



TRADITIONAL PHYTOTHERAPIES OF PTERIDOPHYTES USED BY INDIGENOUS COMMUNITIES OF NORTH WESTERN HIMALAYAN REGION OF HIMACHAL PRADESH FOR FEMALE HEALTH PROBLEMS

NITESH KUMAR	DEPARTMENT OF BIOSCIENCES, HIMACHAL PRADESH UNIVERSITY, INDIA, 171005.
RUCHIKA DEVI*	DEPARTMENT OF BIOSCIENCES, HIMACHAL PRADESH UNIVERSITY, INDIA, 171005.
MAMTA SINGH PATHANIA*	SHOOLINI INSTITUTE OF LIFE SCIENCES & BUSINESS MANAGEMENT, THE MALL, SOLAN, HIMACHAL PRADESH, 173212, INDIA.
RAJESH KUMAR	DEPARTMENT OF BIOSCIENCES, HIMACHAL PRADESH UNIVERSITY, INDIA, 171005.
NEELAM KUMARI	DEPARTMENT OF BIOSCIENCES, HIMACHAL PRADESH UNIVERSITY, INDIA, 171005.
ANU PRIYA SHARMA	DEPARTMENT OF BOTANY, CAREER POINT UNIVERSITY, HAMIRPUR, 324005.

ABSTRACT:

The indigenous communities of the North Western Himalayan region of Himachal Pradesh possess a rich ethnomedicinal heritage, utilizing diverse plant resources, including pteridophytes, to address female health problems. Pteridophytes, often overlooked in ethnobotanical studies, hold significant therapeutic potential due to their bioactive compounds. This study documents and analyses traditional phytotherapies involving pteridophytes for gynecological and reproductive health issues such as menstrual irregularities, leucorrhea, and postpartum recovery. Ethnobotanical data were collected through structured interviews, participatory observations, and field visits in collaboration with local healers and elder community members. A total of 16 species of pteridophytes belonging to 13 families were identified, with specific medicinal applications for female health. Preparation methods included decoctions, infusions, and poultices, often combined with other herbs to enhance efficacy. The most frequently used species included *Adiantum venustum*, *Diplazium esculentum*, and *Dryopteris filix-mas*. These plants show the presence of tannins, flavonoids, and saponins, compounds known for their antimicrobial, anti-inflammatory, and hormonal regulatory properties. However, the declining availability of pteridophytes due to habitat destruction and overharvesting threatens their continued use.

KEYWORDS:

BIOACTIVE COMPOUNDS, NORTH WESTERN HIMALAYAS, PTERIDOPHYTES, TRADITIONAL MEDICINE, WOMEN'S HEALTH.

INTRODUCTION

The North Western Himalayan region of Himachal Pradesh, part of the larger Himalayan biodiversity hotspot, is home to unique plant life and vibrant cultural traditions (Meena et al., 2024). With its varying altitudinal zones, diverse microclimates, and rich native plant diversity, the region supports numerous indigenous communities (Carpenter, 2005). Traditional phytotherapy, the practice of using plants or plant-based remedies for treating various ailments, has been a cornerstone of healthcare systems in Indigenous communities for generations (Niharika et al., 2024). These communities depend on traditional ethnobotanical knowledge, passed down orally through generations, to manage various health issues, including those affecting women's health (Kumar et al., 2021). However, modern medicine is quickly replacing these age-old practices deeply rooted in diverse cultural traditions worldwide. (Wanzala & Minyoso, 2024) However, even today, approximately 80% of the global people rely on conventional healthcare systems. Across all continents, medicinal plants utilizing as remedies for

various ailments since ancient times (Dey et al., 2017; Dey et al., 2012; Modak et al., 2015). While synthetic chemistry advanced greatly in the 20th century, nearly one-fourth of all approved medicines still come from plants. Drug authorities continue to recognize and approve the use of plant-based compounds and phytochemicals (Lounasmaa & Tolvanen, 2000). Phytochemicals with antioxidant, antibacterial, and anti-inflammatory properties are increasingly in demand for their potential to treat various chronic diseases and infections. In recent times, the search for such compounds has grown due to their promising role in combating both chronic and infectious illnesses (Halliwell, 1996). Among the diverse plant groups utilized in ethnomedicine, pteridophytes—a group that includes ferns and fern allies—hold a unique and often underexplored position (Singh et al., 2005; Sureshkumar et al., 2018). Historically regarded as plants with significant ecological and ornamental importance, pteridophytes are now gaining recognition for their medicinal properties (Sureshkumar et al., 2018). These vascular cryptogams, despite their ancient lineage, are integral to traditional

healing systems due to their bioactive compounds that exhibit antimicrobial, anti-inflammatory, and antifungal activities (Commisso et al., 2021). Female health issues like menstrual disorders, leucorrhea, infertility, and postpartum recovery have traditionally been managed using natural remedies made from locally available plants, including pteridophytes (Singh, 2003). Indigenous women in Himachal Pradesh, especially in remote rural and tribal areas, have relied on pteridophyte-based treatments to address reproductive health concerns. These remedies promote maternal well-being and provide a cost-effective, sustainable approach to managing gynecological problems (Hardee et al., 2012). For example, certain fern species are used in the form of decoctions, poultices, or powders to alleviate symptoms such as uterine prolapse, heavy menstrual bleeding, and vaginal infections (Niyaz et al., 2023). Although modern pharmacological research is still in its early stages, there is increasing evidence that pteridophytes contain powerful bioactive compounds (Chandran et al., 2019). These plants are abundant in secondary metabolites such as flavonoids, polyphenols, tannins, alkaloids, glycosides, terpenoids, and phenolic acids. These compounds are recognized for their various pharmacological properties, including anti-inflammatory, antimicrobial, antispasmodic, antioxidant, and hormonal regulation effects, which are especially useful in treating female health issues (Dietz et al., 2016). For example:

- The strong antioxidant qualities of flavonoids and polyphenols may aid in the management of inflammation and oxidative stress, which are frequently linked to gynecological infections, monthly pain, and other reproductive issues (Ciebiera et al., 2021).
- Treating ailments including leucorrhea, postpartum problems, and vaginal infections may benefit greatly from the antibacterial and antifungal qualities of alkaloids and terpenoids (Ugoeze, 2022).
- Tannins possess astringent and wound-healing capabilities, supporting postpartum recovery and alleviating excessive menstrual bleeding (Fraga-Corral et al., 2021).

Despite the encouraging pharmacological potential, there is a significant disconnect between conventional wisdom and contemporary science due to the absence of thorough clinical validation (Patwardhan & Partwardhan, 2005). A scientific foundation for using pteridophyte-based treatments can be established by standardizing them through clinical trials, phytochemical analysis, and experimental research. Bridging traditional practices with contemporary science offers several significant advantages (Benjamin & Manickam, 2007; SM, 1999). First, it aids in preserving indigenous knowledge, ensuring that valuable information on the traditional uses of pteridophytes is documented and protected for future generations, while also recognizing the expertise of indigenous healers. Second, it facilitates the discovery of novel medicinal

compounds; by studying pteridophytes, we may uncover new bioactive compounds that could lead to the development of plant-based pharmaceuticals, especially for addressing female health issues (Afreen et al., 2021; Panda et al., 2011). Third, integrating traditional remedies into healthcare systems could provide sustainable, cost-effective, and accessible healthcare solutions, particularly in rural and underserved regions (Izuka et al., 2023). Finally, emphasizing the medicinal value of pteridophytes helps promote their conservation, as many of these species are at risk from habitat destruction, climate change, and overharvesting (Chivian, 2002). This research attempts to record and assess the conventional use of pteridophytes for treating female health issues, as practiced by the Indigenous societies of the North Western Himalayan region (Khoja et al., 2022). By conducting ethnobotanical surveys, engaging with local healers, and analyzing traditional remedies, the research seeks to explore the untapped potential of pteridophytes while promoting their conservation and sustainable use (Ahmad et al., 2015). The results of this study will not only help preserve indigenous knowledge but also lay the foundation for future pharmacological research and the development of herbal formulations that could benefit women worldwide.

STUDY AREA:

This study was carried out in the North Western Himalayan region of India, specifically Himachal Pradesh, concentrating on areas where indigenous people have used pteridophytes for various women's health issues. The region is noted for its complex geography, which ranges from mid-altitude to high-altitude zones. It also has a rich diversity of pteridophytic flora due to its climate which varies from subtropical at the lower elevations to temperate and even alpine at the higher regions. Ethnobotanical surveys were done on rural and tribal settlements where traditional medical practices still exist. Community like Gaddis, Gujjars, and Pangwals are known to possess wide ranging knowledge on ferns and their relatives. Collecting data on local healers, elderly women, and other traditional practitioners focused on their knowledge on pteridophyte-based remedies for reproductive health problems including menstrual disorders, postpartum care, and other gynecological conditions. The study area is also of great ecological importance as it is rich in biodiversity and is home to a number of protected areas, such as Great Himalayan National Park and Kuight Wildlife Sanctuary. The dependency of local communities on natural resources for healthcare underscores the importance of documenting and conserving this traditional knowledge before it diminishes due to modernization and shifting socio-economic dynamics.

RESULTS:

TABLE 1: SHOWING THE TRADITIONAL PHYTOTHERAPIES OF PTERIDOPHYTES USED FOR FEMALE HEALTH PROBLEMS.

Sr. No:	Botanical Name	Family	Part Used	Mode of use
1.	<i>Adiantum philippense</i> L.	Pteridaceae	Fronds, Rhizome	5-10 ml of fronds decoction drink for one week a month to treat menstrual irregularities. 1-2 tsp powder made from the dried rhizome combined with warm water and honey is used orally once for 4-5 days during the menstrual cycle for birth control/sterility by tribal women.
2.	<i>Adiantum capillus-veneris</i> Linn.	Pteridaceae	Frond	Fresh frond juice (2-5 teaspoons), mixed with tea, is utilized to treat issues like erratic menstrual cycles, and cold swellings of the uterus, and to aid in childbirth and placenta expulsion. 15-20 ml of decoction of fronds is given orally for one month to help overcome infertility in women.
3.	<i>Asplenium trichomanes</i> L.	Aspleniaceae	Whole plant, Frond	Decoction of fresh/dried plant (2-3 tsp.) used to treat uterine abscesses. 2 teaspoons of dried fronds with honey are utilized verbally for a week to encourage menstruation. Decoction of fresh/dried plant (2-3 tsp./5 ml) used in abscess of the uterus. 1 tsp. of dried fronds used orally for a week to promote menstruation.
4.	<i>Asplenium dalhousiae</i> Hook.	Aspleniaceae	Fronds	To treat infertility in women, 10-15 ml of juice extracted from the fronds, mixed with honey, is consumed twice daily.
5.	<i>Asplenium laciniatum</i> D. Don	Aspleniaceae	Root	A paste prepared from the root, combined with cow's urine, is administered orally for the treatment of leucorrhea.
6.	<i>Cheilanthes albomarginata</i> Clarke (CA)	Pteridaceae	Frond	8-10 grams of powder from fronds are mixed with crushed ginger rhizomes (<i>Zingiber officinale</i> L.) and taken orally to treat infertility in women.
7.	<i>Diplazium esculentum</i> (Retz.) Sw.	Aspleniaceae	Fronds	Decoction prepared from the fronds is used to drink for 10-15 days, about 15-20 ml, to manage menstrual irregularities and discomfort. Powder made from the young fronds used to be eaten with honey, about 2-3 tablespoons, by pregnant women as protection against difficult childbirth.

8.	<i>Equisetum ramosissimum</i> Desf.	Equisetaceae	Rhizome	20-25 ml of decoction made from the rhizome is given twice a day for a month to help women conceive.
9.	<i>Hypodematium crenatum</i> (Forssk.) Kuhn	Hypodematiaceae	Fronds	Decoction of 5-10 g fronds mixed with 3-5 ml fresh cow milk is taken after five days of menstrual period for about 5-6 days to facilitate conception in women.
10.	<i>Lygodium flexuosum</i> (L.) Sw.	Schizaeaceae	Whole plant, Rhizome	An infusion of fern (10-15 ml) is administered for 5-7 days for menorrhagia and infertility, while the aqueous rhizome extract (10-15 ml) is taken as a two-week oral treatment for dysmenorrhea and gonorrhea.
11.	<i>Microsorium membranifolium</i> (R.Br.) Ching	Polypodiaceae	Root	Juice extracted from roots (10-15 ml) is used to regulate and control menstrual cycles.
12.	<i>Ophioglossum reticulatum</i> L.	Ophioglossaceae	Frond, Whole plant	Fresh fronds, boiled with rice (0.5 g leaves with 100 g rice), are consumed on an empty stomach for 15-20 days to treat menstrual disorders. The juice and decoction (10 ml) of the whole plant are used for uterine hemorrhage, leucorrhea, and post-delivery recovery, acting as a strength tonic for women and helping prevent infections.
13.	<i>Pteris cretica</i> L.	Pteridaceae	Root	Juice extracted from roots (10-15 ml) is used to regulate and control menstrual cycles.
14.	<i>Polystichum squarrosum</i> (D.Don.) Fee.	Polypodiaceae	Rhizome	5-10g of rhizome powder combined with coconut and raw brown sugar (gur) enhances female fertility.
15.	<i>Selaginella chrysocaulos</i> (Hook. & Grev.) Spring	Selaginellaceae	Whole plant	Consuming 15-20 ml of fresh juice extracted from the whole plant daily for 2-3 weeks helps regulate irregular menstrual cycles.
16.	<i>Thelypteris dentata</i> (Forssk.) St. John	Aspleniaceae	Rhizome	A powder (10-15 g) prepared from the rhizome, mixed with hot water, is taken twice daily for 5-10 days to combat female infertility and possesses antibacterial properties.

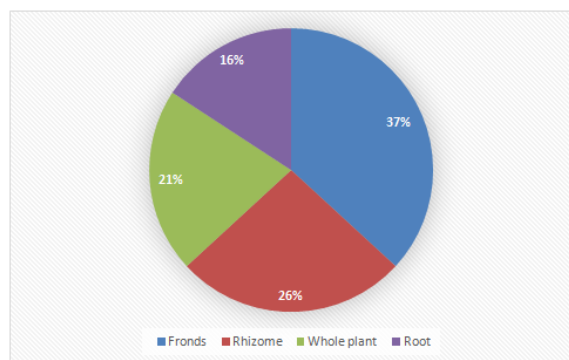


FIGURE 1: DIFFERENT PLANT PARTS USED IN STUDY AREA.

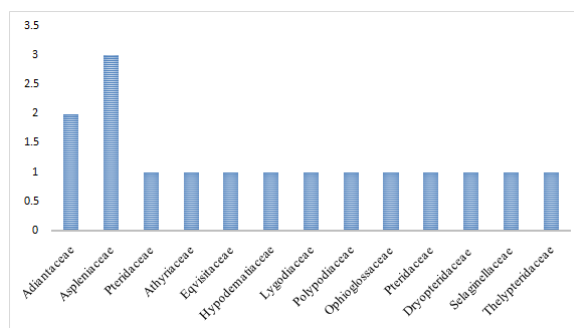


FIGURE 2: SHOWING THE PREDOMINANT FAMILIES OF THE PLANTS IN THE STUDY AREA HAVING ETHNOMEDICINAL PROPERTIES.

DISCUSSION:

This study highlights the significant role of pteridophytes in addressing female health concerns within the Indigenous communities of the North Western Himalayan region. The ethnobotanical survey revealed 16 species of pteridophytes as shown in Table 1, each listed in alphabetic order followed by their family. These pteridophytes are used for treating various gynecological issues, such as menstrual irregularities, infertility, leucorrhea, and postpartum recovery. The remedies, prepared through decoctions, infusions, and powders, emphasize the close relationship between the local people and the surrounding plants. The study reveals that fronds are the most commonly used plant part, accounting for 37% of the medicinal applications for gynecological issues. Rhizomes follow closely behind, comprising 36% of the plant material utilized, while whole plants contribute 21% and roots are used in 16% of treatments. As shown in Figure 2, the Aspleniaceae family is the most dominant, comprising multiple species. The Adiantaceae family follows as the second most abundant. A single species represents each of the other families.

The traditional phytotherapeutic use of *Adiantum philippense* is described—such as 5-10 ml of fronds decoction drink for one week a month to treat Menstrual irregularities. 1-2 tsp powder made from the dried rhizome combined with warm water and honey is taken once daily for four to five days during the menstrual cycle by tribal women for contraception /sterility. Similar uses of this plant is shown by Singh (2003).

The use of *Asplenium dalhousiae* describes such as to treat infertility in women, 10–15 ml of juice extracted from the fronds, mixed with honey, is consumed twice daily. For instance, a study by Suman and Singh (2024) documented the use of fronds of *Asplenium dalhousiae* for treating antifertility in women.

20-25 ml of decoction made from the rhizome of *Equisetum ramosissimum* is given by mouth twice day for a month to help women conceive. A comparable result has been reported by Singh et al. (2005). Decoction of 5-10 g fronds of *Hypodematium crenatum* and mix with 3-5 ml fresh cow milk is taken after five days of the menstrual period for about 5-6 days to facilitate conception in women. Similar results have been shown by Benjamin and Manickam (2007), and SM (1999). Fresh fronds of *Ophioglossum reticulatum* boiled with rice (0.5 g leaves with 100 g rice) are consumed for menstruation issues by keeping the stomach empty for 15 to 20 days. The juice and decoction (10 ml) of the whole plant are used for uterine hemorrhage, leucorrhea, and post-delivery recovery. The plant acts as a strength tonic for women and helps prevent infections. Similar results have been shown by Panda et al., (2011)

The findings also support the need to preserve Indigenous knowledge systems and promote their integration into modern healthcare practices. By documenting and evaluating the use of pteridophytes for female health, this

research contributes to preserving the region's biodiversity while ensuring that these valuable resources continue to benefit future generations. The study's results also open the door for future investigations into the bioactive compounds of pteridophytes, which may lead to the development of natural, plant-based remedies for female health that are both cost-effective and sustainable.

CONCLUSION:

The traditional phytotherapies of pteridophytes used by the Indigenous group of the North Western Himalayan region of Himachal Pradesh represent a rich and invaluable aspect of local healthcare practices, particularly for addressing female health issues. This study has documented the use of various fern species, such as *Adiantum venustum*, *Diplazium esculentum*, and *Equisetum ramosissimum*, in the treatment of gynecological problems, including menstrual irregularities, infertility, leucorrhea, and postpartum recovery. The wide application of pteridophytes highlights their versatility and therapeutic potential due to their bioactive compounds like flavonoids, tannins, and saponins, which are known for their antimicrobial, and hormonal-regulating properties.

Despite the promising results from traditional knowledge, the increasing threats of habitat destruction and overharvesting pose significant risks to the sustainability of these practices. Thus, there is a critical need to promote the conservation of these plants and ensure the preservation of Indigenous knowledge. Further pharmacological research, including clinical trials and phytochemical analysis, is essential to validate the efficacy of these pteridophytes and integrate them into modern healthcare systems. By bridging traditional practices with contemporary scientific approaches, this study not only helps protect the invaluable ethnobotanical knowledge of the region but also opens the door for the development of new, sustainable, plant-based treatments for female health problems.

REFERENCES

1. Afreen, S., Syed, W., & Banerjee, S. (2021). Herbal based drug discovery for skin and surgical infectious diseases. *Biopharmacological activities of medicinal plants and bioactive compounds*, 101, 1-428.
2. Ahmad, M., Bano, A., Zafar, M., Sultana, S., & Rashid, S. (2015). Interdependence of biodiversity, applied ethnobotany, and conservation in higher ecosystems of northern Pakistan under fast climatic changes. *Climate change impacts on high-altitude ecosystems*, 455-489.
3. Benjamin, A., & Manickam, V. (2007). Medicinal pteridophytes from the Western Ghats, 6(4) 611-618.
4. Carpenter, C. (2005). The environmental control of plant species density on a Himalayan elevation gradient. *Journal of Biogeography*, 32(6), 999-1018.

5. Chandran, G., Smitha Grace, S., & Chauhan, J. B. (2019). Fern to pharma: Potential neuroameliorative properties of pteridophytes. *Plant and Human Health, Volume 3: Pharmacology and Therapeutic Uses*, 195-208.

6. Chivian, E. (2002). Biodiversity: its importance to human health. *Center for Health and the Global Environment, Harvard Medical School, Cambridge, MA*, 23, 1-59.

7. Ciebiera, M., Esfandyari, S., Siblini, H., Prince, L., Elkafas, H., Wojtyła, C., Al-Hendy, A., & Ali, M. (2021). Nutrition in gynecological diseases: current perspectives. *Nutrients*, 13(4), 1178.

8. Commisso, M., Guarino, F., Marchi, L., Muto, A., Piro, A., & Degola, F. (2021). Bryo-activities: a review on how bryophytes are contributing to the arsenal of natural bioactive compounds against fungi. *Plants*, 10(2), 203.

9. Dey, A., Gorai, P., Mukherjee, A., Dhan, R., & Modak, B. K. (2017). Ethnobiological treatments of neurological conditions in the Chota Nagpur Plateau, India. *Journal of ethnopharmacology*, 198, 33-44.

10. Dey, A., Gupta, B., & De, J. N. (2012). Traditional phytotherapy against skin diseases and in wound healing of the tribes of Purulia district, West Bengal, India. *J Med Plants Res*, 6(33), 4825-4831.

11. Dietz, B. M., Hajirahimkhan, A., Dunlap, T. L., & Bolton, J. L. (2016). Botanicals and their bioactive phytochemicals for women's health. *Pharmacological reviews*, 68(4), 1026-1073.

12. Fraga-Corral, M., Otero, P., Cassani, L., Echave, J., Garcia-Oliveira, P., Carpena, M., Chamorro, F., Lourenço-Lopes, C., Prieto, M. A., & Simal-Gandara, J. (2021). Traditional applications of tannin rich extracts supported by scientific data: Chemical composition, bioavailability and bioaccessibility. *Foods*, 10(2), 251.

13. Halliwell, B. (1996). Antioxidants in human health and disease. *Annual review of nutrition*, 16(1), 33-50.

14. Hardee, K., Gay, J., & Blanc, A. K. (2012). Maternal morbidity: neglected dimension of safe motherhood in the developing world. *Global public health*, 7(6), 603-617.

15. Izuka, U., Ojo, G. G., Ayodeji, S. A., Ndiwe, T. C., & Ehiaguina, V. E. (2023). Powering rural healthcare with sustainable energy: a global review of solar solutions. *Engineering Science & Technology Journal*, 4(4), 190-208.

16. Khoja, A. A., Haq, S. M., Majeed, M., Hassan, M., Waheed, M., Yaqoob, U., Bussmann, R. W., Alataway, A., Dewidar, A. Z., & Al-Yafarsi, M. (2022). Diversity, Ecological and traditional knowledge of pteridophytes in the western Himalayas. *Diversity*, 14(8), 628.

17. Kumar, A., Kumar, S., Komal, Ramchiary, N., & Singh, P. (2021). Role of traditional ethnobotanical knowledge and indigenous communities in achieving sustainable

development goals. *Sustainability*, 13(6), 3062.

18. Lounasmaa, M., & Tolvanen, A. (2000). Simple indole alkaloids and those with a nonrearranged monoterpenoid unit. *Natural product reports*, 17(2), 175-191.

19. Meena, A. K., Rawat, H., Maikhuri, R., Baduni, P., Saini, A., & Deep, A. (2024). Unveiling The Himalayan Treasures: Exploring Vital Ecosystem Services And Navigating Management Challenges-A Comprehensive Review. *Migration Letters*, 21(S9), 1466-1487.

20. Modak, B. K., Gorai, P., Dhan, R., Mukherjee, A., & Dey, A. (2015). Tradition in treating taboo: Folkloric medicinal wisdom of the aboriginals of Purulia district, West Bengal, India against sexual, gynaecological and related disorders. *Journal of ethnopharmacology*, 169, 370-386.

21. Niharika, Satsangi, M., Umar, S., Ali, A., Parveen, B., & Ahmad, S. (2024). Unveiling Plant-Based Healing Wisdom Through Ethnobotany and Medicinal Ethnopharmacology. In *Ethnopharmacology and OMICS Advances in Medicinal Plants Volume 1: Uncovering Diversity and Ethnopharmacological Aspects*. Springer, 149-171.

22. Niyaz, M., Andrabi, S. A. H., & Mir, R. A. (2023). Medicinal plants used against gynecological disorders by the local inhabitants of District Budgam, Kashmir Himalaya. *Ethnobotany Research and Applications*, 25, 1-23.

23. Panda, S., Rout, S., Mishra, N., & Panda, T. (2011). Phytotherapy and traditional knowledge of tribal communities of Mayurbhanj district, Orissa, India. *Journal of Pharmacognosy and Phytotherapy*, 3(7), 101-113.

24. Patwardhan, B., & Partwardhan, A. (2005). *Traditional Medicine: Modern Approach for affordable global health*. World Health Organization Switzerland. 1-172.

25. Singh, H. B. (2003). Economically viable pteridophytes of India. In *Pteridology in the New Millennium: NBRI Golden Jubilee Volume*. Springer. 421-446.

26. Singh, S., Dixit, R., & Sahu, T. (2005). Ethnomedicinal uses of pteridophytes of Amarkantak, Madhya Pradesh. 4(4), 392-395.

27. SM, V. (1999). Economic importance of pteridophytes. *Ind Fern J*, 16, 130-152.

28. Sureshkumar, J., Silambarasan, R., Bharati, K. A., Krupa, J., Amalraj, S., & Ayyanar, M. (2018). A review on ethnomedicinally important pteridophytes of India. *Journal of ethnopharmacology*, 219, 269-287.

29. Ugoeze, K. C. (2022). Phytopharmaceuticals for treating sexually transmitted diseases. *Herbal drugs for the management of infectious diseases*, 179-261.

30. Wanzala, W., & Minyoso, S. I. (2024). Ethnomedicines in the 21st century: challenges and opportunities in the contemporary world. *Journal of Medicinal Herbs and Ethnomedicine*, 10, 12-36.