Traditional medicine in Wartair, District Malakand, Pakistan: An ethnomedicinal study of locally used plants

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Research

Abstract

Background: The purpose of this study was to explore the utilization and cultural significance of medicinal plants in ethnomedicinal practices among local communities of Wartair, District Malakand, Pakistan. The local people in the study area largely depend on indigenous medicinal plants for their essential healthcare needs.

Methods: This ethnomedicinal study involved regular field trips and discussions with approximately 130 native informants from the study region, representing diverse socio-economic and educational backgrounds. Information was gathered through interviews and semi-structured questionnaires, emphasizing the perspectives of indigenous people. Data analysis employed quantitative indices, including Informant Consensus Factor (ICF) and Fidelity Level (FL %).

Results: This survey comprehensively documented 50 medicinally important plants belonging to 48 genera and 28 families. The findings indicated that herbs dominated (52%) among the collected plants, followed by shrubs (26%) and trees (22%). The collected plants were predominantly perennials (62%), followed by annuals (34%) and biennials (4%). The study revealed that the maximum Informant Consensus Factor (ICF) values were for cardiovascular diseases (0.82), sore throat disease (0.81), and skin disease (0.70). Acacia modesta L., Cannabis sativa L., and Ricinus communis L. emerged as the most significant and extensively used species, with Fidelity Level (FL) values of 94.5%, 92.3%, and 89.28%, respectively.

Conclusion: This study noted that Wartair District Malakand, Pakistan, has rich biodiversity in medicinal plants, which are crucial for the fundamental healthcare requirements of the local inhabitants, particularly the underprivileged.

Keywords: Ethnobotany, Medicinal Plants, Informant Consensus Factor, Fidelity level, Malakand, Pakistan

Background

Ethnomedicine refers to the traditional practice and study of locally available plants, animals, and natural resources used for medicinal, spiritual, and cultural purposes by indigenous communities and local people (Acharya *et al.*2006). These practices are often passed down through generations via oral tradition and cultural heritage. The use of such plants for medicinal purposes is often based on bioactive combinations derived from these plants.

Medicinal plants are considered a natural blessing to humanity, containing a wide range of vegetation, including herbs, shrubs, and trees. Various parts of these plants are employed to treat diseases like jaundice, neurodegenerative disorders, inflammation, and for their properties as anthelmintic, diaphoretics, and diuretics. According to the World Health Organization (WHO), a medicinal plant is one whose components contain substances that can be utilized for diverse therapeutic applications and can serve as a foundation for pharmaceutical manufacturing (Suriyavathana *et al.*2011).

Approximately 70-80% of the global population, predominantly in rural and tribal regions, relies heavily on indigenous medicinal flora for basic healthcare needs due to deprivation and limited access to contemporary medicines (Kapkoti *et al.*2014; Kumar *et al.*2018). Pakistan possesses rich diversity in medicinal plants, with approximately 1572 genera and 6000 plant species, predominantly found in the Hindu Kush, Himalaya, and Karakorum regions (Abbasi *et al.*2010; Sheikh *et al.*2002; Tardio *et al.*2005).

Several comprehensive studies have identified around 600 medicinal plant species used to address common health issues within local communities in Pakistan (Ahmad *et al.*2014; Fatima *et al.*2018; Wondimu *et al.*2007). Over 80% of Pakistan's population depends on traditional medicines for healthcare practices (Ibrahim *et al.*2023). However, this practice is now predominantly observed in rural regions, as there has been a shift towards modern healthcare facilities in urban areas, coupled with evolving lifestyles over time (Ibrar *et al.*2007).

The longstanding traditional knowledge, spanning centuries, is under significant threat due to the modernization of rural societies. Pakistan boasts documentation of approximately 6000 plant species, yet only 600 of them have been explored in ethnomedicinal studies (Shinwari *et al.*2003).

Ethnomedicine encompasses a wide array of remedies crafted from secondary metabolites found in various plant parts. Currently, there is a growing trend in the consumption and significance of medicinal plants. Valuable chemical compounds with medicinal significance are identified and isolated from these plants, subsequently incorporated into both raw and synthetic pharmaceuticals (Alves & Rosa, 2007).

In Pakistan, herbal medicines are widely used, with practices influenced by Unani, Ayurvedic, and traditional folk medicine. Regionally, herbal remedies vary, with different provinces having unique plant-based treatments.

The indigenous communities of Wartair, District Malakand, Pakistan, have relied on traditional medicine for centuries, using locally available plants to treat various ailments. However, this valuable ethnobotanical knowledge is largely undocumented and threatened by modernization, deforestation, and cultural erosion.

Therefore, this survey aims to explore, document, and analyze the traditional medicinal practices of local communities in Wartair, District Malakand, focusing on locally used plants, their uses, and potential health benefits.

Materials and Methods

Study area

The current ethnomedicinal survey was conducted in Wartair, District Malakand, Pakistan (Figure 1) (Ibrahim *et al.*2012). Wartair is situated at 34° 35’ N latitude and 71° 57’ E longitude. District Malakand is a lush green valley with predominantly sandy-loamy soil, surrounded by hills on all sides. The climate is hot during summer and relatively cooler in winter. The total area of District Malakand is approximately 952 square kilometers (368 square miles).

The region is primarily inhabited by Pashtun tribes, with Pashto being the predominant language spoken by the local population. The native people are mainly agriculturalists, living in poverty and relying heavily on cultivated land to meet their basic needs and earn a living (Ibrahim *et al.*2023).

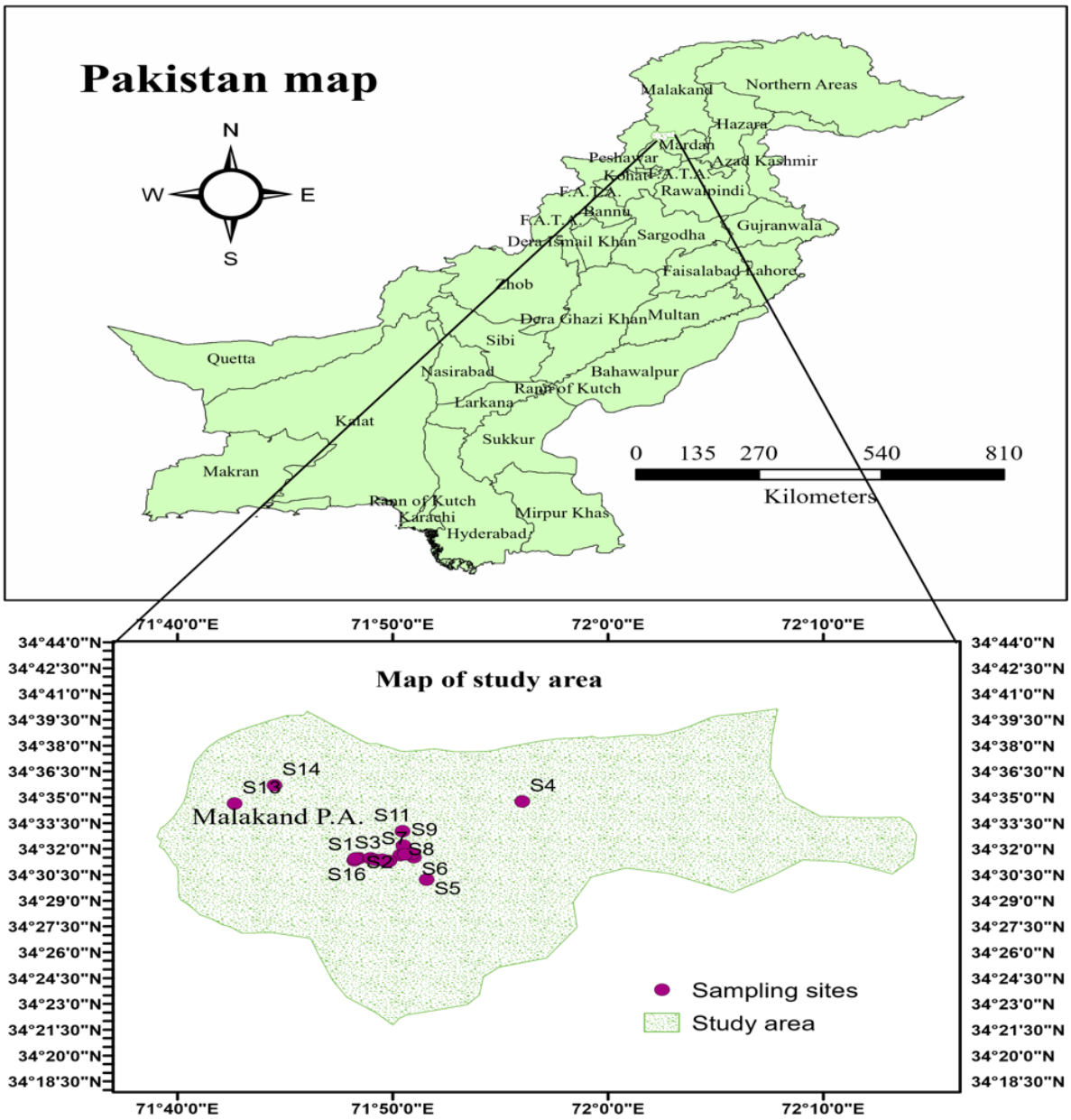

Figure 1. Map of the study area Wartair District Malakand, Pakistan (Ibrahim *et al*. 2023).

Ethnomedicinal Data collection

The ethnomedicinal information was gathered throughout the year 2022. The research was conducted in different periods of the year, with frequent visits to the region to collect ethnomedicinal information from local people. Interviews, group discussions, and semi-structured questionnaires were utilized to gather information from local folks, Pansaries (local sellers), and Hakeems (local healers).

The medicinal plants of the study zone were considered with reference to various aspects, including their botanical characteristics, natural environment, growth pattern, occurrence, frequency, used plant parts, flowering periods, plant status, collection techniques, methods of preparing crude drugs, modes of administration, and ethnomedicinal uses.

Collection and identification of medicinal plant specimens

The plants gathered during this study were carefully cleaned of dust, pressed, shade-dried, conserved, and mounted on standard herbarium sheets. The herbarium sheets were then deposited in the Department of Botany, Government Postgraduate College Dargai, Malakand. The collected plant specimens were identified according to the Flora of Pakistan and available literature (Ali & Qaiser, 1993-2015).

Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) was measured by classifying the described customary treatments and their associated ailments into 22 groups. ICF values were determined by subtracting the frequency of plant use (Nt) from the number of citations for each disease category (Nur) and then dividing by the number of citations for each category minus one. The calculation of ICF was carried out using the following formula:

$$ICF = (Nur - Nt) / (Nur - 1).$$

The Informant Consensus Factor (ICF) values range from 0 to 1. Medicinal plants with higher ICF values are believed to have more significant pharmacological activities compared to those with low ICF values (Heinrich *et al.*1998).

Fidelity Level (FL)

Fidelity Level (FL) helps recognize the plant species favored by important informants for treating specific diseases. Plants regularly used by indigenous rural folks in the area for disease cure show higher FL values compared to less frequently used plants. FL values indicate the percentage of informants who declare the usage of a specific plant species for a specific major ailment treatment. To compute FL values, all ailments were categorized into 22 groups. FL values of plants were calculated using the formula:

$$FL = (Ip / Iu) \times 100.$$

The "Ip" represents the number of participants who mentioned the practice of medicinal plants for a particular disease, while "Iu" stands for the total number of participants who mentioned the same plant for any other disease. Medicinal plants that are frequently used for the same illness are regarded as biologically more effective than others (Jadid *et al.*2020; Srithi *et al.*2009).

Informant's demographics

In the existing survey, a total of 130 informants, including indigenous folks (80%) and customary health practitioners (20%), were interviewed in different social gatherings and places. Among these 130 interviewees, 78 (60%) were men and 52 (40%) were women, respectively. The interviewees aged 60-80 years possessed efficient knowledge about local plants and their ethnomedicinal uses, followed by the age group 40-60 years and 20-40 years old, respectively.

Most of the interviewees who participated in this study were illiterate (61%), followed by those with a primary level education (23%), matric level education (9%), and graduate level education (7%), respectively.

Habitat and Growth Form of Medicinal Plants

A total of 50 medicinal plants were collected from the research area, exhibiting a diverse range of habits and growth forms. The majority of the collected plants were herbs (52%), followed by shrubs (26%) and trees (22%) (Figure 2). This distribution is consistent with other studies, which have also reported herbs as the dominant plant habit in traditional medicinal plant collections. The prevalence of herbs can be attributed to their adaptability to various environmental conditions and their widespread availability in the study area.

Habitat Distribution and Plant Part Usage

The collected plants, categorized by habitat, revealed that the majority (72%) were found in dry land, followed by arable land (16%) and wet land (12%) (Figure 3). This finding suggests that the local medicinal plants are well adapted to the dry conditions prevalent in the region.

In terms of plant part usage, leaves were the most commonly used part (37%), followed by the whole plant (18%), fruits (16%), stem (9%), flowers (8%), roots (5%), seeds (3%), gums (3%), and bark (1%) (Figure 5). The preference for leaves may be attributed to their ease of gathering, high bioactive compound content, and versatility in preparation methods.

Preparation and Administration of Crude Drugs

The preparation methods employed for the crude drugs varied, with decoction being the most common (26%), followed by powder and infusion (25% each), maceration (16%), and concoction (8%) (Figure 6). The majority of the crude drugs were administered orally (57%), with dermal application being the second most common route (43%) (Figure 7). These findings highlight the importance of traditional knowledge in the preparation and administration of medicinal plants and underscore the need for further research into the efficacy and safety of these practices.

The documentation of these traditional practices contributes to the preservation of local cultural heritage and may inform the development of novel phytotherapeutic agents.

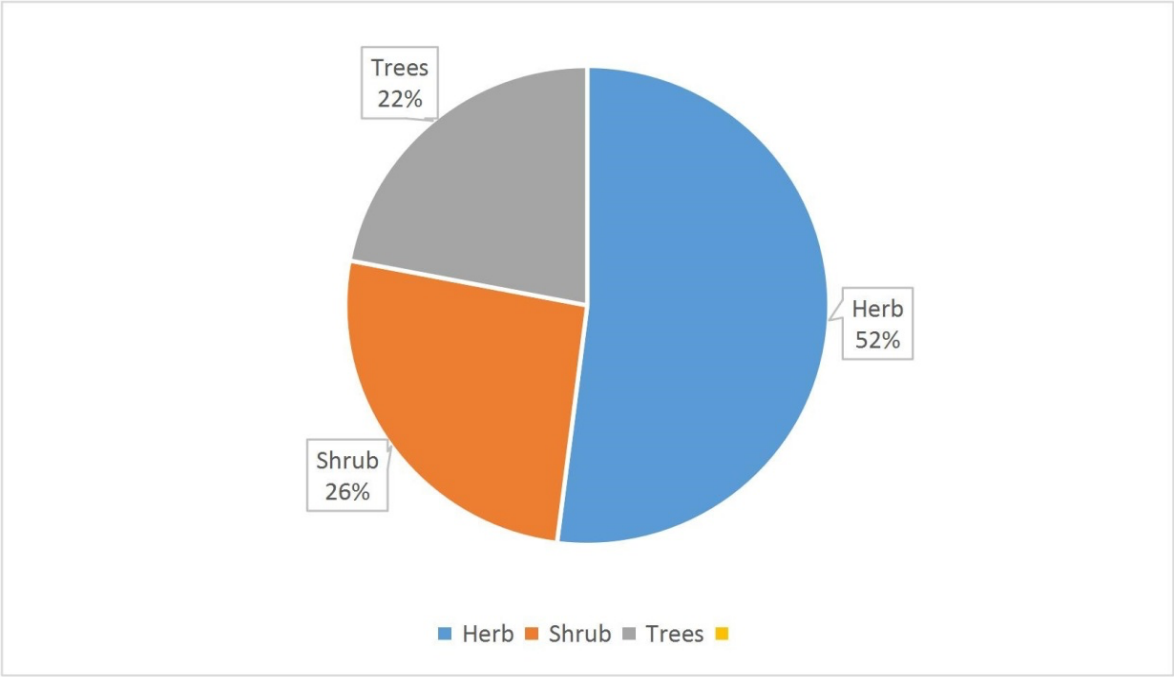

Figure 2. Habit of medicinal plants collected from Wartair, District Malakand

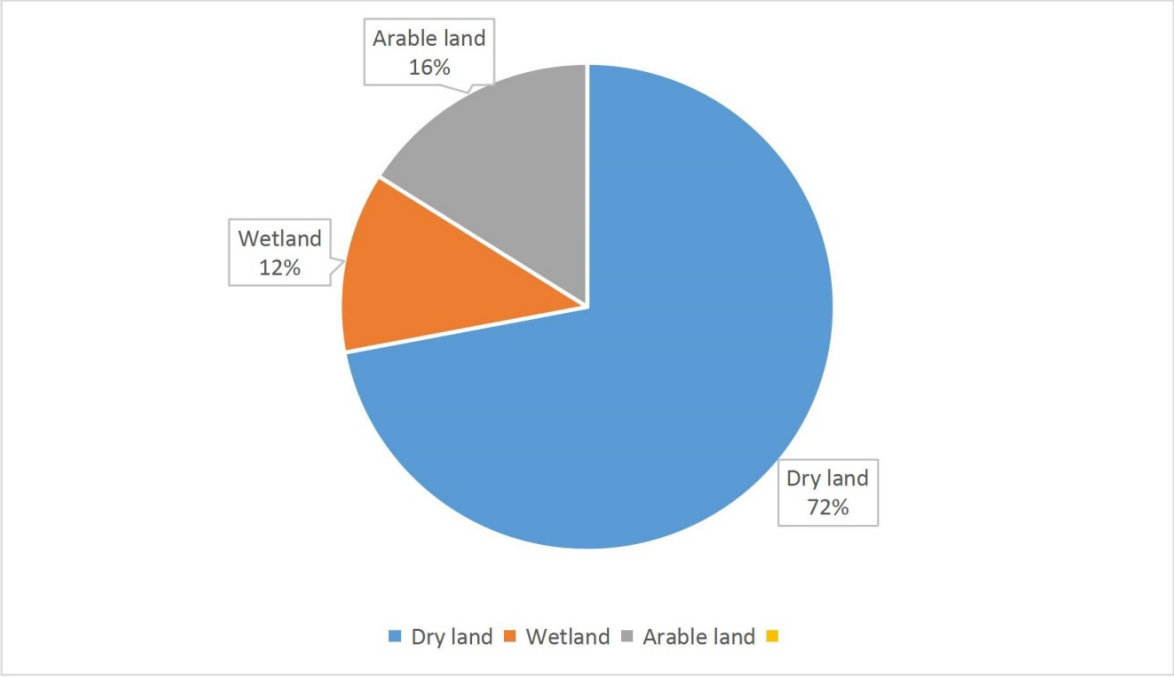

Figure 3. Habitat of medicinal plants collected from Wartair, District Malakand

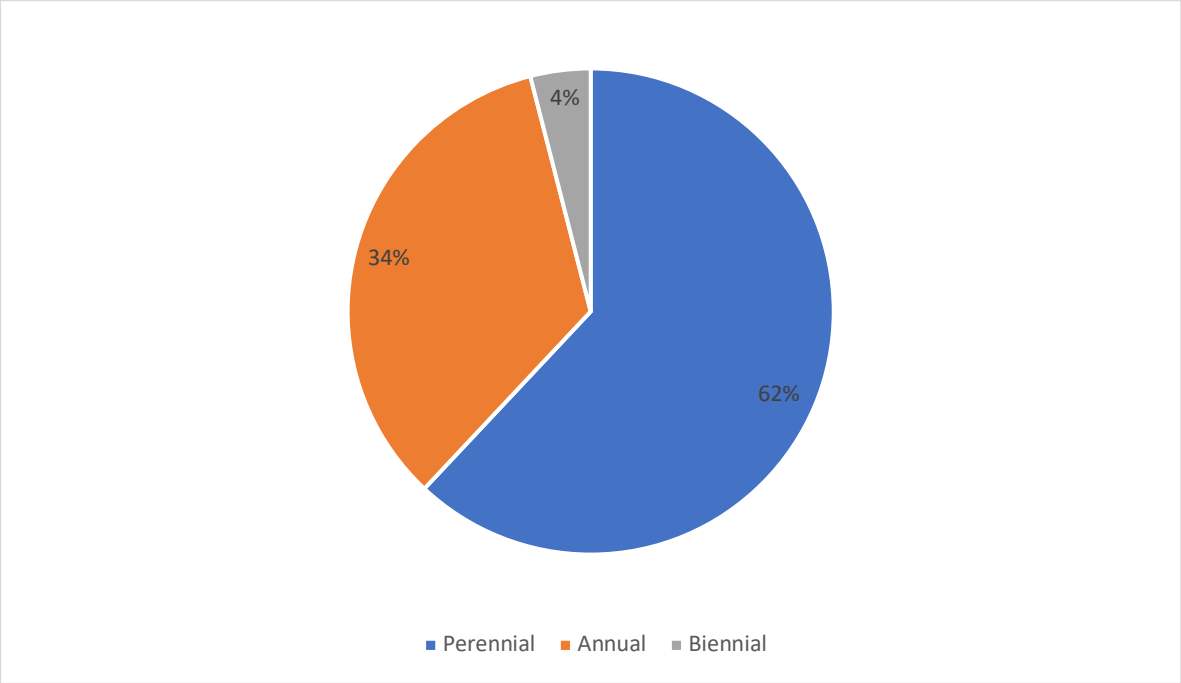

Figure 4. Growth form of medicinal plants collected from Wartair, District Malakand

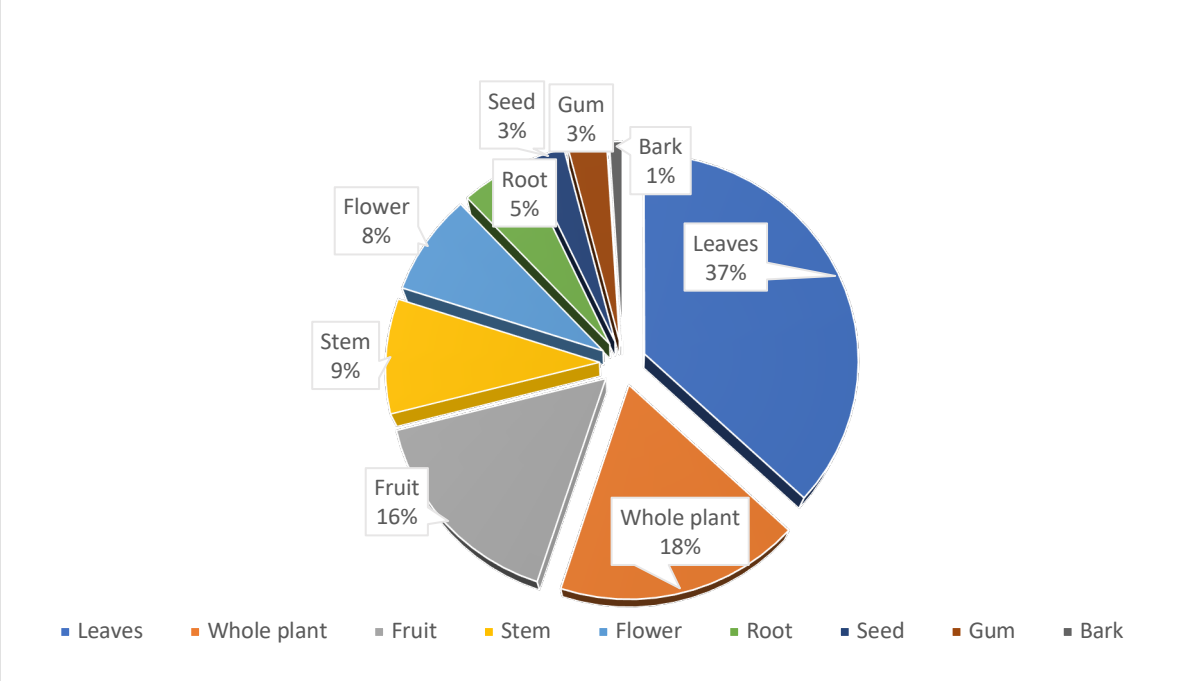

Figure 5. Part used of medicinal plants in crude drug preparation collected from Wartair, District Malakand

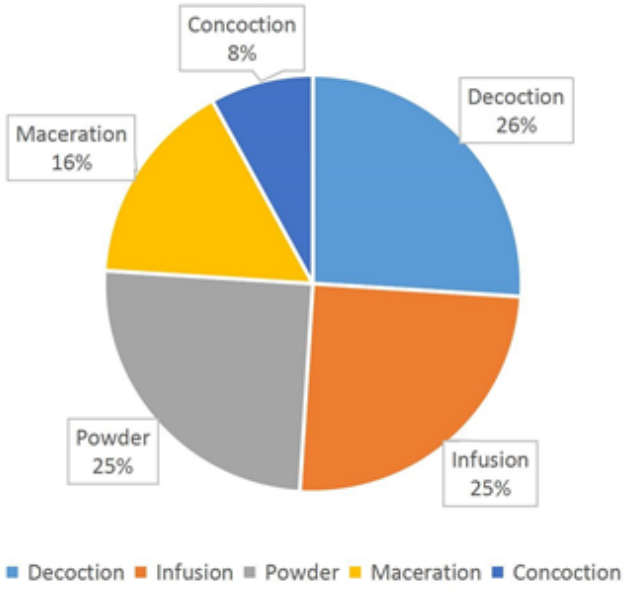

Figure 6. Method of crude drug preparation from medicinal plants collected from Wartair, District Malakand

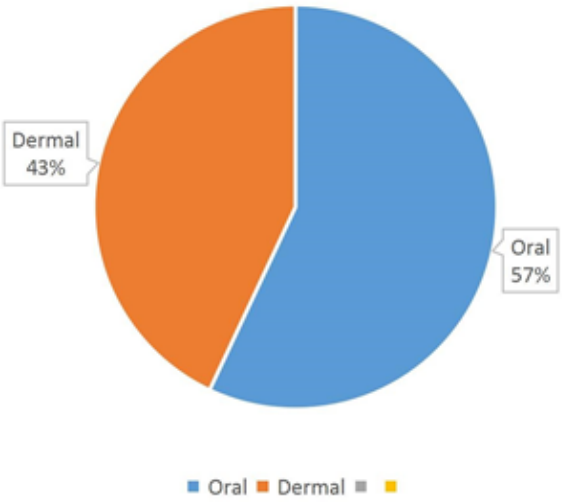

Figure 7. Mode of administration of medicinal plants collected from Wartair, District Malakand

Table 1. Medicinal Plants and their Ethnomedicinal uses collected from Wartair, District Malakand

Botanical name	**Family name**	**Voucher No.**	**Local name**	**Habit**	**Ethnomedicinal Uses**
Justicia adhatoda L.	Acanthaceae	BOT/2022/01	Baikar	Shrub	Leaves are used to cure swellings and asthma.
Amaranthus viridis L.	Amarunthaceae	BOT/2022/02	Ganhar	Herb	Juice, poultice and fresh plant are used for Urinary diseases.
Rhazya stricta Decne.	Apocynaceae	BOT/2022/03	Ghandichar	Herb	Leaves are used for curing joint infections.
Nerium oleander L.	Apocynaceae	BOT/2022/04	Ghanderi	Shrub	Toothache and swellings are cured through juice extracted from leaves.
Phoenix dactylifera L.	Arecaeae	BOT/2022/05	Kajora	Shrub	fruits are eaten for back pain, sexual weakness

Calotropis procera W. T. Aiton.	Asclepiadaceae	BOT/2022/ 06	Spulmai	Shrub	Skin diseases and snake bite are cured through juice from leaves infusion.
Asparagus officinalis L.	Aspargaceae	BOT/2022/ 07	Tendonri	Herb	Decoction is used to treat urinary infection
Erigeron sumatrensis L.	Asteraceae	BOT/2022/ 08	Sheen Botai	Herb	Decoction is used to relive dental pain and headache
Artemisia vulgaris L.	Asteraceae	BOT/2022/ 09	Tarkha	Herb	Powder is use for the Skin diseases and Intestinal worms.
Lactuca serriola L.	Asteraceae	BOT/2022/ 10	Zangali Salad	Herb	Powder is used for wound healing.
Carthamus oxycantha M.Bieb.	Asteraceae	BOT/2022/ 11	Kariza	Herb	Infusion is used for wound healing, pain, swelling associated with trauma and laxative.
Sonchus asper L. Hill	Asteraceae	BOT/2022/ 12	Shodapay	Herb	infusion is use for the Stomach problems and antipyretic
Xanthium strumarium L.	Asteraceae	BOT/2022/ 13	Geshky	Herb	Powder of root apply to remove dandruff.
Taraxacum officinale L.	Asteraceae	BOT/2022/ 14	Ziar gulai	Herb	Juice is used to treat gastric, renal and hepatic disorders
Nasturtium officinale W.T.Aition	Brassicaceae	BOT/2022/ 15	Tarmera	Herb	Stem and leaves are used for wound healing and toothache.
Cannabis sativa L.	Cannabaceae	BOT/2022/ 16	Bhang	Shrub	Leaves and flowers are used as a sedative and anti-anxiety.
Cyperus rotundus L.	Cyperaceae	BOT/2022/ 17	Dela	Herb	Paste prepared from whole plants is considered astringent diaphoretic antispasmodic chromatic sedative tonic and antibacterial.
Euphorbia helioscopia L.	Euphorbiaceae	BOT/2022/ 18	Mandano	Herb	It is used for Kidney stone and cholera.
Mallotus philippensis (Lam) Muell. Arg.	Euphorbiaceae	BOT/2022/ 19	Kambela	Shrub	Juice is use for the Stomach pain, skin troubles and allergy.
Ricinus communis L.	Euphorbiaceae	BOT/2022/ 20	Aranda	Small Tree or shrub	Decoction of leaves and young shoots take for constipation, Urinary disorders, Cooling, Constipation and worm's problem.
Melilotus officinalis (L.) Lam.	Fabaceae	BOT/2022/ 21	Lewanay	Herb	Infusion of leaf and flowers are used to cure wounds, diuretic and to treat genital diseases.
Medicago polymorpha L	Fabaceae	BOT/2022/ 22	Peshtary	Herb	Paste of flower and young stems are used to treat skin infection, stroke, diabetes, halitosis and menopausal disorders in women.
Dalbergia sissoo Roxb. ex DC.	Fabaceae	BOT/2022/ 23	Shawa	Tree	Decoction is used to treat skin problems, sore throats, dysentery,

					syphilis, bronchitis, inflammations, infections and gonorrhea.
Vicia sativa L.	Fabaceae	BOT/2022/24	Cheelo	Herb	Juice and powder are used for skin infections.
Acacia modesta Wall.	Fabaceae	BOT/2022/25	Palosa	Tree	Gum is used as a sexual tonic and for backache.
Acacia nilotica L.	Fabaceae	BOT/2022/26	Kicker	Tree	Gum is used as a sexual tonic and for backache.
Butea monosperma (Lam.) Taub.	Fabaceae	BOT	Palai	Tree	To treat dysentery infusion from flowers are used.
Fumria indica Hausskn.	Fumaricaceae	BOT/2022/28	Papra	Herb	Infusion is used as a sedative.
Mentha spicata L.	Lamiaceae	BOT/2022/29	Podina	Herb	Leaves are used as a flavoring agent and as antispasmodic.
Salvia moorcoftiana Wall. ex Benth	Lamiaceae	BOT/2022/30	Khar ghwag	Herb	Wound healing and boils are cured from extract of leaves.
Mentha longifolia L.	Lamiaceae	BOT/2022/31	Enaly	Herb	Leaves and young shoots are used as antispasmodic.
Vitex altissima L.F.., Milla	Lamiaceae	BOT2022/32	Marwandai	Shrub	Leaves and young shoots are used as a tonic.
Ocimum basilicum L.	Lamiaceae	BOT/2022/33	Kashmaly	Herb	Whole plant is used as anti-spasmodic.
Malva neglecta Wallr.	Malvaceae	BOT/2022/34	Panerak	Herb	Cooked leaves and stem are castoff for constipation and stomach problem.
Melia azedarach L.	Meliaceae	BOT/2022/35	Tora shanday	Tree	Leaves and fruits are used as Anti-septic and to treat skin diseases.
Ficus racemosa L.	Moraceae	BOT/2022/36	Urmal	Tree	Infusion of fruits are in Inflammation due to wasp bites. Used for stomach cleaning and to relieve constipation.
Ficus carica l.	Moraceae	BOT/2022/37	Inzer	Tree	Fresh leaves to treat skin pimples and fruits are used for gastrointestinal diseases.
Syzygium cumini L.	Myrtaceae	BOT/2022/38	Jaman	Tree	Fruit freshly and seeds are grind to use for curing sore throat, bronchitis, asthma, dysentery, ulcers and as blood purifier.
Olea ferruginea Royle Wall.ex Aitch	Oleaceae	BOT/2022/39	Khona	Tree	Olive oil is used to treat rheumatism and toothache.
Oxalis corniculata L.	Oxalidaceae	BOT/2022/40	Threwakay	Herb	Plant Juice is used as stomachic.
Phyllanthus emblica L.	Phyllanthaceae	BOT/2022/41	Ghar kela	Tree	Fruits are used for treatment of diarrhea.
Piper nigrum L.	Piperaceae	BOT/2022/42	Toor Merch	Tree	Fresh leaves and fruits are used for curing cough and cold.
Persicaria hydropiper (L.) Delarbre	Polygonaceae	BOT/2022/43	Pulpulak	Herb	Powder of leaves are used for kidney problems

Zizyphus nummularia (Burm.f.) Wight and Arn.	Rhamnaceae	BOT/2022/ 44	Karkanda	Shrub	Leaves and bark are used to treat Ulcer and skin infection.
Cotoneaster microphyllus Wall. Ex Lindley.	Rhamnaceae	BOT/2022/ 45	Mamanrha	Shrub	Fruits are anti-spasmodic, antimicrobial and diuretic.
Dodonaea viscosa (L.) Jacq.	Sapindaceae	BOT/2022/ 46	Ghwarasky	Shrub	Bone fracture, sprain and wound healing are cured through leaves.
Solanum nigrum L.	Solanaceae	BOT/2022/ 47	Kachmacho	Herb	To cure diarrhea leaves infusion is used.
Lantana camara L.	Verbenaceae	BOT/2022/ 48	Soor Gulai	Shrub	Crushed leaf and seeds are mixed with oil to treat wounds.
Vitex negundo L.	Verbenaceae	BOT/2022/ 49	Vermandai	Shrub	Leaves extract is as astringent and vermifuge.
Fagonia cretica Linn.	Zygophyllaceae	BOT/2022/ 50	Azghaky	Herbs	Juice is used for stomach swelling, anti-inflammatory and as toothache.

Table 2. ICF values of traditional medicinal plants for treating human ailments in District Malakand.

Disease categories	**Number of citations for each disease category (Nur)**	**Frequency of plant use (Nt)**	**Informant Consensus Factor (ICF)**
Gastrointestinal	75	51	0.68
Skin diseases	56	39	0.70
Diuretic	46	28	0.64
Cold, cough, influenza	52	32	0.62
Rheumatism	54	28	0.51
Genital diseases	33	19	0.58
Tonic	58	32	0.55
Analgesic	38	20	0.52
Antiseptic	26	15	0.58
Sore throat	22	18	0.81
Cardiovascular	22	18	0.82

Table 3. Fidelity level value of important medicinal plants used against a given disease.

Medicinal plant	**Disease Cured**	**Number of Participants (Ip)**	**Total number of participants (Iu)**	**Fidelity Level (FL Value%)**
Justicia adhatoda L.	Rheumatism	19	23	82.6
Mentha longifolia L.	Gastrointestinal	33	37	89.1
Ricinus communis L.	Analgesic	25	28	89.28
Cannabis sativa L.	Narcotic	24	26	92.3
Acacia modesta L.	Backache	35	37	94.5
Calotropis procera W. T. Aiton.	Skin diseases	23	15	86.6
Melia azedarach L.	Antiseptic	17	22	77.3
Ficus carica L.	Diarrhea	11	15	73.3
Malva neglecta Wallr.	Constipation	29	33	87.87
Fumria indica Hausskn.	Blood purifier	13	17	76.47
Piper nigrum L.	Cough and cold	34	43	79.0
Zizyphus nummularia (Burm.f.) Wight and Arn.	Ulcer	9	11	81.81
Dodonaea viscosa (L.) Jacq.	Bone fracture	22	25	88.0
Nasturtium officinale W.T.Aition	Diabetes	5	8	62.5

Discussion

The present study highlights the significance of traditional knowledge in the utilization of medicinal plants for primary healthcare needs. Approximately 80% of the global population relies on local herbal medicines to fulfill their primary healthcare needs (Ibrahim *et al.*2023). The World Health Organization (WHO) reports that up to 90% of developing countries depend on local medicinal plants for healthcare needs (WHO, 2002). Our study reveals that the local population in the research area heavily relies on medicinal plants to treat various ailments, including cold, cough, skin diseases, eye diseases, and tooth decay.

The study's findings are consistent with previous ethno-pharmacological studies conducted in the region (Barkatullah *et al.*2009; Gulzar *et al.*2019; Hussain *et al.*2005; Ibrar *et al.*2007; Jan *et al.*2008). The research area is rich in medicinal flora, with local herbalists and indigenous populations utilizing these plants to address various health issues. However, the study also reveals a concerning decline in medicinal plants within the area, attributed to factors such as over-exploitation, overgrazing, habitat degradation, and lack of awareness among indigenous communities about the significance and utilization of medicinal plants.

The study's results align with those of Shinwari and Khan (2000), highlighting the vital necessity for preservation efforts. The majority of medicinal plants were employed for treating respiratory ailments, throat and mouth complaints, joint and gastrointestinal issues, and skin conditions. These findings are consistent with and comparable to those of former investigators (Ahmad & Hussain, 2008; Qureshi *et al.*2008; Tariq *et al.*2004).

Recent studies have also documented the significance of medicinal plants in treating various health issues. For instance, a study by Rehman et al. (2023a) reported that 56 plant species from 32 families were used to treat 24 respiratory ailments. Similarly, a study by Shah et al. (2025) documented 60 wild edible plants used to cure 40 various ailments. The local diseases treated in these studies are similar to the diseases treated or cured with the help of medicinal plants in the present study.

This study contributes to the exploration of novel drug discoveries and serves as a foundation for prospective studies. The documentation of customary information and ethnomedicinal practices of medicinal plants highlights the significance of conserving cultural heritage and encouraging sustainable practices of natural resources. The study underscores the importance of traditional herbal medicine in meeting primary healthcare needs and highlights the requirement for preservation efforts to safeguard medicinal plants from extinction.

Additional research is necessary to validate the effectiveness and safety of these traditional medicines and to explore their potential for modern pharmaceutical applications. Furthermore, conservation efforts should focus on protecting medicinal plant habitats, promoting sustainable harvesting practices, and raising awareness among indigenous communities about the significance and utilization of medicinal plants. By doing so, we can ensure the long-term availability of these valuable resources and promote the well-being of local communities.

Conclusion and Recommendations

The current ethnomedicinal survey underscores the vital role of customary medicinal plants in addressing the healthcare needs of indigenous populations in the research area. The study reveals a diverse and extensively utilized medicinal flora, with elderly individuals and local herbalists possessing valuable knowledge about medicinal plants. However, the limited interest in customary drugs among the younger generation, due to the prevalence of modern synthetic medicines, highlights the importance of conserving customary information and medicinal plant resources.

To safeguard this valuable asset, immediate conservation measures are essential. Recommendations include systematic documentation of indigenous knowledge, intergenerational knowledge transfer through education and training programs, and integration with modern healthcare systems. This study provides a crucial baseline for future research by documenting and analyzing customary practices of medicinal plants in the study area.

Future research studies, such as anti-microbial studies and phytochemistry, are necessary to validate traditional remedies, develop novel phytotherapeutic agents, and investigate medicinal plant cultivation and sustainable harvesting practices. By implementing these measures, we can preserve traditional knowledge, conserve medicinal plant resources, and contribute to the well-being of indigenous populations and the advancement of healthcare systems.

Declarations

Ethics statement: Before conducting the survey, explicit verbal consent was acquired from every participant involved in this study.

Consent for publication: Not applicable.

Availability of data and materials: Inquiries regarding data may be directed to the primary author.

Funding: he research did not receive financial support from any research institution.

Competing interests: The authors affirm that there are no conflicts of interest.

Author contributions: Haseen Ullah and Muhammad Ibrahim conducted the research, performed data analysis, and drafted the initial manuscript. All authors participated in reading, revising, reviewing, and approving the final draft of the manuscript.

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