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From the Editor's

Dear Readers,

In the November issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcomed for improvement.

Dr. R. S. Tomar
Editor-in-Chief
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PESTICIDE EXPOSURE AND THE DEVELOPMENT OF BLOOD CANCERS IN HUMANS

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Abstract
Pesticides play a crucial role in modern agriculture and vector control; however, their widespread and long-term use has raised serious concerns regarding human health. Among the various adverse outcomes, hematological malignancies have attracted significant attention. Blood cancers, including leukemia, lymphoma, and multiple myeloma, arise from abnormal proliferation and differentiation of hematopoietic or lymphoid cells. Growing epidemiological and experimental evidence suggests a strong association between chronic pesticide exposure and the development of these malignancies. Several pesticide classes such as organochlorines, organophosphates, carbamates, and herbicides have been implicated. The underlying mechanisms involve genotoxicity, oxidative stress, immune dysregulation, endocrine disruption, and epigenetic modifications. Agricultural workers, children, and individuals residing in farming communities are particularly vulnerable. Strengthening regulatory frameworks and promoting safer pest control strategies are essential to reduce pesticide-associated blood cancer risk.

Introduction

Hematological malignancies constitute a major public health burden worldwide, contributing substantially to cancer-related morbidity and mortality. These malignancies primarily include leukemia, lymphoma, and multiple myeloma, all of which originate from abnormal growth of blood-forming or immune cells in the bone marrow and lymphatic system. While genetic susceptibility plays an important role, environmental exposures have increasingly been recognized as critical risk factors.

Pesticides are inherently toxic chemicals designed to eliminate pests but may also adversely affect non-target organisms, including humans. Continuous exposure through occupational, dietary, and environmental routes has made pesticides an important concern in cancer

epidemiology. Agricultural workers and populations in rural areas experience particularly high exposure, especially in developing countries where safety regulations and protective measures are often inadequate.

Key Mechanisms

- **Genotoxicity:** DNA damage and chromosomal abnormalities in hematopoietic stem cells
- **Oxidative stress:** Excess ROS leading to DNA and cellular damage
- **Immune dysregulation:** Impaired immune surveillance and lymphocyte function
- **Endocrine disruption:** Hormonal imbalance affecting cell proliferation
- **Epigenetic changes:** Altered gene expression without DNA sequence changes

Classes of Pesticides Associated with Blood Cancers

Several pesticide classes have been linked to hematological malignancies. Organochlorine pesticides, such as DDT and lindane, are persistent and bioaccumulative and have been associated with increased risk of leukemia and non-Hodgkin lymphoma. Organophosphate and carbamate pesticides, widely used insecticides, have been shown to induce DNA damage, oxidative stress, and immune suppression. Herbicides, particularly phenoxy herbicides (e.g., 2,4-D) and triazines (e.g., atrazine), are also implicated due to their immunotoxin and endocrine-disrupting properties.

Fig. 1: Schematic representation of pesticide application in agricultural fields, illustrating the spread of different types of pesticides. The figure highlights potential exposure routes during spraying and through subsequent food consumption.

Routes of Exposure

Humans are exposed to pesticides through multiple routes, including occupational handling during mixing and spraying, dermal absorption, inhalation of aerosols, and ingestion of contaminated food and water. Chronic low-dose exposure is of particular concern, as it may lead to cumulative biological damage. Prenatal and early-life exposure is especially critical due to the high sensitivity of developing hematopoietic and immune systems.

Epidemiological Evidence

Numerous occupational studies have reported elevated risks of leukemia and lymphoma among farmers and pesticide applicators. Large cohort studies, such as the Agricultural Health Study, have demonstrated dose-response relationships between pesticide exposure and cancer incidence. Residential exposure has also been associated with increased childhood leukemia risk. Meta-analyses consistently support a positive association between pesticide exposure and hematological malignancies.

Future Research Directions

To pinpoint precise molecular targets, comprehend gene-environment interactions, and create biomarkers for early detection, more investigation is needed. Developments in molecular epidemiology and toxicogenomic have the potential to enhance risk assessment and prevention.

Conclusion

Current scientific evidence strongly supports a link between chronic pesticide exposure and the development of blood cancers in humans. The risk is particularly high among occupationally exposed populations and children. Implementation of stricter regulations, improved awareness, and adoption of safer pest management strategies are essential to reduce pesticide-related cancer burden.

References

1. **Alavanja, M. C. R., Ross, M. K., & Bonner, M. R.** (2013). Increased cancer burden among pesticide applicators. *CA: A Cancer Journal for Clinicians*, 63, 120–142.
2. **Blair, A., et al.** (2015). Occupational cancer in agriculture. *Occupational and Environmental Medicine*, 72, 441–448.

THE LIFE AND LEGACY OF JANE GOODALL

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Dr. Jane Goodall, one of the world's most renowned primatologists and conservationists, has transformed humanity's understanding of the relationship between humans and animals. Born on April 3, 1934, in London, England, Goodall's fascination with animals began in childhood. Inspired by stories such as Tarzan and Dr. Dolittle, she dreamed of living among wild animals in Africa—a dream that would later become a groundbreaking reality.

Goodall's journey into science began unconventionally. Without formal university training at first, she traveled to Tanzania in 1960 to study wild chimpanzees under the guidance of the famous anthropologist Louis Leakey. In the Gombe Stream National Park, she began her pioneering

research, observing chimpanzees not as mere research subjects but as complex, emotional, and intelligent beings. Her discovery that chimpanzees make and use tools, previously considered a uniquely human trait, redefined the boundaries between humans and animals.

Over time, Goodall documented rich social behaviors among chimpanzees—such as affection, cooperation, conflict, and even grief—revealing that these primates share many psychological and emotional similarities with humans. Her work was compiled in influential publications like "In the Shadow of Man" and "The Chimpanzees of Gombe", which brought her findings to a global audience and changed the course of ethology and anthropology.

Beyond scientific discovery, Jane Goodall's greatest legacy lies in her lifelong commitment to conservation and education. In 1977, she founded the Jane Goodall Institute, which promotes wildlife research, community-centered conservation, and environmental stewardship across the world. She also established the Roots & Shoots program, an international youth-led initiative encouraging environmental and humanitarian action in over 100 countries.

Goodall's tireless advocacy for animals and the planet has earned her numerous honors, including the UN Messenger of Peace title, the Kyoto Prize, and the Templeton Prize. Even in her nineties, she continues to travel globally, spreading messages of hope, compassion, and sustainability.

In essence, Jane Goodall's life and legacy remind the world that empathy and science can coexist. Her work not only redefined our understanding of chimpanzees but also inspired generations to protect the interconnected web of life on Earth. Through her dedication, humility, and vision, Goodall stands as a living symbol of what one person can achieve in service of nature and humanity.

ROLE OF THE UNIVERSITY SOPHISTICATED INSTRUMENTATION CENTRE (USIC) IN RESEARCH AND DEVELOPMENT

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The University Sophisticated Instrumentation Centre (USIC), JSS AHER, Mysuru is a state-of-the-art research facility equipped with advanced, cutting-edge technologies that support high-quality research and innovation across disciplines. The centre houses High-dimensional Flow Cytometry (FACS), Confocal Microscopy (CM), Gas Chromatography–Mass Spectrometry (GC-MS/MS), Nuclear Magnetic Resonance (NMR), High-Resolution Mass Spectrometry (HR-MS), and Attenuated Total Reflectance–Fourier Transform Infrared Spectroscopy (ATR-FTIR). These major facilities have been established through funding support from national agencies such as the Department of Biotechnology (DBT) and the Department of Science and Technology (DST).

USIC plays a crucial role in addressing fundamental and translational research questions. Advanced imaging and single-cell analysis platforms, particularly flow cytometry and confocal microscopy, enable detailed understanding of disease pathogenesis and facilitate the discovery of novel

Fig. 1: Representative images of the advanced research instrumentation facilities at the University Sophisticated Instrumentation Centre (USIC), JSS AHER, Mysuru, Karnataka, India.

biomarkers and therapeutic targets in cancer, autoimmune disorders, and infectious diseases. Complementary analytical platforms such as GC-MS/MS, HR-MS, NMR, and ATR-FTIR support structural characterization of compounds, protein analysis, and investigation of complex chemical mixtures.

For example, at the University Sophisticated Instrumentation Centre (USIC), flow cytometry is routinely employed for the analysis of human blood samples using the TBNK panel. This platform enables comprehensive immune profiling to better understand disease pathogenesis and to identify novel biomarkers that can help predict treatment response and clinical outcomes.

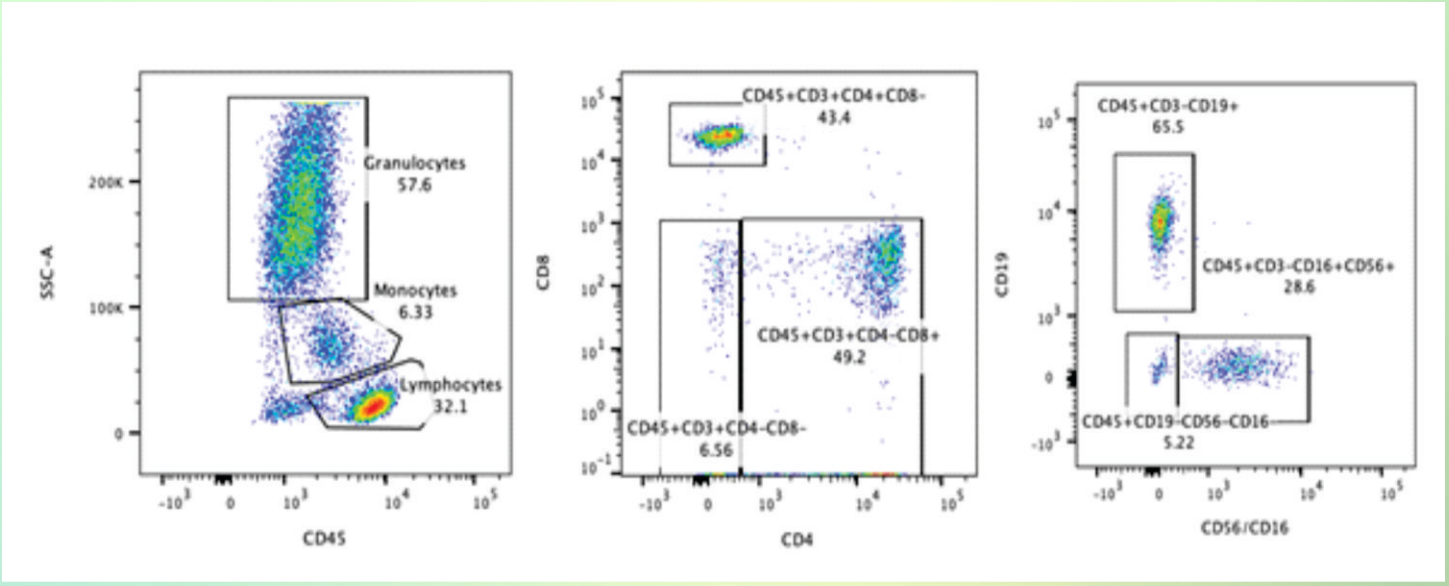

Fig. 2: Gating strategy used to identify and define major leukocyte populations from a healthy individual. The analysis was performed using the TBNK panel, which enables quantification of T cells, B cells, and natural killer (NK) cells, along with T-cell subsets including $CD4^+$ and $CD8^+$ cells. This assay is routinely employed in the evaluation of immune status in viral infections such as HIV/AIDS and in cancer. Flow cytometry-based immune phenotyping provides a comprehensive assessment of immune cell composition and can be extended to study various diseases using disease-specific antibody panels.

PATHOGENESIS AND MODES OF TRANSMISSION OF *KLEBSIELLA PNEUMONIAE*

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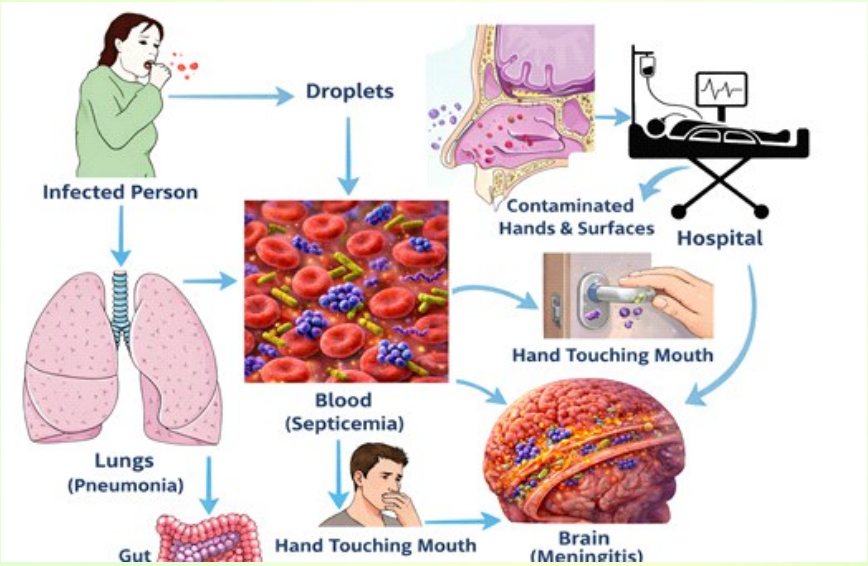
By effectively colonizing mucosal surfaces and then moving from these main locations to deeper tissues and distant organs, *Klebsiella pneumoniae* is a highly pathogenic Gram-negative bacterium that can cause serious and potentially fatal infections. The respiratory and gastrointestinal mucosae are frequently the sites of initial colonization, where the organism can either survive asymptomatically or serve as a reservoir for invasive illness. Under the right circumstances, *Klebsiella pneumoniae* can penetrate epithelial barriers and spread into the circulation, resulting in potentially fatal systemic infections, especially in immunocompromised people. In the natural world, members of the genus *Klebsiella* are found in a variety of environmental reservoirs, including soil, water, and animals. These organisms play a vital role as nosocomial infections in healthcare settings because they easily colonize hospital surfaces, invasive devices, and medical equipment. Their spread in healthcare settings is further facilitated by inadequate infection control procedures. A significant percentage of community-acquired illnesses globally, including pneumonia, liver abscesses, septicemia, and meningitis, are caused by *Klebsiella pneumoniae* in addition to hospital-acquired infections. The capacity of *Klebsiella pneumoniae* infections to spread metastatically beyond the original site of infection to distant organs is a noteworthy characteristic, leading to serious consequences and a significant risk of morbidity and mortality. Hypervirulent strains of *Klebsiella pneumoniae*, which have greater pathogenic potential than classical strains, are often linked to these invasive and widespread infections. Increased capsule synthesis, increased resilience to host immune responses, and an improved capacity to obtain vital nutrients within the host are characteristics of hypervirulent strains. Four main virulence factors—the polysaccharide capsule, lipopolysaccharide (LPS), fimbriae, and siderophores—are responsible for the pathogenicity of *Klebsiella pneumoniae*. Immune evasion is made possible by the capsule's defense against complement-mediated death and phagocytosis. Lipopolysaccharide plays a role in septic shock and inflammation caused by endotoxins. Fimbriae promote colonization and the production of biofilms by facilitating adherence to host tissues and medical devices. For bacteria to thrive and survive in host environments with little iron, siderophores improve iron acquisition. Together, these virulence characteristics enable *Klebsiella pneumoniae* to establish infection, bypass host defenses, and produce severe invasive illness.



Modes of transmission:
Mode of transmission of *Klebsiella pneumoniae* infection is a similar to some other pathogenic bacteria, basically this bacterium is habitual in gut, it will be translocated through intestinal barriers into the blood stream and cause infection leads to bacteremia and ascending through urinary tract infection when it enters the blood it may infect some other organs like liver, lungs as well as brain. Especially in brain it will cause meningitis, nosocomial infections are very high across the globe especially in ICU, it can spread through ventilators, hospital equipment and the patient who get contacted with other patient or other person, will get airborne infection, if there is any wound in the skin it will travel through air, contacted with contaminated surfaces and get contacted with infected individual It will cause severe infection which leads to sepsis, then again it may enter bloodstream and cause bacteremia, major infection takes place in the lungs which causes lung damage, it will enter to trachea and saliva and spread through cough.

References:

1. **Young, T. M., Bray, A. S., Nagpal, R. K., Caudell, D. L., Yadav, H., & Zafar, M. A.** (2020). Animal model to study Klebsiella pneumoniae gastrointestinal colonization and host-to-host transmission. *Infection and immunity*, *88*(11), 10-1128.

2. **Gorrie, C. L., Mirčeta, M., Wick, R. R., Judd, L. M., Lam, M. M., Gomi, R. & Holt, K. E.** (2022). Genomic dissection of Klebsiella pneumoniae infections in hospital patients reveals insights into an opportunistic pathogen. *Nature communications*, *13*(1), 3017.

3. **Li, D., Huang, X., Rao, H., Yu, H., Long, S., Li, Y., & Zhang, J.** (2023). Klebsiella pneumoniae bacteremia mortality: a systematic review and meta-analysis. *Frontiers in Cellular and Infection Microbiology*, *13*, 1157010.

4. **Yang, J., Li, Y., Tang, N., Li, J., Zhou, J., Lu, S., ... & Feng, J.** (2022). The human gut serves as a reservoir of hypervirulent Klebsiella pneumoniae. *Gut Microbes*, *14*(1), 2114739.

INTEGRATING AYUSH WISDOM WITH ENVIRONMENTAL EDUCATION & SOCIAL SCIENCES FOR HOLISTIC HEALTH & SUSTAINABLE SOCIETY: AN INTERNATIONAL MULTI-DISCIPLINARY CONFERENCE CONDUCTED IN HOWRAH, WEST BENGAL

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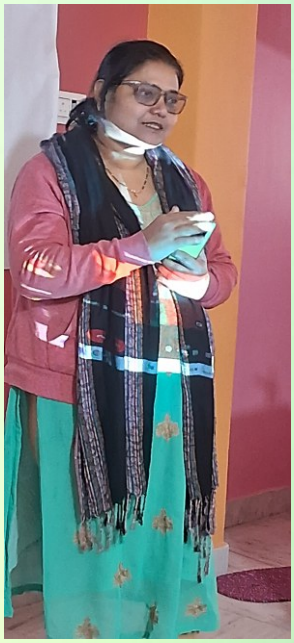
On January 10, 2026, Howrah Suparna successfully organized an international multidisciplinary conference themed "Integrating AYUSH Wisdom with Environmental Education & Social Sciences for Holistic Health & a Sustainable Society" at Ramrajatola, Howrah. The event brought together scholars, educators, practitioners, students, community leaders, and policymakers to explore how traditional AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homeopathy) systems can be meaningfully integrated with modern education and social sciences to advance holistic well-being and sustainability. This conference has been organized by Howrah Suparna under the aegis of United Relugions Initiative (URI) in collaboration with Rural Development Society, Raghunath Ayurved Mahavidyalay & Hospital, Riaz Memorial College Inc., and Centre for Multidisciplinary Research & Action.

The core objectives of the conference were to explore the interface between AYUSH systems and contemporary environmental education paradigms, focusing on how traditional health wisdom can support mental, physical, emotional, environmental and social well-being, to encourage interdisciplinary research and dialogue between scholars from education, sociology, psychology, health sciences, envisciences and traditional medicine, to identify innovative frameworks for embedding holistic health principles into educational systems, community practices, and social policy; and to promote environmebtal sustainability-oriented interventions rooted in indigenous knowledge systems that support both individual and socio-environmental resilience.



AYUSH—rooted in ancient wisdom systems such as Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homoeopathy—offers time-tested approaches to health, well-being, and harmony with nature and environment. When this rich traditional knowledge is meaningfully integrated with modern environmental education systems and the insights of environmental and social sciences, it opens new pathways for addressing public health, mental well-being, social equity, environmental sustainability, and community resilience.

The AYUSH systems are deeply rooted in the philosophy of harmony between humans and nature. Integrating AYUSH with environmental education and awareness offers a holistic approach to sustainability, ecological balance, and human well-being. Traditional AYUSH knowledge emphasizes respect for natural elements such as soil, water, air, plants, and animals. Ayurveda's concept of Panchamahabhuta (five elements) and Prakriti underscores the interdependence between environmental health and human health. Teaching these principles within environmental education helps learners understand that ecological degradation directly affects physical, mental, and social well-being.

It has been a true privileged to have such a diverse and distinguished gathering of experts from across disciplines and regions both from India and abroad (Canada, Mexico, Nepal, Sri Kanka and the Phillipines). Their gracious presence reflected a shared commitment to dialogue, innovation, and collaboration at a time when the world is increasingly seeking holistic, inclusive, and sustainable solutions to complex health, environmental and social challenges. Integrating AYUSH with environmental education thos conference has nurtured ecological consciousness, promoted sustainable living, and reinforced

the idea that human health and environmental health are inseparable. Thus august gathering contributed significantly towards building a resilient, healthy, and environmentally responsible society.

This international conference served as a vibrant interdisciplinary platform where scholars, educators, health professionals, environmentalists and social scientists exchanged their valuable thoughts and ideas, and shared research findings, and explored innovative frameworks that bridge tradition with modernity. Over the course of this conference, there were several critical discussions on policy, pedagogy, community engagement, and sustainable development, envirinmental education and awareness grounded in both scientific inquiry and cultural wisdom.

Environmental awareness programs enriched with AYUSH perspectives promoted biodiversity conservation, sustainable use of medicinal plants, and protection of traditional knowledge. Topics such as medicinal plant conservation, organic farming, herbal gardens, and sustainable harvesting practices encouraged responsible interaction with nature while supporting livelihoods and healthcare systems.Yoga and Naturopathy foster mindfulness, simplicity, and eco-friendly lifestyles by encouraging reduced consumption, stress management, and a closer connection with natural surroundings. The conference emphasized that these practices can be effectively integrated into environmental education to inspire behavioral change, environmental ethics, and stewardship among students and communities.

The participants actively engaged in the sessions, interacted across disciplines, and used this opportunity to build networks that extend beyond this event. This conference inspired new perspectives, collaborative research, and actionable strategies for promoting holistic health and a sustainable society towards comprehensive environmental education and awareness among the dedicated participants. The collective efforts of all the conference stakeholders contributed meaningfully to knowledge, well-being, and the greater good of the public at large.

The conference culminated with a set of recommendations for scholars, educators, environmentalusts and practitioners. Integration of AYUSH principles into formal environnmental education systems as part of well-being and life-skills curricula. Building collaborative research networks that bring together traditional health practitioners with environmental and social scientists, researchers, academics, policy makers and educators. Advocating for policy frameworks that support holistic health and promotion of different burning environmental issues and policies among our communities, workplaces, primary, secondary and tertiary educational institutions. Encouraging community outreach programs that translate academic insights into public health and better ecological and environmental interventions.

The International Multidisciplinary Conference on served as an enriching platform that bridged traditional knowledge systems with modern scholarly inquiry. The event not only spotlighted the enduring relevance of AYUSH in contemporary contexts; but, also charted a path forward for research, education, and public engagement aimed at fostering healthier, sustainable societies and creating better ecosystems and environment.

Photo credit: ***Sa*ikat Kumar Basu**

NESA Members are requested to share articles/write up for publications in NESA Newsletter
- Editor-in-Chief

AI IN SCHOOL AND HIGHER EDUCATION

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Abstract:
AI is moving from isolated pilots to system-level adoption, with generative AI, learning analytics, and intelligent tutoring systems reshaping teaching, learning, and assessment across K–12 and universities. We can frame AI as both an opportunity for personalization and efficiency and a governance challenge around ethics, equity, and academic integrity, using recent school and university case studies from India and abroad.

Artificial Intelligence (AI) is rapidly transforming school and higher education systems worldwide by enabling new forms of personalization, automation, and data driven decision making. In school education, AI powered adaptive learning platforms, automated assessment tools, and classroom analytics are being used to differentiate instruction, provide real time feedback, and identify at risk learners. In higher education, universities are deploying generative AI, virtual tutors, and predictive analytics to enhance student support, streamline administrative work, and redesign curricula for AI rich workplaces.

Our objective is to analyse current trends in AI adoption across school and higher education and to present illustrative case studies that highlight both benefits and risks. Methodologically, the chapter draws on a qualitative review of recent empirical studies, policy reports, and institutional initiatives between 2020 and 2025, with a particular focus on Indian and international implementations. Selected school level and university level cases are examined in depth to understand how AI tools affect teaching practices, student engagement, learning outcomes, and issues of ethics, privacy, and academic integrity.

Key findings indicate that AI can support more personalized learning, reduce routine workload for educators, and improve early identification of learning difficulties, but that impact is uneven and strongly

mediated by digital infrastructure, teacher readiness, regulatory frameworks, and institutional culture. The chapter concludes with a practical framework and policy recommendations for responsible, context sensitive AI integration in schools and higher education institutions.

AI in school and higher education is now centred on adaptive learning, generative AI, learning analytics, and policy driven large scale initiatives, illustrated by concrete institutional and national case studies across countries including India. These trends bring strong potential for personalization and efficiency but also raise complex questions about ethics, equity, data governance, and the changing role of teachers. Growing use of AI driven adaptive platforms, virtual tutors, and automated assessment to personalise instruction and provide real time feedback in classrooms. National level initiatives such as India's plan to mandate AI education from Class 3 and establish a Centre for AI Excellence to shift from "chalkboards to chipsets" and build AI readiness at scale.

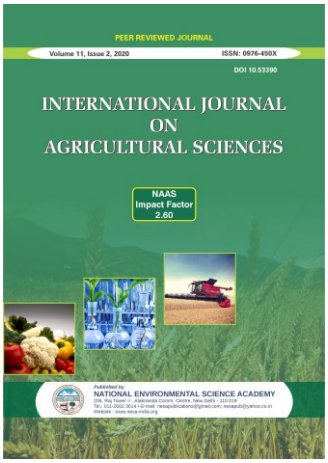
Educational institutions are embedding AI in teaching and operations via chatbots, generative AI writing support, predictive analytics for student success, and AI enhanced simulations and labs. Emerging institutional strategies emphasise faculty development, innovation labs, and governance frameworks so that AI adoption supports learning while managing risks like academic misconduct and bias. Opportunities include more personalized learning pathways, reduced routine workload for teachers, improved early warning for students in difficulty, and new AI literacy skills for all learners. Due to inequality of access to AI, opaque algorithms, data privacy, over reliance on automation, and the need for clear ethical and regulatory frameworks, prompting guidance from bodies such as UNESCO and national ministries.

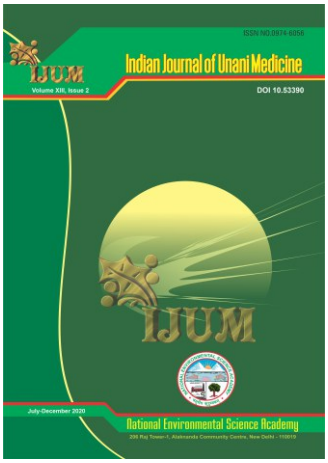
Keywords: Artificial Intelligence in education, School education, Higher education, Personalized learning, Learning analytics

References

1. https://www.ed.gov/sites/ed/files/documents/ai-report/ai-report.pdf
2. https://springsapps.com/knowledge/main-ai-trends-in-education-2024

3. https://www.unesco.org/en/digital-education/artificial-intelligence
4. https://www.apa.org/monitor/2025/01/trends-classrooms-artificial-intelligence
5. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2181411
6. https://etedge-insights.com/technology/artificial-intelligence/centre-mandates-ai-education-from-class-3-a-comprehensive-look-at-the-transformational-policy/
7. https://edtechconferences.london/ai-in-classroom-teaching-latest-trends-in-2025/
8. https://www.digitallearninginstitute.com/blog/education-technology-trends-to-watch-in-2025
9. https://www.govtech.com/education/higher-ed/complete-college-america-offers-case-studies-for-ai-in-higher-ed
10. https://digitaldefynd.com/IQ/ai-in-schools-case-studies/





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Chief Editor

CORRELATION OF ENVIRONMENTAL PROBLEM TO HUMAN PSYCHOLOGY

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1. AIR POLLUTION

a) Definition: It is defined as the introduction of undesirable and unwanted physical, chemical & biological changes in the air due to which the life on land and water are being affected.

b) Features: It's not visible though but can cause severe respiratory ailments or disorders like asthma, COPD (Constructive Obessive Pulmonary Disorder) etc. It may also lead to acid rain (any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms) & Smog (a form of air pollution that appears as a visible, often yellowish-brown, haze over urban and industrial areas).

c) Chief Sources: Motor Vehicles like Car, Bike, Trucks; Burning of wood; Natural Disasters like Volcanic Eruptions.

2. AIR POLLUTANTS

a) Definition: Those substances that contaminate the air and causes pollution.

b) Types:

- **Primary Pollutants:** Emitted directly from a source (e.g., sulfur dioxide from factories).
- **Secondary Pollutants:** Formed when primary pollutants react in the atmosphere (e.g., smog from smoke and fog).

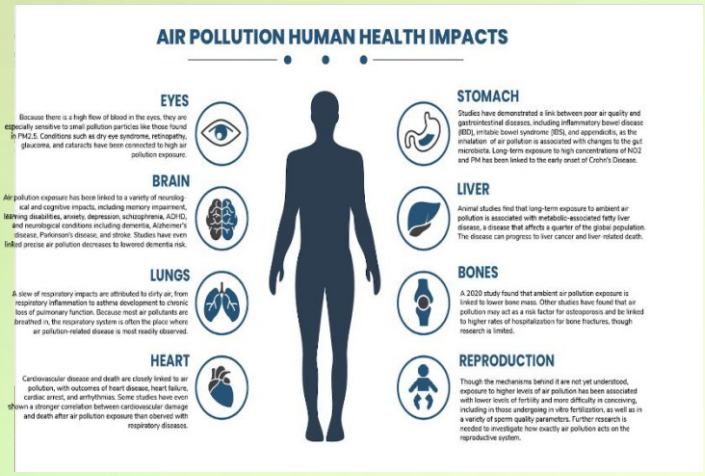
c) **Examples: Gases-** Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Ozone (O_3), Methane (CH_4); **Particulate Matter (PM):** Tiny solid or liquid particles like dust, soot, and aerosols; **Volatile Organic Compounds (VOCs):** Chemicals that easily evaporate.

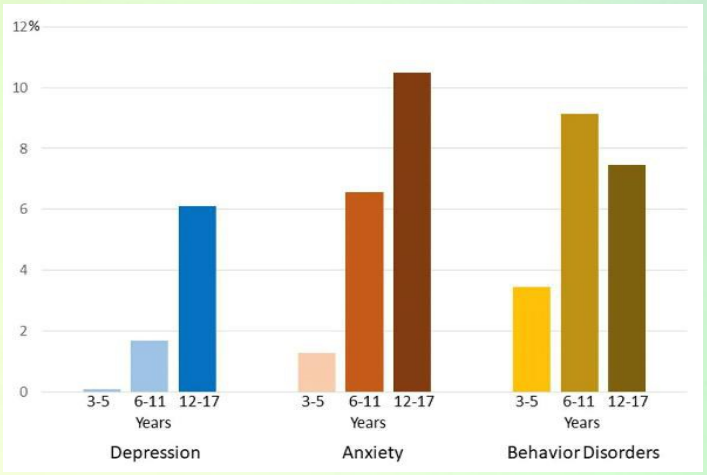
3. CORRELATION OF AIR POLLUTION TO HUMAN PSYCHOLOGY

- Air pollution significantly impacts human psychology by triggering inflammation and oxidative stress in the brain, increasing risks for depression, anxiety, schizophrenia, and cognitive decline, and even raising rates of self-harm and suicide, with vulnerable populations like children and the elderly being more affected through mechanisms like neuro-inflammation and reduced outdoor activity.
- Fine particulate matter (PM2.5) and nitrogen dioxide (NO_2) are key culprits, entering the bloodstream and damaging neural pathways, disrupting mood regulation, and worsening existing conditions, while also reducing quality of life and sleep.
- **Psychological Impacts**
  - **Anxiety & Depression**: Higher pollution levels are linked to increased symptoms of anxiety, depression, and psychological distress, as stated by aqi.in.
  - **Psychiatric Disorders:** Studies show associations possessing higher risks for schizophrenia, bipolar disorder, personality disorders, and increased psychiatric hospitalizations, say AQI.in and Psychiatry.org.
  - **Cognitive Decline & Dementia:** Pollution might impair memory and cognitive function, contributing to dementia risk, but reducing exposure can leads to slow decline, according to research from Clarity Movement Co.
  - **Behavioral Issues:** Often leads to increased rates of self-harm, suicide, drug use, and reduced work productivity, report MDPI and Psychiatry.org.
- **How Pollution Affects the Brain**
  - **Inflammation & Oxidative Stress:** Tiny particles (PM2.5) cross into the bloodstream, causing inflammation and oxidative stress (cellular damage) in the brain, disrupting mood regulation, say MDPI.
  - **Direct Neural Impact :** Pollutants interfere with nervous system development and function, notes PubMed.
  - **Indirect Effects:** Poor air quality reduces physical activity and sleep quality, further worsening mental well-being, says AQI.in.
    - **Factors**
  - **Gender & Climate:** Women and people in colder climates (due to more indoor time) can experience more severe impacts, according to ScienceDirect.com.

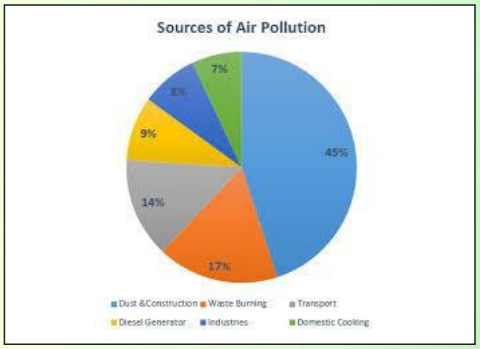
Current Air Pollution Status in India

- Air pollution in India remains a public health emergency, with nearly all of its 1.4 billion residents living in areas that exceed the WHO's annual PM2.5 guideline of 5 $\mu g/m^3$.





IMPACT OF AIR POLLUTION ON HUMAN PSYCHOLOGY



SOURCES OF AIR POLLUTION

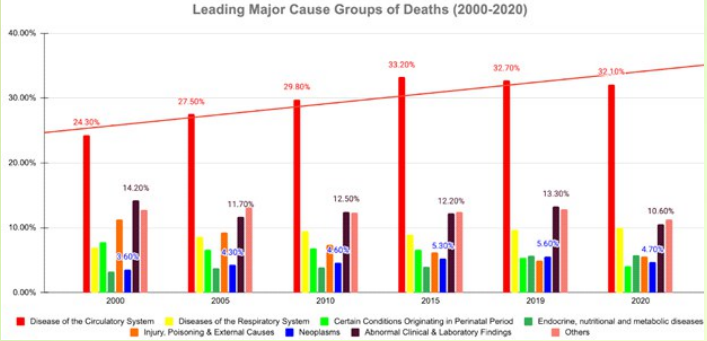
- **Widespread Exposure**: The average annual PM2.5 concentration in India was approximately 41.4 $\mu g/m^3$ in 2023, which is over eight times the WHO standard.
- **Peak Pollution Hotspots**: Cities in the Northern Plains, such as Delhi-NCR, remain among the most polluted in the world, with residents of Delhi facing an estimated loss of 8.2 years of life expectancy if pollution levels are not reduced to meet WHO standards.
- **Indoor Air Pollution**: The use of solid fuels for cooking (biomass, coal, etc.) remains widespread in rural areas, contributing significantly to indoor air pollution, which is also linked to cognitive decline and depression.

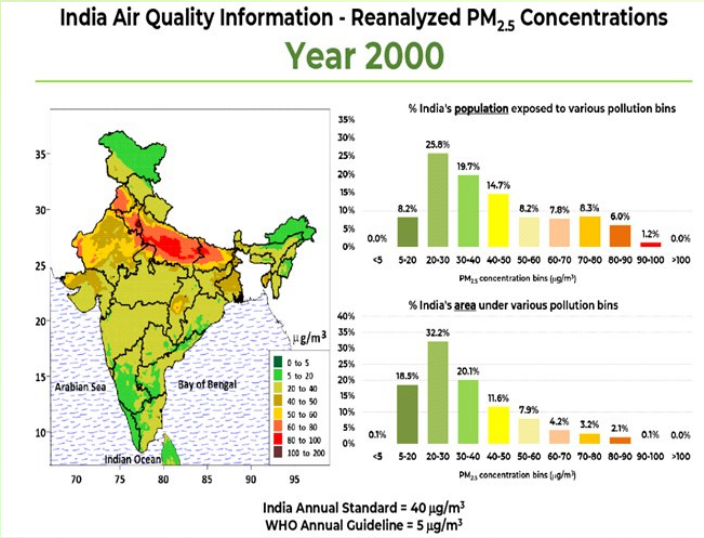
- **Psychological Impacts and Recent Findings**

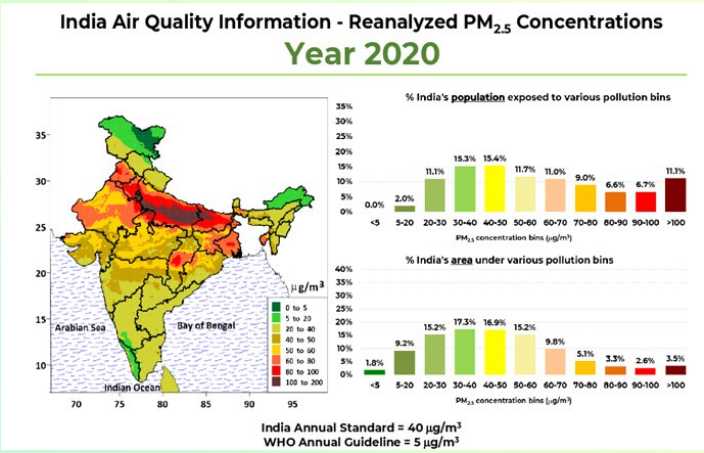
- A growing body of evidence, including numerous studies from 2023-2025, has shifted the focus from merely correlational findings to establishing a causal link between air quality and mental health outcomes.
- **Anxiety and Depression**: Higher levels of PM2.5 and other pollutants are consistently associated with increased symptoms of anxiety, stress, and depression. Living in a constantly polluted environment acts as a chronic psychological stressor, keeping the nervous system on alert.
- **Cognitive Decline and Dementia**: Long-term exposure to fine particulate matter is linked to accelerated cognitive decline and an increased risk of dementia in older adults. One recent 2025 report included dementia as a new key indicator of air pollution's health toll in India, attributing over 54,000 dementia-related deaths to it in 2024.
- **Suicide Rates**: Studies have found a link between elevated air pollution levels and increased suicide rates, particularly with short-term exposure to PM2.5 spikes.
- **Vulnerable Populations**: Children, older adults, and low-income communities are disproportionately affected. Children's developing brains are especially vulnerable, with studies in India finding a significant detrimental impact on their cognitive performance, such as math and reading scores.

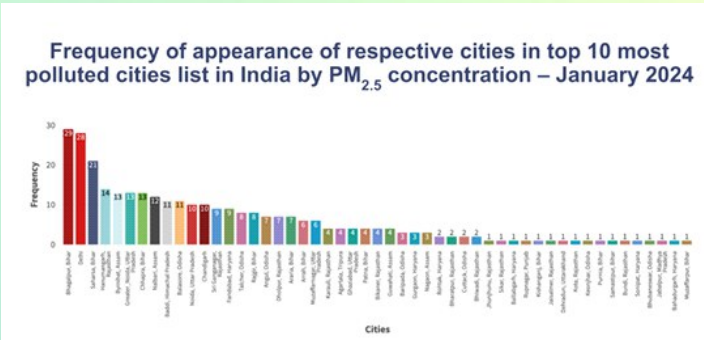
- **<u>Key Global Status Points (2024-2025)</u>**

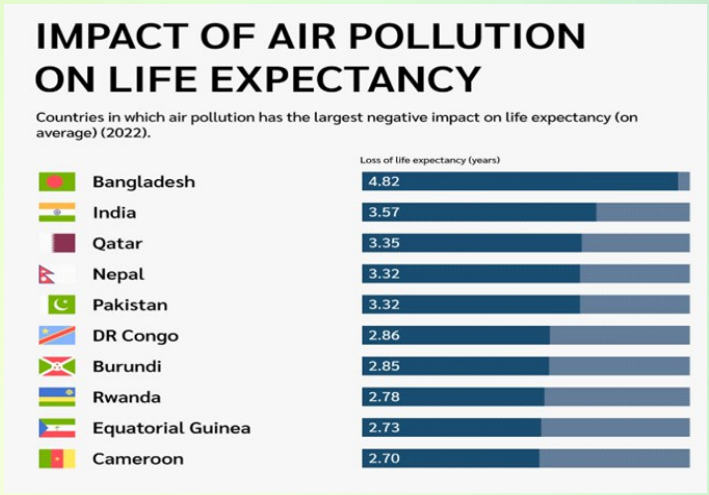
- **Widespread Exposure**: 99% of the world's population breathes air that exceeds the World Health Organization (WHO) annual guidelines for PM2.5 (fine particulate matter).

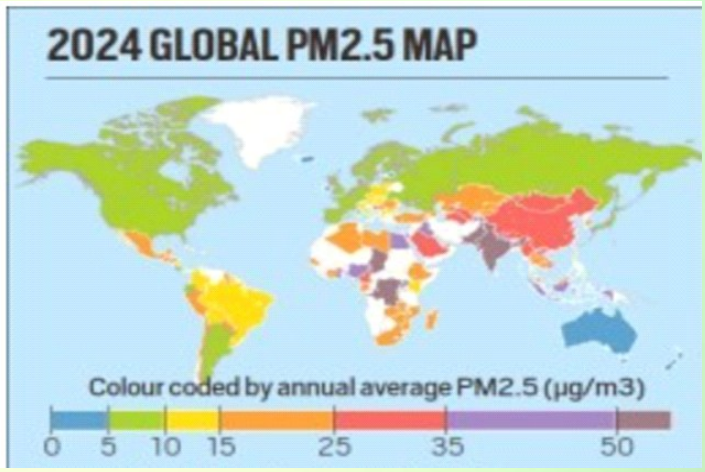


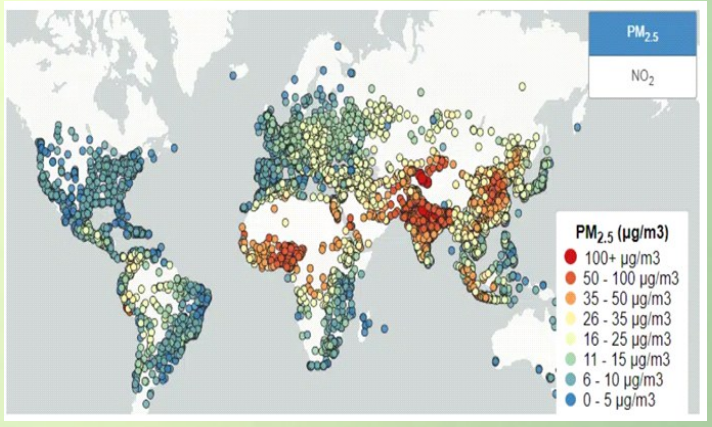




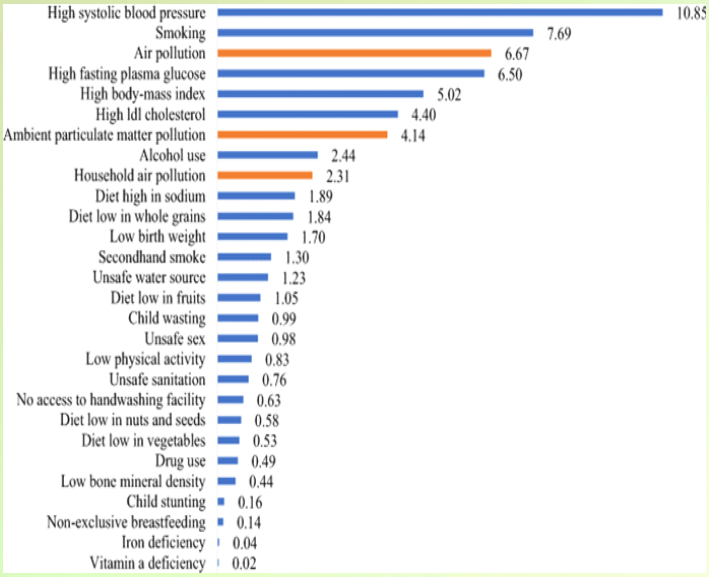


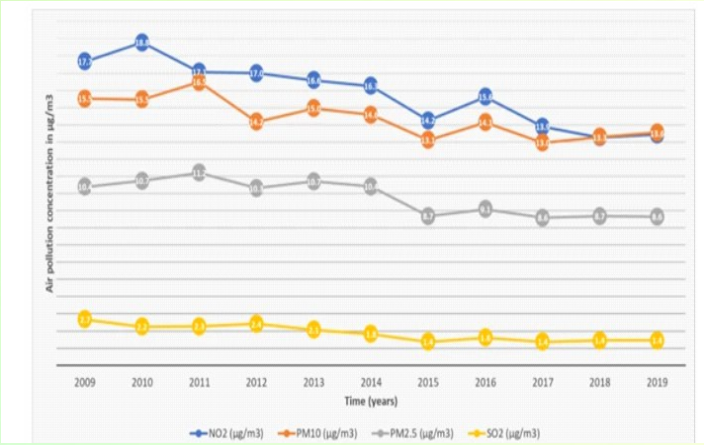






- **Strong Consensus in Research**: Recent scoping and systematic reviews (published in 2024 and 2025) of numerous studies found that higher levels of air pollutants are significantly





associated with a range of negative mental health outcomes.

- **Vulnerable Populations**: Children, adolescents, older adults, and low-income communities are disproportionately affected. Children's developing brains are especially vulnerable to damage, which can lead to behavioral problems and cognitive difficulties later in life.

- **Regional Trends**

Asia records the highest levels of air pollution globally, with 97.7% of its cities exceeding WHO guidelines in 2024. Nine of the top ten most polluted cities are in **India**.

Europe and North America also show links between air pollution and mental health, even in areas with comparatively lower, but still unsafe, pollution levels.

Africa and South America have significant data gaps due to sparse monitoring networks, but the populations in those regions are also widely exposed to unsafe air quality.

REFERENCES

1. www. Wikipedia.com
2. www. byju's.com
3. www. biorender.com
4. "A deep dive on the health impacts of air pollution" on 26th January 2022
5. "Unveiling the health consequences of air pollution in the world's most polluted nations" on 29th April 2024
6. "Air Pollution Reduces the Individuals Life Satisfaction Through Health Impairment" on 27 January 2024

"It is our collective and individual responsibility to protect and nurture the global family, to support its weaker members, and to preserve and tend to the environment in which we all live."

— Dalai Lama

Let's clear the air for Earth's future.

NESA Members are requested to share articles / write up for publications in NESA Newsletter
- Editor-in-Chief

MEDICINAL PLANTS: A CRUCIAL NATURAL RESOURCE FOR INDIA

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Medicinal plants, also known as medicinal herbs have been discoverer and used in traditional medicine practises since the prehistoric times. Plants synthesise hundreds of chemical compounds for various functions including defenses and protections against insects, fungi, diseases and para sites. Medicinal plants are botanical wonders filled with therapeutic potency and healing properties. They are also an essential part of the traditional Indian medicine and ethnomedicine, with over 3000 species used in Indian medicinal systems like Ayurveda, Siddha, Unani and others. These plants are used in various forms including fresh, dried, powdered, extracts and oil.

Medicinal Plants have been used for centuries to cure various diseases. Many modern medicines have derived from plants such as Quinine (Cinchona). Medicinal plants are often more affordable than synthetic medicines. In India, medicinal herbs are gathered from wild regions, framing and some are imported from abroad. Growing medicinal plants in India can be a very profitable businesses

Where and how does India source medicinal plants for the pharmaceutical industries?

- **Wild Collection/ Forest Supply (60- 70%)**
  Many medicinal plants are still collected from forests especially by the local tribal communities.

→ Found near:

- **Western Ghats** (Kerala and Karnataka)
  Amla (*Emblica officinalis*)
  Sarpagandha (*Rauvolfia serpentina*)
  Maramanjal (*Coscinum fenestratum*)
  Sathavari (*Asparagus racemosus*)
- **Eastern Ghats** (Tamil Nadu)
  Neem (*Azadirachta indica*)
  Holi Basil (*Ocimum sanctum*)
  Green Chiretta (*Andrographis paniculata*)
  Indian Bael (*Aegle marmelos*)
- **Himalayas** (Himachal and Uttarakhand)
  Jatamansi (*Nardostachys jatamansi*)
  Shatavari (*Asparagus racemosus*)
  Kala Jeera (*Bunlum persicum*)
  Kutki (*Pierorhiza kurroa*)
- **Central India** (Madhya Pradesh)
  Kalmegh (*Andrographis paniculata*)
  Shankhapushpi (*Evolvulus alsinoides*)
  Arjun (*Terminalia arjuna*)
  Babul (*Acacia nilotica*)

- **Cultivation on Farms (30-40%)**
  Many medicinal plants like ashwagandha, *Aloe vera*, lemongrass, tulsi and sarpagandha are cultivated commercially on farms. They are mostly found near: Rajasthan, Madhya Pradesh, Uttarakhand, Tamil Nadu, Karnataka, Uttar Pradesh and Chhattisgarh

- **Government-runs Herbal Gardens and Research Farms:**
  The governmental gardens and research farms are managed by organizations like NMPB (National Medicinal Plants Board) and ICAR (Indian Council of Agricultural Research). They are found across every state of India.

- India imports certain species of Medicinal herbs:
  India imports certain medicinal plants for many reasons.

  → For meeting high domestic and international demands.

  → Import of specific native species

→ India both imports and exports medicinal herbs to meet the needs of its large herbal and pharmaceutical industries.

India imports herbal plants like -

- *Commiphora wightii* (Guggul)
- *Aquilaria agallocha* (Agar)

Can Medicinal Plants be successfully and commercially grown in India?

YES! India is a great place to grow medicinal herbs for business. Here is, why_

\India has both traditional forest based collection and a large scale of commercial cultivation. The government of India provides subsidise up to 75% for the cultivation ethnomedicinal herbs.

Commercial farming is practised extensively across the country.

Rajasthan leads with 56% of the total cultivated area.

- Uttar Pradesh with 25%
- Follow by Madhya Pradesh by 11%
- States like Tamil Nadu, Punjab, Chhattisgarh, Andhra Pradesh contributing smaller shares.

→ India has 15 Agricultural territory and rich bio-diversity, covering 18000 species of flowering plants, provide ideal conditions for growing a diverse variety of medicinal herbs. The government of INDIA also provides schemes and supports. Here are some of them:

- National AYUSH mission and NMPB subsidies up to 75% for farming.
- Contract farming with herbal medicine companies including:
  - → Patanjali
  - → Himalaya
  - → Dabur
  - → Parampara
  - → Big Indian Farms
  - → Zandu
  - → Charak Pharma

Photo credit: ***Saikat Kunar Basu***

NESA Members are requested to please send / share a short article on ***Agriculture / Environment and other related fields*** for the NESA Newsletter which is published monthly to circulate among the ***NESA Members and scientific / academic community***.

Chief Editor

Plant Tree **Save Environment**

Abstract Submission Date is extended to 31st Dec., 2025

2nd Circular

National Conference
on

ENVIRONMENTAL STEWARDSHIP FOR SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE MITIGATION (ESSACCM-2026)

at

ICAR-Research Complex for Eastern Region (ICAR-RCER), Patna, Bihar
January 22-24, 2026

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