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"ROLE OF ENVIRONMENTAL TOXICITY IN AGADTANTRA WITH CONTEMPORARY AND AYURVEDIC RELEVANCE- A REVIEW ARTICLE."

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ABSTRACT:

Agadtantra, also known as Ayurvedic toxicology, is a specialised branch of Ayurveda that addresses the identification, classification, and management of poisons from natural and artificial sources. In the context of environmental toxicity, Agadtantra offers valuable insights into understanding and mitigating the adverse effects of pollutants on human health. As we know, pollution is one of the most dangerous environmental problems nowadays. To stop this, it is necessary that we start taking some actions to keep the environment safe and healthy. The idea of air, water, and land pollution has also been explored in a number of significant works of literature, and its contribution to diseases and the downfall of civilisations has been clarified. Dincharya, ritucharya, and janpadodhvansa are three ways in which our Acharyas have already described environmental wellness. The cumulative toxicity has also been included in the dooshi visha concept. By integrating ayurvedic principles with modern toxicological understanding, agadtantra offers holistic approaches to mitigate and manage the adverse impacts of environmental toxins on human health.

In this review article we are trying to identify answers to problems with growing environmental degradation and their management.

KEY WORDS:- pollution, janapadodhvansa, dooshi visha, poisons, environmental toxins.

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INTRODUCTION

In the face of escalating environmental pollution, traditional medical systems like Ayurveda provide valuable perspectives on health and disease. Agadtantra, one of the branches of Ashtanga Ayurveda, focuses on the study and management of poisons, encompassing natural toxins from plants, animals, and minerals, as well as artificial substances like pesticides and industrial chemicals. This branch emphasises the body's ability to eliminate toxins through various channels such as sweat, urine, and respiration, and advocates for treatments that support these natural detoxification processes. Key concepts within Agadtantra, such as Dooshivisha, highlight the importance of addressing cumulative toxicity resulting from prolonged exposure to environmental pollutants.

Furthermore, the principle of Janpadodhvansa illustrates how environmental degradation can lead to widespread health issues, reflecting the interconnection of ecological health and human well-being. As we review and integrate these ancient insights of Agadtantra, it offers a holistic approach to combating environmental toxicity, emphasising prevention, early detection, and personalised treatment strategies.

This article will concentrate on some of the ancient methods for treatment of environmental toxicity.

AIM & OBJECTIVE

This review article aims to review environmental toxicity and its management according to Ayurveda.

MATERIAL AND METHOD

Literary Review – Data were collected from ayurvedic classical texts such as Charak Samhita, Sushrut Samhita, Ashtang Hridaya, and relevant commentaries were conducted to gather insights on environmental toxicity.

Peer-reviewed medical publications and textbooks of contemporary medical sciences. also have been cited as sources for this topic.

TYPES OF ENVIRONMENT –

1] Natural environment.

2] Social environment.

3] Man- made environment.

TYPES OF TOXINS –

1] Metals, commercial chemicals, pollutants, pesticides, fuels, herbicides etc.

2] Bacterial toxins, parasitic product, bile etc.

3] Carcinogenic chemicals and endocrine disruptors, man-made or natural, that can be harmful to our health by disrupting sensitive biological systems.

TYPES OF POLLUTION –

1] Air pollution.

2] Water pollution.

3] Soil pollution.

ENVIRONMENTAL TOXICITY –

Environmental toxicology is a scientific field that studies the harmful effects of various chemical, biological and physical factors on living organisms. There are many sources of environmental toxicity that contribute to many diseases. The presence of toxins in our food, water and air Pollutants are a major source of environmental toxicity.

Janpada, where the disease spreads in the form of an epidemic, means the whole people get sick and destroys the whole area, known as "Janpadodhvansa Rogas".

- This has been described by Acharya Charak in Vimana Sthan chapter 3, where 1] Vayu (Air), 2] Desha (Earth), 3] Kala (Season) and 4] Jala (Water) are all affected.

- Acharya Charaka also describes the symptoms of 1] Samanya Vayu (Normal Air), 2] Vikrutvayu (Polluted Air) and 3] Vishdushit Vayu (Toxic Air).

- Poorvarupa (early signs) of Janpadopdhvansa are abnormal conditions of stars, planets, moons, the sun, air, fire and the environment that disturb the seasons.[1]

In the modern view, we can see that the above four components become contaminated by pollution, which also destroys communities (epidemics). Regular exposure to numerous pollutants causes pathogenic illnesses, including allergic skin disorders, asthma, hair loss, oligospermia, cardiac issues, neurological disorders, etc., to develop in our bodies, which simulate the effects of dushivisha.[2]. Dushivisha is a poison, whether animal, vegetable, or chemical, not fully eliminated from the system and partially inherent therein, enfeebled by anti-poisonous remedies, the sun, the fire, and the wind, which is having fewer properties or lesser potency of all the ten properties of Visha. Due to the coverage of bodily kapha, dushivisha remains in the system for some years.[3]

1] AIR POLLUTION -

Types and Causes -

Air pollution refers to the presence of harmful substances in the atmosphere that can negatively affect human health, the environment, and the climate. These pollutants can come from natural sources (like wildfires or volcanic activity) or, more commonly, from human activities (like vehicle emissions, industrial processes, and agriculture). Smoke from chimneys, factories, and wood burning. This releases sulphur dioxide into the air and other toxic gases into the atmosphere, causing global warming and acid rain.

Major Air Pollutants are –

Air Pollutants	**Sources**
Particulate Matter [PM2.5 and PM10]	Vehicle exhaust, construction sites, burning fossil fuels.
Nitrogen Oxides (NOx)	Motor vehicles, power plants.
Sulphur Dioxide (SO2)	coal-burning power plants, industrial facilities.
Carbon Monoxide (CO)	car exhaust, gas appliances.
Ozone (O_3) at ground level	A secondary pollutant formed by reactions between sunlight and other pollutants like NOx and VOCs
Volatile Organic Compounds (VOCs)	paints, cleaning products, fuel combustion.

As per Ayurveda –

Vikrita Vayu Lakshana [4] - Air of this type should be known as causing illness, such as not following the season, excessively moist, speedy, harsh, cold, hot, rough, blocking, or terribly sounding; excessively clashing with each other; and affected by an unpleasant smell, vapour, gravel, dust, and smoke.

Effects of Polluted Air and Its Purification[5]– When birds are dropping from the sky in a tired condition, it indicates that the wind and the smoke (of the atmosphere) are poisoned. It is further attended with an attack of cough, nasal discharge, headache, and severe eye diseases among persons inhaling the same wind and smoke.

Accrding to ayurvedic view – Purification of polluted air[6]: the atmosphere should be purified by burning herbal drugs like Laksha, Haridra, Ativisha, Abhaya, Musta, Harenuka, Ella, Tamalapatra Vakra, Kustha, and Priyangu in the open ground. The fumes of these drugs would purify the poisonous air.

A] According to Acharya charaka - Charak mentioned some fuming process for detoxification in Chikista Sthan 23, chapter[7].

- Combination of equal quantities of Laksha (Shellac), Usheer (Vetiveria zizanioidis L.), Tejpatra (Cinnamomum tamala Buch. -Ham. T.Nees), Guggula (Commiphora mukul Hook ex Stocks), Bhallatak (Semicarpus anacardium L.), flower of Arjuna (Terminalia arjuna Roxb.), Raal (Extract of Shorea robusta Gaertn.), and White Aparajita (Clitoria ternatea L.)
- Combination of Tagar (Valeriana wallichii DC.), Kusthha (Saussurea lappa C.B. Clarke), and flower of Shirisha (Albizzia lebbeck Benth.)
- Powder of Yellow Mustard (Brassica campestris L.) and Chandana (Santalum album L.) + Ghrita (Clarified butter).

B] Dhoopana (Herbal Fumigation)-

Dhoopana involves burning specific herbal mixtures to disinfect and purify the air. Studies have shown that formulations like Nagakesaradi Dhoopana Yoga possess antimicrobial properties effective against pathogens such as Staphylococcus aureus, Pseudomonas aeruginosa, and Aspergillus niger. This method is traditionally used in various settings, including post-operative care units and during disease outbreaks, to maintain air hygiene.

C] Lakshaharidraadi Yoga-

This Ayurvedic formulation combines Laksha (lac) and Haridra (turmeric), among other ingredients. Research indicates that it can effectively reduce airborne microbial load, making it a natural alternative to chemical disinfectants.

D] Dundubhiswaniya-

An ancient practice involving the use of specific sounds and rituals to purify the air. While less commonly practised today, some studies have explored its potential in reducing indoor air pollution.

According to modern view[8]–

1] Containment Prevent the release of toxic substances into the surrounding air.

2] Replacement Replacing technological processes that cause air pollution with new processes that do not affect the air.

3] Dilution Install "greenbelts" between industrial and residential areas to dilute condensed air.

4] Legislation: Air pollution is controlled by appropriate legislation in many countries.

5] International Action – To tackle air pollution around the world, WHO has established an international network of laboratories that monitor and study air pollution.

2] WATER POLLUTION -

Water is uniquely vulnerable to pollution. Known as a "universal solvent", water is able to dissolve more substances than any other liquid on earth. It's the reason we have Kool-Aid and brilliant blue waterfalls. It's also why water is so easily polluted. Toxic substances from farms, towns, and factories readily dissolve into and mix with it, causing water pollution.

Water pollution occurs when harmful substances often chemicals or microorganisms contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment.

This widespread problem of water pollution is jeopardising our health. Unsafe water kills more people each year than war and all other forms of violence combined. Meanwhile, our drinkable water sources are finite: Less than 1 per cent of the earth's freshwater is actually accessible to us. Without action, the challenges will only increase by 2050, when global demand for freshwater is expected to be one-third greater than it is now.

Here are some of the major sources of water pollution worldwide:

Types and causes -

1] Agricultural-

Around the world, agriculture is the leading cause of water degradation. It's a major contributor of contamination to estuaries and groundwater. Every time it rains, fertilisers, pesticides, and animal waste from farms and livestock operations wash nutrients and pathogens – such as bacteria and viruses – into our waterways. Nutrient pollution, caused by excess nitrogen and phosphorus in water or air, is the number-one threat to water quality worldwide and can cause algal blooms, a toxic soup of blue-green algae that can be harmful to people and wildlife.

2] Sewage and wastewater-

Used water is wastewater. It comes from our sinks, showers, and toilets (think sewage) and from commercial, industrial, and agricultural activities (think metals, solvents, and toxic sludge). The term also includes stormwater runoff, which occurs when rainfall carries road salts, oil, grease, chemicals, and debris from impermeable surfaces into our waterways.

3] Oil pollution-

Big spills may dominate headlines, but consumers account for the vast majority of oil pollution in our seas, including oil and gasoline that drips from millions of cars and trucks every day. Moreover, nearly half of the estimated 1 million tonnes of oil that makes its way into marine environments each year comes not from tanker spills but from land-based sources such as factories, farms, and cities. At sea, tanker spills account for about 10 per cent of the oil in waters around the world, while regular operations of the shipping industry through both legal and illegal discharges contribute about one-third. Oil is also naturally released from under the ocean floor through fractures known as seeps.

4] Radioactive substances-

Radioactive waste is any pollution that emits radiation beyond what is naturally released by the environment. It's generated by uranium mining, nuclear power plants, and the production and testing of military weapons, as well as by universities and hospitals that use radioactive materials for research and medicine. Radioactive waste can persist in the environment for thousands of years, making disposal a major challenge.

Types of water being impacted are groundwater pollution, surface water pollution, and ocean water pollution.

According to Ayurveda - Praninam pranah[9] beings. Water is the life of all living

Vikrita Jala Lakshana Water should be known as devoid of merits when it is excessively deranged in the six categories, namely as 10-

1] Sparsha (touch), 2] Roopa (sight/colour), 3] Rasa (taste), 4] Gandha (odour), 5] Veerya (potency), 6] vipaka (chemical transformation).

Effects of polluted water and its purification[11] –

A sheet of poisoned water becomes slimy, strong-smelling, and frothy and is marked with (black-coloured) lines on the surface. Frogs and fish living in the water die without any apparent cause. Birds and beasts that live in the water and on its shores, roaming about wildly in confusion, can be seen as the effects of poison, and if a man, a horse or an elephant baths in this contaminated water, they may suffer from vomiting, fainting, fever, a burning sensation and swelling of the limbs.[12]

According to modern view -

A) Storage Water is drawn out from the source and impounded in natural or artificial reservoirs. When water is stored, it helps provide a reserve of water from which further pollution can be avoided.

B) Filtration – Filtration is a second stage in the purification of water and quite an important

stage because 98-99% of the bacteria are removed by filtration, apart from other impurities, e.g., 'biological or slow sand' filters and 'rapid sand or mechanical' filters.

C) Disinfection – For a chemical or an agent to be potentially useful as a disinfectant in water supplies.

According to Ayurvedic view –

Dushita jal shodhan bhasma [13]–

To purify the contaminated water, drugs like Dhava (dhaya), Ashwakarna, Asana, Paribhadra, Patala, and Siddhaka (Nigundi) are used. Mokshaka (Makha), Amalatas, and Somavalka should be collected and burnt. The cold ashes should then be cast into the contaminated water; it will make the water pure (non-poisonous), or a handful (1 Anjali, 160 gm) of this ash should be put into the pot containing drinking water to be used when needed.

In Ayurvedic classics, there have been discussed some tools which can make Kalushita Jala (defected water) 14/15 acceptable.

1] **Herbal additives** –

Bad smells are removed by putting the flowers of Naga (Mesua ferrea L.), Champaka (Michelia chmpaca L.), Utpala (Nymphaea stellata Willd.), Patala (Stereospermum suaveolens DC.), Karvira (Nerium indicum Mill.) and such other perfuming herbs into the water.

2] **Chandrakanta mani** (moonstone) –

When exudates are in water, it removes harmful bacteria, insects, worms, and poison.

3] It should be made clear by putting Parni-moola and knots of lotus plants into the water.

4] Water should be drunk perfumed in a golden, silver, copper, or earthen vessel, or in a bowl made of bell metal or precious stones.

5] **Storage in specific vessels** –

Water stored in copper containers overnight and consumed the next day is believed to impart 'health benefits'. According to the Ayurveda classics, copper produces a scraping effect (Lekhana) and heals and nourishes when administered in a small dose.

6] **Hansodaka**[16] - In Sharada ritu (autumn season).

7] Herbs Impregnation of Kataka (Strychnos Potatorum L.), Gomeda (Hessonite), Bisagranthi (Root of Lotus), Shaivala moola (Root of Algae), Vastra (Cloth), Mukta (Pearl) and Sphatika (Potash alum).

3] SOIL POLLUTION -

Healthy soil is essential for human health. While soil is not something we physicians consider very often in our daily work, soil is, in fact, a key component of our planet's infrastructure, and it is foundational to human health. Healthy soil is essential for the production of safe, healthy, sufficient food.

Soil pollution occurs when unwanted chemicals are absorbed into the soil through human activities. Nitrogen compounds are absorbed through the use of pesticides,making it unsuitable for plants to obtain nutrients. Industrial waste emissions, mining and deforestation are also depleting the soil. As plants cannot grow properly, they cannot hold the soil, leading to soil erosion.

Types and causes –

1] **Heavy Metals**: Elements such as lead, mercury, arsenic, cadmium, and chromium can accumulate in the soil due to industrial processes, mining, and improper waste disposal. These metals are toxic to plants and animals and can enter the food chain, posing health risks to humans.

2] **Organic Contaminants**: Compounds like polycyclic aromatic hydrocarbons (PAHs), pesticides, herbicides, and polychlorinated biphenyls (PCBs) originate from agricultural runoff, industrial discharges, and improper waste management. These substances can persist in the environment and disrupt soil microbial communities.

3] **Radioactive Substances**: Radionuclides such as uranium, thorium, and radium can contaminate soil through nuclear activities, improper disposal of radioactive waste, and natural geological processes. These pollutants pose long-term health hazards due to their persistent radioactivity.

4] **Biological Agents**: Pathogens from sewage sludge, animal waste, and decaying organic matter can introduce harmful microorganisms into the soil, leading to diseases in plants, animals, and humans.

5] **Microplastics:** Tiny plastic particles resulting from the breakdown of larger plastic debris can accumulate in the soil, affecting its structure and function. Microplastics can also be ingested by soil organisms, leading to bioaccumulation and potential entry into the food chain.

According to Ayurveda –

The concept of environmental pollution in Ayurveda – Janapadodhwamsa, Charaka Samhita vimanasthana chapter 03 and Sushruta Samhita Kalpasthana, chapter 3 – expands on this concept by highlighting the role of deliberate human actions in causing environmental pollution.

Vikrita Bhumi/Desha Lakshan 17 – The desha (bhumi) of the following description is to be known as unwholesome: having colour, odour, taste, and touch that are unnatural; excessively damp; abounding in serpents, beasts of prey, mosquitoes, locusts, flies, mice, owls, birds and animals such as the jackal; abounding in woods of weeds and Ulupa grass; abounding in creepers where crops have either fallen, withered or been destroyed in an unprecedented manner; where the winds are smoky; where the sound of birds is unceasing; and where the baying of dogs always assails the ears.

Effects of polluted soil and its purification 18-

Unnatural colour or odour in soil. Poor plant growth or vegetation. Presence of pests or lack of biodiversity. Producing food that is tasteless, deficient in nutrition, or causes disease. May be equated with modern soil contamination by chemicals, metals, sewage, etc.

Poisoned ground or stone slab, landing stage, or desert country gives rise to swellings in those parts of the bodies of men, bullocks, horses, camels and elephants that may chance to come in contact with them. In such cases, a burning sensation is felt in the affected parts, and hair and nails (of these parts) fall off.

According to Ayurveda, purification of soil 19–

Yajnas (Sacrificial Rituals) Role of Agnihotra: The Agnihotra ritual, a key part of the Rig Veda, was performed to purify the environment, including the soil.

1] The fire rituals involved offerings of ghee, grains, and other natural substances into the fire, with the belief that the smoke and ashes would cleanse the surrounding environment, including the land.

2] Purification through Soma Plant: "The Soma, once purified, is offered to Indra to drink and is praised with great reverence." The cultivation and use of Soma were believed to cleanse the land, as the Soma rituals were directly linked to maintaining the purity of the environment.

3] Yajurveda: The YajurVeda, which serves as a manual of rituals, contains more direct references to purification techniques that could be applied to contaminated soil. Like –

a] Use of mantras.

b] Use of Cow Products – Gomutra (Cow Urine) and Cow Dung.

c] Herbal Purification-

usage of sprinkling agents and decoction agents. Anantha (Hemidesmus indicus), sarva gandha (Eladi gana), sura, cow’s milk and Kali mitti (black clay) in water are indicated as

sprinkling agents."

Another yoga is a decoction of vidanga (Embelia ribes), patha (Cissampelos pareira), and kadabhi (Albizzia procera).

4] Vrikshayurveda – recommends using herbal mixtures made from plants like Haridra (Curcuma longa), Manjishta (Rubia cordifolia), and Triphala (Terminalia chebula, Emblica officinalis, and Terminalia bellerica) to detoxify and combat soil pathogens, thereby rejuvenating soil fertility and health.

5] Use of Earthworms and Microbial Inoculants.

SIGN AND SYMPTOMS –

A] Environmental Signs of Pollution-

Environmental Signs	**Symptoms**
Smog or Hazy Skies	Indicates air pollution (from vehicles, industries, etc.)
Unusual Odours	Chemical smells from industrial waste, sewage, or decay
Dead Fish or Aquatic Life	Often a result of water pollution (chemical runoff, oil spills, etc.)
Algae Blooms	Caused by excessive nutrients (like nitrogen or phosphorus) from fertilizer runoff.
Litter and Plastic Waste	Visual pollution on land and in water.
Stunted Plant Growth	Due to acid rain or contaminated soil.
Decreased Wildlife Population	Habitat destruction or toxic exposure.

B] Human Health Symptoms Due to Pollution-

Pollution	Symptoms
Air Pollution	Coughing, wheezing, or shortness of breath, Irritated eyes, nose, and throat, Asthma attacks or aggravated respiratory issues, Headaches or dizziness, Fatigue or general weakness.
Water Pollution	Stomach pain or gastrointestinal infections (from drinking/using contaminated water), Skin rashes or irritation, Cholera, dysentery, or typhoid (in severe contamination).
Soil Pollution	Exposure to contaminated soil can cause skin problems, Long-term exposure may lead to heavy metal poisoning or cancer (from pesticides, industrial waste)
Noise Pollution	Hearing loss, Sleep disturbances, Stress or anxiety, Headaches.

TREATMENT –

According to Ayurveda – Acharya Charaka 20: management of janapadodhwansha

1] The living beings affected by environmental toxicity should be managed by panchakarma therapy, including vamana, virechana, astapana basti, anuvasana basti, and nasya, followed by rasayana (rejuvenative/immunomodulatory) therapies. For this purpose, drugs should be collected from the proper place in the proper kaala.

2] The individuals should follow a proper regimen and lifestyle as advised under-

- Sadvritta (ethical code of conduct) and
- Achara rasayana (moral, ethical and benevolent conduct which can be roughly termed as behavioural tonic).

- minimizing Adahrma.

3] Manage diet and lifestyle.

4] Yoga and meditation.

Our acharyas detail treatments for conditions and ailments associated with dooshi visha and jannapadopdhvansa.

treatment for dooshi visha 21 [cumulative toxicity] – according to dosha predominance

- swedan karma followed by vamana and virechana.
- Agadpan – anti toxic medicine such as dushivishari agada + honey every day after body purification
- raktamokshana.

DISCUSSION –

Agadtantra is a branch of Ayurveda dealing with various types of toxicities and their management. In the modern world, environmental pollution significantly affects a person's health. It is a major contributing factor to the rise in epidemic diseases. Understanding how environmental pollution contributes to epidemics (Janopadodhwansa) is crucial for developing a comprehensive strategy for better managing epidemic diseases. Ayurvedic medicine offers strategies for managing epidemics that are both preventive and therapeutic. There are many Vishaghana dhrvyas mentioned in Ayurvedic literature that have proven their efficacy in eradicating various kinds of toxins by virtue of their pharmacodynamics. Lots of references regarding the Bhumi Shodana, Jala Shodana, and Vayu Shodana prove the effectiveness of different kinds of Aushdi Yogas in environmental toxicity.

CONCLUSION

If we look at today's era, it leads to the gradual destruction of our ecosystem in the form of pollution, which is the most iconic problem for all the countries in the world. If this burning problem of pollution is not taken seriously, then it will create a frightening future. In ancient contemporary science, our Acharya Charak has described Janpadopdhavnasa, which is very effective in pollution-associated problems. Much experimental research can be done to designate the efficacy of these ayurvedic drugs and methods specified in the Ayurveda through which they will help in detoxifying the body and environment without causing any damage to other essential factors.

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