# Traditional Ethnobotanical Practice in Indigenous Communities of Australia, Asia, and South Asia, and Modern Medicinal Prospects

Md Jakir Hossain [1], Abdullah Al Mamun [2], Md Shamsuddin Sultan Khan [3*]

## Abstract

Indigenous tribes worldwide have a rich history of using plants in their cultural and medical traditions. This review describes ethnobotany, traditional herbal knowledge, the practices of indigenous populations in Australia, Asia, and South Asia, and their relevance in contemporary medicine. These cultures have relied on the natural environment for sustenance, healing, and spirituality for generations. Aboriginal Australians, for example, have a deep connection to the land and utilize various plants for therapeutic purposes. Similar practices are observed in ethnic groups across Asia and South Asia, where traditional herbal knowledge is passed down through rituals and ceremonies. Global statistics show that about 80% of the population still depends on traditional herbal remedies for primary healthcare, with indigenous communities leading in these practices. Researchers and ethnobotanists collaborate closely with native tribes to document their use of herbs, contributing to preserving cultural heritage and uncovering potential therapeutic benefits. The review highlights that over 6,000 plant species have been employed for treating ailments, spiritual ceremonies, and dietary needs. Furthermore, it is noted that many folk medicines contain substances with pharmacological activity. The review emphasizes the importance of preserving traditional herbal knowledge and harnessing its transformative potential for the benefit of humanity.

**Keywords:** Australian native flora, Bioactive compounds, Biopharmaceuticals, Cancer, Cardiovascular diseases

***Significance*** | Indigenous tribes' traditional herbal Knowledge is a link between the past and present, demonstrating the adaptability of civilizations and the possibility for ground-breaking developments in contemporary medicine.

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## Introduction

Throughout history, people from all cultures have relied on plants for essential needs like food, housing, warmth, and medicines (Schultes, 1992). This reliance has led to the development of various plant-related skills, which were shared during nomadic wandering with nearby tribes, friends, and even enemies, fostering the spread of plant knowledge globally. Studying plants and their applications has been a crucial human endeavor for generations, known as 'Ethnobotany,' a term coined by US botanist John William Harshberger in 1895. Ethnobotany, combining "ethno" (the study of people) and "botany" (the study of plants), explores the interaction between plants and humans, forming a multidisciplinary science and a subfield of ethnobiology. The connection between plants and human societies goes beyond basic needs, extending to areas such as religious rituals, health care, and adornment (Schultes, 1992).

Studying ethnobotany involves a mix of skills like botany,

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anthropology, and linguistics to identify and preserve plant specimens. Linguistic training is crucial for transcribing local terms and understanding native language aspects. However, native healers may withhold some of their knowledge (Jose et al., 1983). Despite our limited exploration of Earth's biological richness and potential, exploiting land for pasture or timber may not always be as beneficial as preserving its natural state (Peters et al., 1989). Techniques like random screening, taxonomy collecting, and ethnobotanical collecting help identify therapeutic plants. Chemicals from ethnobotanical sources have shown greater activity than those from random screening, suggesting higher potential for product development. Plants play a significant role as food and medicine sources, contributing to treating illnesses and maintaining good health.

Ethnobotany, as described by Balick and Cox (1996), is the study of how plants are used, controlled, and perceived in human civilizations (Figure 1). This encompasses a wide range of uses such as food, medicine, divination, cosmetics, dyes, textiles, construction materials, tools, money, clothing, music, social activities, and rituals. The connection between people and plants has always been crucial, as every aspect of our life relies on plants. Plants not only regulate the air's gas composition but also uniquely convert sunlight into the food energy that sustains all other forms of life. Native Americans, with their extensive knowledge of medicinal herbs, remain a valuable source of information, particularly in modern medicine.

With the worldwide trend toward obtaining pharmaceuticals from plant sources, the significance of plants in medicine is even more crucial. As a result, attention has been drawn to the therapeutic value of herbal therapies for safety, effectiveness, and affordability (Glombitza & Mahabir et al,1997). The World Health Organization (WHO., 1992) stressed the necessity to guarantee plant product quality control by adopting contemporary methods and appropriate standards. (WHO., 1992.) Due to the development of modern technology and changes in traditional culture, indigenous traditional Knowledge of medicinal plants from many ethnic communities, passed down orally for ages, is quickly vanishing off the face of the earth. Before traditional Knowledge is entirely lost, it is urgently necessary to document the ethnobiological information that is now available across many groups (Rao et al,1996). As traditional culture slowly fades away, a large portion of this treasure of information is completely being lost (Hamilton et al,1995). Therefore, there is a pressing need for human-centered ethnobotanical research (Maheshwari et al,1983).

As described by Balick and Cox (1996), ethnobotany can be categorized into two main branches. The first is basic ethnobotany, which involves gathering and organizing facts on the biota from indigenous and other peoples. Examples include gathering Knowledge about helpful plants and animals, comprehending how peoples utilize certain plants and animals, and managing their environs and becoming familiar with their classifications and lexicons. What it is that we work as hard as we can to use real-world data from primary sources. When species identification is finished, these outcomes can then be arranged in various ways. They might basic documentation, quantitative analysis, and experimental ethnobotany are all part of assessment of usage, management, and experimental evaluation.

Researching indigenous herbal knowledge is not only interesting but also crucial for addressing some of today's most pressing global issues. Indigenous peoples have been stewards of various ecosystems, and their deep understanding of plant life can contribute to solving problems in areas such as modern medicine, conservation, and sustainable agriculture. This article takes the reader on a captivating journey through ethnobotanical traditions, focusing on indigenous peoples in Australia, Asia, and South Asia. These regions host diverse cultures, each with a unique relationship with plants. The goal is to explore how plants have shaped human history and continue to do so through their traditional herbal knowledge. This essay seeks to bridge the gap between the past and present, examining the resilience of traditional medical practices in the face of globalization, the principles of traditional medicine, and the therapeutic benefits of plants. Additionally, it explores how ethnobotanical knowledge could impact and support modern healthcare, environmental conservation, and cultural preservation initiatives.

**Ethnobotany and Traditional Medicine System**

Traditional medicine has long relied on herbal remedies, playing a vital role in healthcare systems worldwide. In India, Native Indians use various natural remedies to effectively treat different illnesses. The methods of administering and preparing plant-based medicines vary across regions. Although knowledge of herbal remedies is declining over time, some men continue to actively practice traditional herbal healing. Local communities regularly utilize these plants for treating various ailments, fostering the development, exchange, and preservation of information, expertise, and techniques within communities (Pushpangadan, 2005). Figure 2 below illustrates the traditional use of medicine and its benefits.

Before modern medicine, generations from different civilizations collaborated to create traditional medical knowledge, also known as folk or indigenous health (Principe et al., 2002). This body of knowledge, comprising theories, beliefs, and customs from indigenous cultures, plays a valuable role in health maintenance. It encompasses aspects such as diagnosis, treatment, and prevention of both physical and mental diseases. According to the World Health Organization (WHO), an estimated 70% of people utilize complementary and alternative medicine (WHO, 2008, 2019).

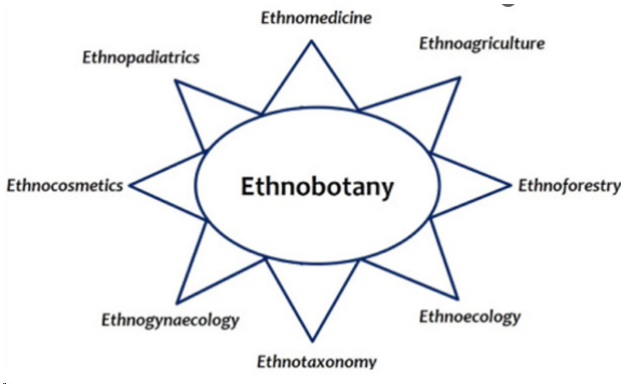


**Figure 1.** Ethnobotany overview. Plants used for food, medicine, divination, cosmetics, dyes, textiles, construction materials, tools, money, and clothing, music, social activities, and rituals.

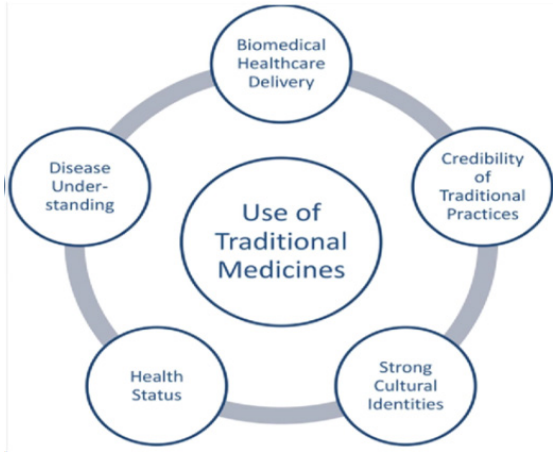


**Figure 2.** Traditional Medicine. Traditional use of medicine how these are beneficial for us.

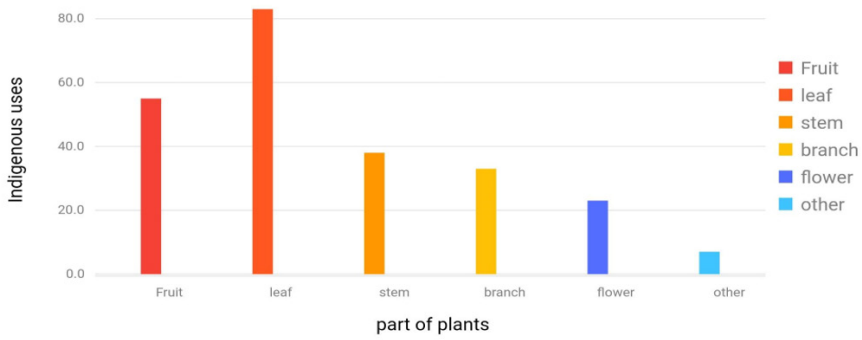


**Figure 3**. Indigenous use of plant and their part for use.

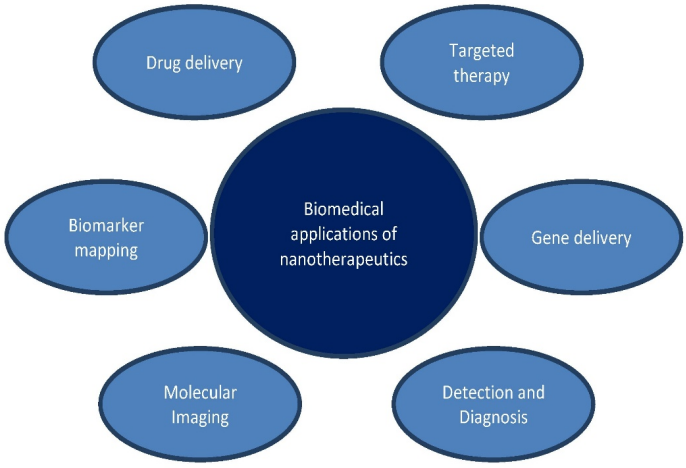


**Figure 4.** The use of plant in modern medicinal prospect

Ethnobotany is a subfield of ethnobiology, which also includes ethnopharmacology, ethnomedicine, and ethnozoology, along with ethnic studies, mycology, and ethnoveterinary research with broad applications (Conklin et al., 1967). The term "ethnobotany" was first introduced by John Harshberger in 1896, describing it as "the application of Native Americans' use of plants" (Martin et al., 1995). Schultes later defined Ethnobotany as "the study of the connection between members of primitive societies and their plant environment" (Balick et al., 1996). Ethnobotany captures the understanding of human-plant interactions influenced by culture (Schultes et al., 1962) and has expanded to include various disciplines. There is a growing trend in using ethnobotany for medicinal plant selection to identify plants with potential components for further research and the development of new drugs.

**Ethnobotanical Practices in Indigenous Australia**

In the late eighteenth century, Europeans began documenting how Indigenous Australians used plants as they explored the land and sea. Initially, this was driven by practical needs, focusing on the economic potential of plants for future settlers. In the twentieth century, Western academics studied indigenous cultures with a new perspective, leading to the development of ethnobotany. Ethnobotany explores the intricate relationship between culture and the natural environment, investigating native taxonomies and the symbolic significance of plants. Today, Australian ethnobotany considers both practical and cultural aspects of human plant usage, evolving into a field of study that involves various professionals, including settlers, explorers, biologists, pharmacologists, anthropologists, and more, all collectively referred to as "ethnobotanists."

Most of the information in Maiden's compendium was gathered by other field researchers. Botany emerged as a field of study in the late nineteenth century, while anthropology was in its early stages. Additional scientists, such as Cleland and MacPherson, who were medical practitioners, diligently documented the features of plants used by Indigenous Australians. In 1939, Campbell, a dentist, explored Indigenous cuisine in relation to dental hygiene. Biologist Thomson (1987) from Melbourne, alongside his extensive collection of materials, engaged with Aboriginal people during field expeditions in northern and central Australia, with his field notes containing valuable ethnobotanical information. Acting as the "curator of ethnology," Tindale (1974), a biologist at the South Australian Museum, scientifically documented Aboriginal culture, gathering ethnobotanic data and specimens across Australia.

Since the eighteenth century, chemists and pharmacologists have been exploring the medicinal properties of Indigenous Australian herbal remedies. Bancroft investigated pituri, the favored narcotic of an inland Aboriginal group, discovering it contained nicotine alkaloids (Bancroft et al., 1872). In Queensland, poisons were the subject of research by Hamlyn-Harris and Smith (1916). Webb, at the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Brisbane, initiated the Australian Phytochemical Survey in 1944 due to Queensland's diverse ecological zones and plant diversity. Webb (1977) collaborated with Aboriginal people, anthropologists, and scientists at Lockhart River in northern Queensland to document Indigenous plant usage, recognizing the importance of a holistic investigation from both scientific and cultural perspectives (Figure 3). The chart illustrates plants used in medicine. Anthropologist White and botanist Scarlett conducted joint fieldwork in northern Arnhem Land from 1973 to 1980 (Scarlett et al., 1982). Other researchers have explored Aboriginal use of wild tobacco plants (Goddard and Kalotus, 1988) and the potential use of phytochemicals in cancer (Meher U Nessa et al., 2020). Melbourne-based CSIRO researchers published the findings of the Phytochemical Survey in 1984 (Collins et al., 1990).

The Bush Medicine Project, funded by the Northern Territory Department of Health and Community Services in the 1980s, employed a collaborative approach to investigate Indigenous plant usage. Published in 1988, "Traditional Bush Medicines" aimed to document the pharmacopoeia of Aboriginal tribes in the Northern Territory (Barr et al., 1988). Compiled by a team primarily consisting of botanists and pharmacologists, the medicinal information was derived from extensive joint research. The book represents a blend of botany and pharmacology, providing botanical descriptions and chemical analyses of each plant. While the project created a list of medicinal plants selected for potential chemical efficacy, termed "medical ethnobotany," it did not necessarily incorporate an Aboriginal perspective on plant use despite collaboration with specialists and Indigenous informants (Telban, 1988).

Conventional medicine relies on quantitatively studying the active components in plants to establish preparation and dosage criteria. Analyzing an Indigenous perspective on medicinal practices involves considering cultural ideas about disease causes and the qualities of medicines, particularly those linked to mythology and cosmology (Furst, 1982). The sociological role of Aboriginal healers and their impact on the interplay of environmental, social, and spiritual aspects is crucial to understanding their practices. In many hunting and gathering societies, the distinction between food and medicine, as perceived in Western contexts, becomes less relevant.

The use of plants by Aboriginal people has influenced various healing practices. According to Webb (1948), some Aboriginal treatments gained popularity among Chinese herbalists, while others became part of the medical practices of bushmen, drovers, and woodcutters. Certain therapeutic plants were recommended by physicians in the early nineteenth century due to their taxonomic relationship with foreign plant species used in drug production.

Additionally, Australian plants have been studied by healers practicing unconventional Western medicine. For instance, naturopath and homeopath White (1987) made claims in a pamphlet titled Australian Bush Flower Remedies, suggesting that the healing abilities of Aboriginal traditions should be rediscovered. Indigenous traditions from the Northern Hemisphere have significantly influenced modern herbalist practices in Australian cities. Professional herbalists sometimes seek help in incorporating Indigenous plant usage into their medicine lists. Anthropologists working at institutions like the South Australian Museum often assist such eclectic medical professionals.

Nutritionists and pharmacologists have examined Aboriginal plants for dietary qualities, generating quantitative data (Brand and Maggiore, 1992). This research subtly impacts the menus of certain eateries specializing in Australian bushfood, potentially supporting authorities in managing Aboriginal health issues, especially in remote areas where the diet relies heavily on wild foods (Altman et al, 1984).

Since the 1980s, there has been increased public awareness of the Australian environment, leading to a resurgence of scholarly and public interest in native plant characteristics. Australian flora is no longer perceived as culturally stunting, and articles by Cribb and Cribb (1981a, 1981b, 1982) incorporate data on Aboriginal plant usage and empirical methodologies. Survival training offered by biologists and environmentalists for military services includes information on Aboriginal plant use. The Aboriginal environment is utilized for tourism in northern Australia, with booklets based on Top End Aboriginal plant usage prepared for the general market in 1991 (Wightman and Andrews 1991). Ecotourism encourages appreciation of the Australian landscape through knowledge of Aboriginal plant usage.

**Studying hunters and gatherers**

Research on Aboriginal plant usage has been interdisciplinary, offering insights into pre-European hunting and gathering practices. Anthropologists, archaeologists, and historians have applied ecological theory since the 1960s to understand non-Western perspectives and explore the connections between people and their environments. FGG Rose (1987) defined hunters and gatherers, highlighting the significant changes in subsistence patterns among Australian Aboriginal people during the first half of the 20th century when they integrated into a money-commodity economy with Europeans.

Post-World War II, traditional production relations vanished permanently, limiting social anthropologists' firsthand observations. Researchers have relied on records from observers at the edge of European expansion for reconstructing pre-European contact modes of subsistence. The study primarily captures a "memory culture," revealing how Indigenous groups, even in remote areas, retained knowledge of pre-European plants. While labor-intensive sources like grass seeds and poisonous tubers have diminished, contemporary Indigenous food-plant usage has shifted to simpler sources like fruits and gums.

In recent decades, scholars studying pre-European ways of life have mainly been documenting a "memory culture." This applies not only to settled areas in Australia but also to isolated regions, considering both culture and location. For instance, Pitjantjatjara women in the Western Desert still knew how to make damper from wild seeds in the 1970s, as noted by Brokensha (1975). However, this practice had become less frequent due to the availability of flour at local shops. Despite the gradual loss of this firsthand knowledge, modern Indigenous communities continue to utilize several plants from the pre-European era. The focus has shifted away from labor-intensive sources like grass seeds and poisonous tubers, emphasizing simpler options like raw fruits and gums. Changes in Aboriginal connections to the landscape are evident in their current plant-use practices.

Researchers in regions where hunting and gathering were prohibited, like many parts of southeastern Australia, have evaluated the significance of specific foods based on historical sources (Bonney et al., 1994). Ethnobotanists collaborate with elder Australians who have firsthand knowledge of past practices. Concerns are raised by researchers and Indigenous custodians regarding the rapid disappearance of plant usage information, especially concerning medicines (Parker, 1980). To understand regional practices in the late nineteenth century, authors in southeast Australia had to rely on comparative studies from other parts of the country. Ford (1978) warned that ethnobotany could turn into a literary tradition unless researchers study cultures undergoing change or Westernization. Ethnobotany is seen as a form of rescue work, assembling knowledge fragments from deteriorating hunting and gathering systems as they adapt to European agriculture. Palaeoethnobotanists (Beck et al., 1989) primarily focus on the pre-European era's Aboriginal plant usage through archaeological studies.

**Ethnobotanical Practices in Indigenous in Asian Countries**

Traditional healthcare systems heavily depend on medicinal plants. In emerging Asian countries, an estimated 70–80 percent of rural residents still rely on traditional medicine for basic healthcare, despite the widespread availability of allopathic medication. Access to food, healthcare, and wood-derived energy is crucial in these rural societies, with no other resource alternatives available. The sale of medicinal herbs serves as a significant source of income, contributing to the growth of the contemporary industry and the economy in rural areas. For example, the nations of the Hindu Kush and Himalayas have approximately 7500–10,000 different species of therapeutic herbs, playing a crucial role in the region's biodiversity

and holding significant global biodiversity value (Pei, 1998). Countries such as Afghanistan, Bangladesh, Bhutan, China, India, and the Hindu Kush Himalayas host the four major traditional medical systems in the world: Ayurvedic, Chinese, Tibetan, and Unani, especially in Nepal and Pakistan. This region stands out as the only one among the tall mountain ranges globally (The Himalayan, Andean, African, and European systems) with abundant diversity in medicinal plants.

Ethnobotany, a scientific research field, is extensively used to document indigenous knowledge about plant uses and compile an inventory of valuable species in the diverse flora of local Asian nations (Jain, 1987; Pei, 1988; Martin, 1995). Ethnopharmacology is described as a scientific field investigating how indigenous civilizations use botanicals for medicine, confirming their efficacy and side effects through science. These ethnopharmacological techniques are recommended for use in many cultures to enhance health, especially in developing countries (Farnsworth, 1993). In Asian nations like China, India, and Nepal, ethnobotany is widely employed, particularly in India and Bangladesh, to catalog and record traditional knowledge of medications made from plants (Shah, 1990).

The most recent record and inventory of Traditional Chinese Medicine (TCM) consist of 11,146 plant species, 1581 animal species, and 80 minerals. Approximately 500 to 600 of these species are commonly used as remedies in TCM. This comprehensive information about TCM is available in six volumes of Chinese Medicinal Books published by Science Press and the Chinese National Corporation of Traditional & Herbal Medicine in Beijing during 1994–1995. These volumes cover Chinese Medical Resources, Chinese Herbal Resources Outline, Regionalization of Chinese medicine, Common Chinese medicinal substances, Chinese Folk Prescriptions, and The Chinese Herbal Medicine Resource Atlas.

The Atlas is a valuable pharmacological resource with both academic and practical significance. It comprises a series of Traditional Chinese Medicine (TCM) papers containing 20,000 folk prescriptions and an inventory of 12,807 medicinal plants, animals, and minerals. The entries provide information on resource distribution, environmental factors, history of harvesting, history of use, and conservation details. China's 18 provinces, covering 64% of its land, are home to 100 million people from 55 ethnic minority groups. Their traditional knowledge of herbal remedies and medical systems is collectively known as China's "Ethno-Medicine" (EMC). Over the past two decades, around 8000 inventories of plant and animal species have been recorded, including 1106 plants, 448 animals, 840 natural minerals in Tibetan medicines. This ethnobotanical knowledge serves as a valuable resource for developing new drugs and promoting regional economic growth (Zheng, 1997; Xiao, 1999).

Traditional healers in India reportedly use 2500 plant species, with 100 plant species serving as regular sources of medication (Shah, 1990). In Nepal, ethnobotanists recorded over 800 medicinal plants (Mamamdhar, 1995), while in Bangladesh, there were claims of approximately 700 medicinal plants (Banik, 1998). Reports suggest that Pakistan is responsible for around 50% of the raw materials needed in contemporary medicine, as they are synthetically produced based on petrochemicals (Hussain, 1987). There has been a growing interest in documenting and inventorying traditional herbal medicine in recent years, particularly in Himalayan nations utilizing ethnobotanical techniques. Various international organizations, including UNESCO, WWF International, ICIMOD, IDRC, and European funding agencies, have significantly contributed to the advancement and promotion of ethnobotanical practices.

**Modern Medicinal Prospects: the Potential of Advanced Therapies**

Recent advancements in technology, a deeper understanding of genetics, and increased Knowledge about the human body have led to a significant transformation in the field of medicine. This article explores the potential impact of these developments on modern healthcare and how they might reshape our current healthcare practices. Figure 4 provides an overview of the prospects brought about by these advancements in medicine.

**Precision Medicine: Tailoring Treatments to Individuals**

Precision medicine is a cutting-edge development in modern healthcare, tailoring medical treatment to each individual's unique characteristics. The foundation of this approach is genetic profiling, which helps identify disease risks, select the most effective treatments, and predict patient responses to therapy. Since the launch of the Precision Medicine Initiative by the National Institutes of Health (NIH) in 2015, research in this field has made significant strides, encouraging scientists and medical professionals to delve deeper into the realm of personalized medicine.

The core idea behind precision medicine is simple yet crucial. By examining a patient's genetic makeup, doctors can determine which medications are likely to be effective and which may have adverse effects. For example, a patient with a specific genetic mutation might not respond well to a particular treatment, while another patient without that mutation could benefit significantly from the same therapy. This level of personalization has the potential to reduce trial-and-error in treatments, minimize side effects, and improve patient outcomes.

**Immunotherapy: Empowering the Body's Defenses**

Exploring a different facet of modern medicine is immunotherapy, a novel approach that harnesses the body's immune system to

combat certain diseases, including cancer. The remarkable progress in cancer immunotherapy was acknowledged with the 2018 Nobel Prize in Physiology or Medicine (The Nobel Prize, 2018). While the immune system serves as a robust defense against external threats, cancer cells often evade its protection. Immunotherapy aims to revive the immune system's dormant ability to fight against cancer (John Catanzaro et al. 2020). One promising avenue in this field is the use of checkpoint inhibitors, which block cancer cells' escape routes, making it easier for the immune system to detect and combat them.

Another groundbreaking development is CAR-T cell therapy, which has shown remarkable results in treating previously incurable malignancies. This therapy involves genetically modifying the patient's immune cells to target and eliminate cancer cells. Clinical studies have indicated the potential for long-term remission in patients with specific forms of leukemia and lymphoma.

**Gene Editing: Precision at the Genetic Level**

Advancements in gene editing technologies, particularly CRISPR-Cas9 (Doudna & Charpentier, 2014), have revolutionized genetic research. CRISPR-Cas9 allows precise modification of genes, opening up a wide range of therapeutic possibilities for hereditary diseases. Imagine a future where genetic abnormalities underlying conditions like cystic fibrosis or sickle cell anemia can be effectively corrected. Gene editing holds the potential to make this a reality. While researchers are actively exploring ways to utilize CRISPR-Cas9 and similar techniques to address genetic disorders once considered incurable, practical applications are still in the early stages of development.

**Artificial Intelligence (AI): Enhancing Medical Decision-Making**

Artificial intelligence (AI) has become crucial in healthcare due to its ability to analyze vast amounts of patient data, identify patterns, and predict outcomes much faster than human capacity allows. AI applications include disease prognosis, drug development, and medical diagnostics (Gao et al., 2020). Obermeyer et al.'s work (2019) illustrates how AI can forecast the progression of illnesses, providing early indicators of poor health for quicker intervention by clinicians, potentially saving lives.

Moreover, AI plays a significant role in expediting drug discovery by efficiently examining extensive databases of chemical compounds and predicting their potential interactions with biological targets. This is particularly valuable when addressing new disorders or the need for specialized drugs.

**Nanomedicine: Precision Drug Delivery**

Nanotechnology has opened up new possibilities in medicine, particularly in drug delivery. By engineering nanoparticles, which are microscopic structures at the nanoscale, drugs can be targeted to specific cells or tissues in the body. This precise medication distribution enhances treatment effectiveness while reducing adverse effects (Bhadra et al., 2009). Nanomedicine holds the promise of delivering chemotherapy medications directly to cancer tumors, sparing healthy cells from the harmful effects of the drugs. Researchers are actively exploring the potential of nanoparticles in treating various conditions, including cancer, cardiovascular disease, and neurological problems.

**Regenerative Medicine: Repairing and Replacing Tissues**

Regenerative medicine shows great promise in addressing illnesses once considered irreversible by repairing or replacing damaged tissues and organs (Trounson & McDonald, 2015). The key component of regenerative medicine is stem cell therapy, as stem cells possess the remarkable ability to differentiate into various cell types. Ongoing clinical trials are exploring the use of stem cells to treat conditions like degenerative diseases, heart problems, and spinal cord injuries.

**Telemedicine: The Future of Healthcare Access**

Telemedicine has gained popularity in healthcare, especially during the COVID-19 pandemic (Smith et al., 2020). Using technology, telemedicine simplifies and enhances healthcare by allowing remote consultations, monitoring, and treatment. The increased use of telehealth during the pandemic, driven by the need for safer alternatives to in-person visits, is likely to persist. This shift towards telemedicine has the potential to improve healthcare accessibility, particularly for individuals in rural or underserved areas.

**Vaccines and mRNA Technology: A Game-Changer**

The potential of mRNA technology was demonstrated by the rapid development of COVID-19 vaccines (Polack et al., 2020). mRNA vaccines, a groundbreaking immunization method, offer more than just a solution for the pandemic. Their versatility allows for the swift creation of vaccines against various diseases, potentially revolutionizing vaccine production, enhancing efficiency, and preparing for new health threats. In summary, the future of modern medicine holds the promise of a healthcare revolution. The convergence of genetics, advanced therapeutics, artificial intelligence, nanotechnology, and emerging technologies is poised to transform healthcare by providing personalized treatments, addressing genetic diseases, advancing drug development, and optimizing patient outcomes. Staying informed about the latest medical advancements is crucial to fully grasp the scope of this revolutionary era as science continues to progress beyond the knowledge cutoff date.

**Conclusion**

Studying ethnobotanical practices among indigenous communities in Australia, Asia, and South Asia reveals the deep connections

between people and nature. Recognizing the importance of documenting and preserving these valuable traditions as we enter the twenty-first century is crucial. Collaborating with indigenous tribes becomes essential in safeguarding this knowledge against the influences of modernization and globalization. The potential for advancements in contemporary medicine stemming from ethnobotanical knowledge is promising. Traditional remedies have unveiled numerous substances with therapeutic potential, leading to the development of new medications and therapies. These ancient traditions offer hope for the future of medicine, addressing challenges like antimicrobial resistance and the need for sustainable healthcare solutions. In essence, the traditional herbal knowledge of indigenous tribes serves as a bridge between the past and present, showcasing the adaptability of civilizations and the potential for groundbreaking developments in modern medicine.

### Author contribution

M.J.H., A.A.M. and M.S.S.K. wrote, drafted, reviewed and edited the paper.

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### Competing financial interests

The authors have no conflict of interest.

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