in silico modeling, to elucidate their active constituents and underlying mechanisms of action. By addressing a previously unreported ethnomedicinal domain in Chhattisgarh, the present investigation fills a critical gap in both regional and global literature. The documentation of preparation techniques, dosage patterns, and routes of administration provides a level of detail that is rarely preserved in oral traditions. However, the knowledge system remains vulnerable, largely due to diminishing intergenerational transmission and limited formal recognition of traditional healers. To ensure the long-term preservation and sustainable utilization of this cultural heritage, initiatives such as capacity-building among healers, community-based knowledge archives, and collaborative research networks are essential. Future studies should focus on validating the pharmacological efficacy of prioritized species and exploring potential synergistic effects among multi-herb formulations traditionally used for haemorrhoids.

Table 1. Sociodemographic information of the renowned traditional healers in the district Surguja, Chhattisgarh

Number of traditional healers	Age	Gender	Name of tribes	Education	Occupation	Work experience in years	Sources of knowledge	Number of haemorrhoid patients treated
TH-1	45	Male	Uraon	5th	Fishery	10	Guru (Traditional teacher)	≥22
TH-2	60	Male	Barge	Never attended a school	Farmer	13	Relatives	≥30
TH-3	35	Female	Barge	3rd	Housewife	8	Husband	≥15
TH-4	65	Male	Gond	Never attended a school	Farmer	23	Self	≥85
TH-5	90	Male	Kanwar	Never attended a school	Farmer	65	Guru (Traditional teacher)	≥20
TH-6	66	Male	Gond	Never attended a school	Farmer	35	Father and Grand father	≥35
TH-7	65	Male	Gond	12th	Retired Teacher	28	Guru (Traditional teacher)	≥20
TH-8	66	Male	Gond	Never attended a school	Farmer	27	Father	≥12
TH-9	68	Male	Uraon	Never attended a school	Farmer	40	Old man	≥34
TH-10	60	Male	Uraon	Never attended a school	Farmer	40	Father	≥25
TH-11	40	Male	Manjhwar	Never attended a school	Farmer	8	Guru (Traditional teacher)	≥12
TH-12	45	Male	Uraon	5th	Farmer	20	Self	≥40
TH-13	45	Female	Uraon	Never attended a school	Housewife	15	Father	≥20
TH-14	50	Male	Kanwar	2nd	Farmer	30	Father	≥100
TH-15	71	Male	Uraon	Never attended a school	Farmer	50	Father	≥62
TH-16	45	Male	Uraon	Never attended a school	Farmer	7	Father	≥15
TH-17	47	Male	Uraon	10th	Farmer	12	Father	≥15
TH-18	49	Male	Kanwar	5th	Farmer	12	Father	≥10
TH-19	72	Male	Barge	Never attended a school	Farmer	22	Father	≥45
TH-20	63	Male	Kanwar	8th	Farmer	15	Father	≥08
TH-21	54	Male	Kanwar	8th	Farmer	20	Self	≥25
TH-22	67	Male	Kanwar	5th	Farmer	8	Father	≥20

Abbreviations: TH = Traditional Healer

Table 2. Medicinal plants used in the treatment of haemorrhoids and other various human disease treatments in the district Surguja, Chhattisgarh, India.

Scientific name [Voucher number]	Family	CN	LN	Habit	PPU	Dosages for haemorrhoids	FTADT	OVHDT	PPUIOHDT	PSM	Reference	ΣUi	UV
***Abelmoschus esculentus* (L.) Moench [DKBS-011]**	Malvaceae	Ladies finger	Bhindi	Herb	Root	Consume the root paste of this plant in the morning before breakfast for three consecutive days.	Non veg	Inflammation (TUR-08), stomach irritation (TUR-04)	Root	Pectin, flavonoids, saponin	(Borokini *et al.* 2022; Sengkhamparn *et al.* 2010)	18	0.82
***Abutilon hirtum* (Lam.) Sweet [DKBS-005]**	Malvaceae	Indian mallow	Bachanghi	Herb	Leaves	In the morning, before breakfast, consume a drink made from the paste of leaves for 5 to 7 days.	Non veg, Spicy foods	Gonorrhoea (TUR-05), inflammation (TUR-04)	Root	Flavonoids, phenolic compounds, tannins	(Qari, 2023)	13	0.59
***Achyranthes aspera* L. [DKBS-081]**	Amaranthaceae	Chaff-flower	Chirchira	Herb	Root	Mix a cup of root powder with warm water and drink it both in the morning and evening for 21 days.	Non veg, Milk and Milk products	Asthma (TUR-12), insect (TUR-08) and snake bites (TUR-03)	Root	Tannins, terpenoids, protein, reducing sugar	(Dhale and Bhoi, 2013)	30	1.36
***Aegle marmelos* (L.) Corrêa [DKBS-030]**	Rutaceae	Wood apple	Bel	Tree	Fruit	The fruit pulp of the tree is taken during piles for laxative stool.	Non veg, Tapioca Sago	Cancer (TUR-15), blood pressure (TUR-03)	Leaves	Coumarins, alkaloids, marmelin, aegelenine, ethanol	(Akhouri *et al.* 2020; Manandhar *et al.* 2018)	30	1.36

***Allium sativum* L. [DKBS-042]**	Amaryllidaceae	Garlic	Lahsun	Herb	Bulb	Boil garlic, peel the cover, make a paste by adding mustard oil, and apply it to the piles area 3 to 5 times a day for three consecutive days.	Non veg, Chilli pakoda	Bronchitis (TUR-03), abdominal pain (TUR-01),	Bulb	Phenols, terpenoids	(Jini *et al.* 2022)	15	0.68
***Aloe vera* (L.) Burm.f. [DKBS-007]**	Asphodelaceae	Alo vera	Gheegwar	Herb	Whole plant	Consume the paste of the whole plant on an empty stomach for 3 to 7 days.	Non veg, Alcohol	Psoriasis (TUR-04), ulcers (TUR-03)	Whole plant	Phlobatannins, anthroquinones, flavonoids	(López *et al.* 2013)	10	0.45
***Argemone mexicana* L. [DKBS-025]**	Papaveraceae	Mexican poppy	Satyanashi	Herb	Root	Every morning takes root juice of this plant for 14 days in empty stomach.	Non veg, Alcohol	Fever (TUR-12)	Root	Berberine, muramine	(Brahmachari *et al.* 2013)	24	1.09
***Asparagus racemosus* Willd. [DKBS-036]**	Asparagaceae	Asparagus	Satawari	Herb	Tuber	Prepare juice from the tuber and consume it twice a day for one week.	Non veg, Alcohol	Tuberculosis (TUR-07), diabetes (TUR-08), gynaecological disorder (TUR-05)	Tuber	Saponins, sapogenins	(Bopana and Saxena, 2007)	28	1.27
***Azadirachta indica* A.Juss. [DKBS-044]**	Meliaceae	Indian lilac	Neem	Tree	Bark	Consume the paste made from the bark twice a day for	Non veg, Spicy foods	Fever (TUR-03), cancer (TUR-03), mouth ulcer	Bark, Leaves	Anthraquinone, phenols,	(Jafari *et al.* 2013)	21	0.95

						a duration of 15 to 30 days.		(TUR-02), wound (TUR-04)		isoquercetin		
***Boerhavia repens* L. [DKBS-018]**	Nyctaginaceae	Red Hogweed	Gadpurna	Herb	Whole plant	Drink the paste made from the whole plant on an empty stomach every morning for two weeks.	Non veg, Alcohol	Anaemia (TUR-07)	Whole plant	Rotenoids, lignans, xanthones	(Mishra *et al.* 2014)	10	0.45
***Calotropis procera* (Aiton) W.T.Aiton [DKBS-004]**	Apocynaceae	Apple of sodom	Akawan	Herb	Root	Consume the root paste before breakfast for a period of 7 to 14 days.	Non veg, Alcohol	Dog bite (TUR-16)	Root	Coroglaucigenin, calotropin, calotropagenin	(Rabelo *et al.* 2021)	28	1.27
***Cannabis sativa* L. [DKBS-035]**	Cannabaceae	Hemp	Ganja	Herb	Leaves	Make a paste from 4 to 5 leaves of this plant and consume it on an empty stomach in the morning for a duration of 3 days.	Non veg, Alcohol	Asthma (TUR-03), epilepsy (TUR-02)	Leaves, Root	Cannabidiol, cannabichromene, cannabigerol	(Di Sotto *et al.* 2022)	14	0.64
***Chenopodium album* L. [DKBS-043]**	Amaranthaceae	Wild spinach	Bhathiwa	Herb	Leaves	Consume the paste made from the leaves every morning for a duration of 3 weeks.	Non veg, Alcohol	Eye problem (TUR-05), hair growth (TUR-03)	Leaves	Flavonoids, phenolic acids, terpenoids	(Chamkhi *et al.* 2022)	14	0.64

***Colocasia esculenta* (L.) Schott [DKBS-038]**	Araceae	Taro	Kochai	Herb	Leaves	Drink the paste made from fresh leaves on an empty stomach in the morning for 3 days.	Non veg, Alcohol	Insects' bites (TUR-02)	Root	Terpenes, glycoside, phenol	(Mitharwal *et al.* 2022)	7	0.32
***Coriandrum sativum* L. [DKBS-016]**	Apiaceae	Coriander	Dhaniya	Herb	Leaves, Seeds	Consume a paste made from leaves, seeds, or a combination of both, on an empty stomach twice a day for one week.	Non veg, Alcohol	Diabetes (TUR-14)	Leaves, Seeds	Tocol, carotenoids, sterol, flavonoids	(Fattahi *et al.* 2021)	17	0.77
***Cuscuta reflexa* Roxb. [DKBS-008]**	Convolvulaceae	Giant dodder	Akash bel	Climber	Whole plant	Take the paste of the plant on an empty stomach in the morning for a period of 14 to 21 days.	Non veg, Tapioca Sago	Cancer (TUR-05), inflammation (TUR-01)	Whole plant	Saponins, phenols, flavonoids	(Sharma *et al.* 2021)	12	0.55
***Cynodon dactylon* (L.) Pers. [DKBS-013]**	Poaceae	Bermuda grass	Doobghash	Herb	Leaves	Drink the paste made from leaves in the morning and evening for a duration of 14 to 21 days.	Non veg, Tea	Urine retention (TUR-02),	Leaves	Hydroquinone, alpha-tocopherol, p-coumaric acid	(Savadi *et al.* 2020)	10	0.45

***Diospyros melanoxylon* Roxb. [DKBS-019]**	Ebenaceae	Coromandel ebony	Tendu	Tree	Leaves	Drink a paste made from fresh leaves on an empty stomach every morning for a duration of 7 to 14 days.	Non veg, Alcohol	Anaemia (TUR-03), diabetes (TUR-06)	Root, Bark	Steroids, glycosides, alkaloids	(Sahu *et al.* 2020)	13	0.59
***Euphorbia hirta* L. [DKBS-014]**	Euphorbiaceae	Hairy spoorge	Dudhiya	Herb	Whole plant	In the morning and evening, consume the paste made from the whole plant for a period of 7 to 14 days.	Non veg, Alcohol	Dengue fever (TUR-07)	Leaves	Gallotannins, hydroxybenzoic, tri-O-galloyl-glucose isomers	(Mekam *et al.* 2019)	13	0.59
***Ficus benghalensis* L. [DKBS-022]**	Moraceae	Banyan tree	Bargad	Tree	Leaves	Mix the paste of one fresh leaf with a glass of water and consume it on an empty stomach in the morning and evening for 7 days.	Non veg, Alcohol	Female sterility (TUR-10)	Root	Flavonoids, phenolic compounds, saponins	(Bhaskara Rao *et al.* 2014)	15	0.68
***Ficus semicordata* Buch.-Ham. ex Sm. [DKBS-031]**	Moraceae	Drooping fig	Dumer	Tree	Fruit	Consume 4 to 5 ripe fruits in the morning for 7 days.	Non veg, Alcohol	Menstrual disorders (TUR-03)	Immature fruit	α-ylangene, α-copaene, 4-methylanisole	(Chen *et al.* 2009)	7	0.32
***Hemidesmus indicus* (L.) R. Br. [DKBS-028]**	Apocynaceae	Indian sarsaparilla	Anantmool	Climber	Root	Take the root paste in the morning for a	Non veg, Alcohol	Snake bites (TUR-02)	Root	Phenolics, tannin, flavonoid	(Nandy *et al.* 2021)	7	0.32

						period of 5 to 7 days.							
***Lantana camara* L. [DKBS-006]**	Verbenaceae	Lantana Red Sage	Raymuniya	Shrub	Leaves	After coming from the latrine, mix a paste of 5 leaves with mustard oil and apply it to the piles area for 5 days.	Non veg, Alcohol	Eczema (TUR-01), asthma (TUR-06)	Root, Leaves	Gautin, tricin, hispidulin	(Sousa *et al.* 2015)	15	0.68
***Leucas aspera* (Willd.) Link [DKBS-033]**	Lamiaceae	Thumba	Chota Hulkusha	Herb	Whole plant	Drink the juice extracted from the whole plant in the morning for a duration of 21 days.	Non veg, Alcohol	Psoriasis (TUR-02), cough (TUR-03)	Whole plant	Terpenoids, polyphenols, alkaloids, flavonoids	(Kumar *et al.* 2023)	11	0.50
***Mangifera indica* L. [DKBS-039]**	Anacardiaceae	Mango	Amaa	Tree	Bark	Consume the paste made from barks every morning for two to three consecutive weeks.	Non veg, Alcohol	Heat strokes (TUR-02), bladder catarrh (TUR-03)	Bark, Root	Gallotannins, benzophenone	(Oliveira *et al.* 2016)	9	0.41
***Mimosa pudica* L. [DKBS-024]**	Fabaceae	Shy plant	Chuimui	Herb	Leaves	Consume the paste made from leaves every morning for two consecutive weeks.	Non veg, Oily foods	Brain damage (TUR-03), psoriasis (TUR-02)	Root	Quinines, coumarin, glycosides	(Kenmogne *et al.* 2023)	11	0.50

***Moringa oleifera* Lam. [DKBS-020]**	Moringaceae	Drum stick	Munga	Tree	Bark	Consume the paste made from the bark in the morning and evening for a period of 21 days.	Non veg, Alcohol	Liver damage (TUR-01), hair growth (TUR-08), diabetes (TUR-06)	Bark, Leaves	Resins, saponins, glycosides, flavonoids	(Biswas *et al.* 2020)	20	0.91
***Musa × paradisiaca* L. [DKBS-041]**	Musaceae	Banana	Kela	Herb	Fruit	On an empty stomach, take one ripe banana with camphor in the morning and evening for 3 days.	Non veg, Alcohol	Hypertension (TUR-02), leprosy (TUR-01)	Fruit	Flavonoids, phlobatannins, glycosides, terpenoids	(Abdel Ghany *et al.* 2019)	15	0.68
***Nerium oleander* L. [DKBS-026]**	Apocynaceae	Rosebay	Kaner	Shrub	Root	Mix root powder with water and drink it twice a day for a duration of 7 to 21 days.	Non veg, Alcohol	Cancer (TUR-15)	Root	Saponin, cardiac glycoside, alkaloid, tannin	(Bakir Çilesizoğlu *et al.* 2022)	18	0.82
***Ocimum gratissimum* L. [DKBS-010]**	Lamiaceae	Clove basil	Ramtulsi	Herb	Leaves	Drink the paste made from leaves on an empty stomach for one week.	Non veg, Alcohol	Cough (TUR-11)	Leaves	Apigenin, xanthomicro, luteolin, nepetoidin	(Ugbogu *et al.* 2021)	17	0.77
***Ocimum tenuiflorum* L. [DKBS-015]**	Lamiaceae	Holy basil	Tulsi	Herb	Leaves	Take the paste made from leaves in the morning and evening for a period of 10 to 15 days.	Non veg, Alcohol	Kidney stones (TUR-02), anxiety (TUR-01), cold (TUR-04)	Root, Leaves	Phenolics, terpenoids, phenyl propanoids, flavonoids, steroids	(Singh and Chaudhuri, 2018)	11	0.50

***Ocimum basilicum* L. [DKBS-001]**	Lamiaceae	Sweet basil	Tulsi	Herb	Leaves	Drink the paste made from leaves on an empty stomach for one week.	Non veg, Alcohol	Cancer (TUR-15)	Root	Phenolic compounds, flavonoid, antioxidant	(Mahmoudi *et al.* 2020)	18	0.82
***Opuntia tuna* (L.) Mill. [DKBS-040]**	Cactaceae	Erect Pricklypear	Nagfani	Shrub	Whole plant	Consume the paste made from the whole plant and apply it to the affected area for 3 to 7 days.	Non veg, Alcohol	Neuron problem (TUR-13)	Whole plant	Polyphenols, polysaccharides, flavonoids	(Bastola *et al.* 2022)	19	0.86
***Phoenix dactylifera* L. [DKBS-021]**	Arecaceae	Date palm	Khajoor	Tree	Root	Consume the root paste with a glass of water in the morning before breakfast for a duration of 3 days.	Non veg, Alcohol	Fever (TUR-03)	Root	Polyphenols, flavonoid, tannins	(Bouhlali *et al.* 2017)	12	0.55
***Phyllanthus emblica* L. [DKBS-002]**	Phyllanthaceae	Indian gooseberry	Anwla	Tree	Fruit	Take dried fruit powder or raw fruit juice with water twice a day for a period of 7 to 10 days.	Non veg, Alcohol	Wound (TUR-02), immunity booster (TUR-10), hair problem (TUR-08)	Bark, Fruit	Flavonoids, polyphenols, rutin, kaempferol	(Ur-Rehman *et al.* 2007)	25	1.14
***Physalis angulata* L. [DKBS-012]**	Solanaceae	Cutleaf ground cherry	Rasbhari	Herb	Leaves	Drink the juice extracted from leaves twice a day for	Non veg, Alcohol	Headaches (TUR-06)	Leaves	Phygrine, withanone, acnistins,	(Liang *et al.* 2024)	9	0.41

						a duration of 21 days.				withanolides			
***Pongamia pinnata* (L.) Pierre [DKBS-065]**	Fabaceae	Indian beech	Karanj	Tree	Leaves, Bark	Consume a paste made from both leaves and bark on an empty stomach in the morning and evening for a period of 7 days.	Non veg, Alcohol	Cancer (TUR-04), wound (TUR-07)	Leaves, Bark	Terpenoids, alkaloids, phenolics, flavonoids, anthraquinones	(Priya *et al.* 2024)	16	0.73
***Saccharum officinarum* L. [DKBS-055]**	Poaceae	Sugar cane	Ganna	Herb	Root	Mix dried root powder with warm water and consume it in the morning for a period of 3 to 7 days.	Non veg, Alcohol	Fertilization (TUR-10)	Stem juice	Luteolin, caffeic, tricin	(Duarte-Almeida *et al.* 2011)	17	0.77
***Saraca asoca* (Roxb.) W.J.de Wilde [DKBS-027]**	Fabaceae	Asoka tree	Ashok	Tree	Bark	Consume the paste made from bark in the morning and evening, twice a day, for a period of 2 weeks.	Non veg, Alcohol	Syphilis (TUR-03), bone fracture (TUR-05)	Bark, Root	Catechins, epicatechin, gallic acid	(Hegde *et al.* 2018)	14	0.64

***Shorea robusta* C.F.Gaertn. [DKBS-143]**	Dipterocarpaceae	Sal	Sal	Tree	Bark	Mix fresh bark paste with honey and warm water, then drink it in the morning for a duration of 7 days.	Non veg, Alcohol	Ear pain (TUR-04), itching (TUR-06)	Bark, Root	Shoreaphenol, alkaloids, sterols, resins	(Saraswathy *et al.* 1992)	18	0.82
***Solanum virginianum* L. [DKBS-037]**	Solanaceae	Sticky nightshade	Choti Kateri	Herb	Leaves, Fruit	Consume the paste made from both fruit and leaves in the morning and evening for a period of 10 to 15 days.	Non veg, Alcohol	Tooth decay (TUR-15)	Root	Saponin, flavonoid	(Patel *et al.* 2012)	17	0.77
***Terminalia chebula* Retz. [DKBS-045]**	Combretaceae	Harada	Harra	Tree	Fruit, Bark	Consume either dried fruit powder or bark paste on an empty stomach in the morning for a duration of 21 days.	Non veg, Alcohol	Jaundice (TUR-03), asthma (TUR-10)	Bark	Corilagin, punicalagin, phenols, chebulanin, chebulic acid	(Bag *et al.* 2013)	24	1.09
***Tinospora crispa* (L.) Hook. f. & Thomson [DKBS-009]**	Menispermaceae	Bitter grape	Giloy	Climber	Stem	Make a paste from the stem, boil it in water, and take it twice a day for a period of 7 days.	Non veg, Alcohol	Scabies (TUR-10), common cold and cough (TUR-08), fever (TUR-05)	Stem	Alkaloids, terpenoids, flavonoids, flavone glycosides	(Haque *et al.* 2023)	28	1.27

***Vitex negundo* L. [DKBS-034]**	Lamiaceae	Chinese chaste tree	Nirgundi	Shrub	Bark	Consume the paste made from bark twice a day for a duration of 15 days.	Non veg, Alcohol	Menstrual cramps (TUR-04), mouth ulcer (TUR-02)	Bark, Leaves	Flavonoids, lignans, terpenoids	(Zheng *et al.* 2015)	17	0.77
***Vitis vinifera* L. [DKBS-003]**	Vitaceae	Grapes	Angoor	Climber	Root	Consume the juice of the root paste on an empty stomach for approximately 15 days.	Non veg, Alcohol	Sore throats (TUR-02)	Root	Epigallocatechin-3-gallate, quercetin, resveratrol, flavonoid	(Karimi *et al.* 2020)	8	0.36
***Withania somnifera* (L.) Dunal [DKBS-017]**	Solanaceae	Indian ginseng	Ashwagandha	Shrub	Root	Take the root paste in the morning for a period of 5 to 7 days.	Non veg, Alcohol	Rheumatism (TUR-01), cuts (TUR-02)	Root, Leaves	Alkaloids, flavonoids, withanolides	(Mukherje e *et al.* 2021)	12	0.55
***Woodfordia fruticosa* (L.) Kurz [DKBS-023]**	Lythraceae	Fire flame bush	Dhatki	Herb	Leaves	Take one cup of leaves paste twice a day for a duration of 7 days.	Non veg, Alcohol	Dysentery (TUR-02)	Leaves	Anthraquinone glycosides, tannins, flavonoids, steroids	(Das *et al.* 2007; Mishra *et al.* 2022)	5	0.23

Abbreviations: S.No. = Serial number, CN= Common name, LN= Local name, PPU= Plant parts used, FTADT= Foods to avoid during treatment, PPUIOHDT= Plant parts used in other human disease treatment, OVHDT= Other various human disease treatment, PSM= Plant secondary metabolites, ΣUi= The total number of informants for a particular plant species that each participant mentioned, TUR= Total use report, and UV= Use value.

Table 3. Fidelity level (FL) of medicinal plants in the study area.

Scientific name [Voucher number]	Total number of informants who mentioned the plant for any use	Disease treated	Fidelity level in percentage
Abelmoschus esculentus **(L.) Moench [DKBS-011]**	18	Haemorrhoids (TUR-06)	33.33
		Inflammation (TUR-08)	44.44
		Stomach irritation (TUR-04)	22.22
Abutilon hirtum **(Lam.) Sweet [DKBS-005]**	13	Haemorrhoids (TUR-4)	30.76
		Gonorrhoea (TUR-05)	38.46
		Inflammation (TUR-04)	30.76
Achyranthes aspera **L. [DKBS-081]**	30	Haemorrhoids (TUR-07)	23.33
		Asthma (TUR-12)	40
		Insect bites (TUR-08)	26.66
		Snake bites (TUR-03)	10
Aegle marmelos (L.) Corrêa [DKBS-030]	30	Haemorrhoids (TUR-12)	40
		Cancer (TUR-15)	50
		Blood pressure (TUR-03)	10
Allium sativum **L. [DKBS-042]**	15	Haemorrhoids (TUR-11)	73.33
		Bronchitis (TUR-03)	20
		Abdominal pain (TUR-01),	6.66
Aloe vera **(L.) Burm.f. [DKBS-007]**	10	Haemorrhoids (TUR-03)	30
		Psoriasis (TUR-04)	40
		Ulcers (TUR-03)	30
Argemone mexicana **L. [DKBS-025]**	24	Haemorrhoids (TUR-12)	50
		Fever (TUR-12)	50
Asparagus racemosus **Willd. [DKBS-036]**	28	Haemorrhoids (TUR-08)	28.57
		Tuberculosis (TUR-07)	25
		Diabetes (TUR-08)	28.57
		Gynaecological disorder (TUR-05)	17.85
Azadirachta indica **A.Juss. [DKBS-044]**	21	Haemorrhoids (TUR-09)	42.85
		Fever (TUR-03)	14.28
		Cancer (TUR-03)	14.28
		Mouth ulcer (TUR-02)	9.52
		Wound (TUR-04)	19.04
Boerhavia repens **L. [DKBS-018]**	10	Haemorrhoids (TUR-03)	30
		Anaemia (TUR-07)	70
Calotropis procera **(Aiton) W.T.Aiton [DKBS-004]**	28	Haemorrhoids (TUR-12)	42.85
		Dog bite (TUR-16)	57.14

***Cannabis sativa* L. [DKBS-035]**	14	Haemorrhoids (TUR-09)	64.28
		Asthma (TUR-03)	21.42
		Epilepsy (TUR-02)	14.28
***Chenopodium album* L. [DKBS-043]**	14	Haemorrhoids (TUR-06)	42.85
		Eye problem (TUR-05)	35.71
		Hair growth (TUR-03)	21.42
***Colocasia esculenta* (L.) Schott [DKBS-038]**	7	Haemorrhoids (TUR-05)	71.42
		Insects' bites (TUR-02)	28.57
***Coriandrum sativum* L. [DKBS-016]**	17	Haemorrhoids (TUR-03)	17.64
		Diabetes (TUR-14)	82.35
***Cuscuta reflexa* Roxb. [DKBS-008]**	12	Haemorrhoids (TUR-06)	50
		Cancer (TUR-05)	41.66
		Inflammation (TUR-01)	8.33
***Cynodon dactylon* (L.) Pers. [DKBS-013]**	10	Haemorrhoids (TUR-08)	80
		Urine retention (TUR-02)	20
***Diospyros melanoxylon* Roxb. [DKBS-019]**	13	Haemorrhoids (TUR-04)	30.76
		Anaemia (TUR-03)	23.07
		Diabetes (TUR-06)	46.15
***Euphorbia hirta* L. [DKBS-014]**	13	Haemorrhoids (TUR-06)	46.15
		Dengue fever (TUR-07)	53.84
***Ficus benghalensis* L. [DKBS-022]**	15	Haemorrhoids (TUR-05)	33.33
		Female sterility (TUR-10)	66.66
***Ficus semicordata* Buch.-Ham. ex Sm. [DKBS-031]**	7	Haemorrhoids (TUR-04)	57.14
		Menstrual disorders (TUR-03)	42.85
***Hemidesmus indicus* (L.) R. Br. [DKBS-028]**	7	Haemorrhoids (TUR-05)	71.42
		Snake bites (TUR-02)	28.57
***Lantana camara* L. [DKBS-006]**	15	Haemorrhoids (TUR-08)	53.33
		Eczema (TUR-01)	6.66
		Asthma (TUR-06)	40
***Leucas aspera* (Willd.) Link [DKBS-033]**	11	Haemorrhoids (TUR-06)	54.54
		Psoriasis (TUR-02)	18.18
		Cough (TUR-03)	27.27
***Mangifera indica* L. [DKBS-039]**	9	Haemorrhoids (TUR-04)	44.44
		Heat strokes (TUR-02)	22.22

		Bladder catarrh (TUR-03)	33.33
***Mimosa pudica* L. [DKBS-024]**	11	Haemorrhoids (TUR-06)	54.54
		Brain damage (TUR-03)	27.27
		Psoriasis (TUR-02)	18.18
***Moringa oleifera* Lam. [DKBS-020]**	20	Haemorrhoids (TUR-05)	25
		Liver damage (TUR-01)	5
		Hair growth (TUR-08)	40
		Diabetes (TUR-06)	30
***Musa × paradisiaca* L. [DKBS-041]**	15	Haemorrhoids (TUR-12)	80
		Hypertension (TUR-02)	13.33
		Leprosy (TUR-01)	6.66
***Nerium oleander* L. [DKBS-026]**	18	Haemorrhoids (TUR-03)	16.66
		Cancer (TUR-15)	83.33
***Ocimum gratissimum* L. [DKBS-010]**	17	Haemorrhoids (TUR-06)	35.29
		Cough (TUR-11)	64.7
***Ocimum tenuiflorum* L. [DKBS-015]**	11	Haemorrhoids (TUR-04)	36.36
		Kidney stones (TUR-02)	18.18
		Anxiety (TUR-01)	9.09
		Cold (TUR-04)	36.36
***Ocimum basilicum* L. [DKBS-001]**	18	Haemorrhoids (TUR-03)	16.66
		Cancer (TUR-15)	83.33
***Opuntia tuna* (L.) Mill. [DKBS-040]**	19	Haemorrhoids (TUR-06)	31.57
		Neuron problem (TUR-13)	68.42
***Phoenix dactylifera* L. [DKBS-021]**	12	Haemorrhoids (TUR-09)	75
		Fever (TUR-03)	25
***Phyllanthus emblica* L. [DKBS-002]**	25	Haemorrhoids (TUR-05)	20
		Wound (TUR-02)	8
		Immunity booster (TUR-10)	40
		Hair problem (TUR-08)	32
***Physalis angulata* L. [DKBS-012]**	9	Haemorrhoids (TUR-03)	33.33
		Headaches (TUR-06)	66.66
***Pongamia pinnata* (L.) Pierre [DKBS-065]**	16	Haemorrhoids (TUR-05)	37.5
		Cancer (TUR-04)	25
		Wound (TUR-07)	43.75
***Saccharum officinarum* L. [DKBS-055]**	17	Haemorrhoids (TUR-07)	41.17
		Fertilization (TUR-10)	58.82

***Saraca asoca* (Roxb.) W.J.de Wilde [DKBS-027]**	14	Haemorrhoids (TUR-06)	42.85
		Syphilis (TUR-03)	21.42
		Bone fracture (TUR-05)	35.71
***Shorea robusta* C.F.Gaertn. [DKBS-143]**	18	Haemorrhoids (TUR-08)	44.44
		Ear pain (TUR-04)	22.22
		Itching (TUR-06)	33.33
***Solanum virginianum* L. [DKBS-037]**	17	Haemorrhoids (TUR-02)	11.76
		Tooth decay (TUR-15)	88.23
***Terminalia chebula* Retz. [DKBS-045]**	24	Haemorrhoids (TUR-11)	45.83
		Jaundice (TUR-03)	12.5
		Asthma (TUR-10)	41.66
***Tinospora crispa* (L.) Hook. f. & Thomson [DKBS-009]**	28	Haemorrhoids (TUR-05)	17.85
		Scabies (TUR-10)	35.71
		Common cold and cough (TUR-08)	28.57
		Fever (TUR-05)	17.85
***Vitex negundo* L. [DKBS-034]**	17	Haemorrhoids (TUR-11)	64.7
		Menstrual cramps (TUR-04)	23.52
		Mouth ulcer (TUR-02)	11.76
***Vitis vinifera* L. [DKBS-003]**	8	Haemorrhoids (TUR-06)	75
		Sore throats (TUR-02)	25
***Withania somnifera* (L.) Dunal [DKBS-017]**	12	Haemorrhoids (TUR-09)	75
		Rheumatism (TUR-01)	8.33
		Cuts (TUR-02)	16.66
***Woodfordia fruticosa* (L.) Kurz [DKBS-023]**	5	Haemorrhoids (TUR-03)	60
		Dysentery (TUR-02)	40

Abbreviations: TUR= Total use report

Table 4. Jaccard index (JI)

Area of research	Studied year	Total plant species recorded	Common plant species in both study sites	Dissimilar plant species	Jaccard index in%	References
Tabora region, Tanzania	2022	26	3	23	4.28	(Kacholi and Mvungi Amir, 2022)
South-Western Nigeria	2010	144	11	131	6.11	(Soladoye et al., 2010)
Manipur, India	2014	29	6	23	8.57	(Tomba Singh, 2014)
Ede, Nigeria	2022	37	3	34	3.7	(Israel, 2022)
Ibadan, Nigeria	2020	25	2	23	2.85	(Ariyo et al., 2020)

Declarations

Ethics approval and consent to participate: This study involved only ethnobotanical field surveys and interviews. No animal or clinical experiments were conducted. Prior informed consent was obtained from all participants before conducting the interviews, and their participation was entirely voluntary. All participants schown in images gave theior permission to have the image published.

Declaration of competing interest: The researchers declare that they have no conflicts of interest related to their publishing of this piece of work.

Data availability: Not applicable.

Declaration of generative AI in scientific writing: The authors declare that generative artificial intelligence (AI) tools, specifically ChatGPT developed by OpenAI, were used solely to assist in improving the language, grammar, and clarity of the manuscript. These tools were not used to generate scientific content, interpret results, or draw conclusions. All ideas, interpretations, and conclusions presented in this manuscript are the original work of the authors. The authors take full responsibility for the integrity, accuracy, and originality of the content submitted.

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