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Water crisis in India: A study

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Abstract

Water is the most precious natural resource as it is essential for human survival and life on earth. But the availability of freshwater for human consumption is highly under stress because of a variety of factors. By Water scarcity we mean insufficient freshwater resources to meet the human and environmental demands of a particular area. Adequate access to safe drinking water is a priority for global development. Though most of the countries are progressing, billions of people still lack safe water. However, with the challenges of population growth, profligate use and changes in weather patterns due to global warming, many countries, both rich and poor are facing water scarcity in the 21st century. This problem of water Crisis is most visible in India. India is facing one of its major and most serious water Crisis. India has only 4% of the world's fresh water resources despite a population of over 1.3 billion people. In addition to the uneven availability of freshwater, water scarcity in India results from drying up of rivers and their reservoirs in the summer months, right before the onset of the monsoons throughout the country. The crisis has especially worsened in the recent years due to climate change which results in delayed monsoons, consequently drying out reservoirs in many regions. Other factors attributed to the shortage of water in India are a lack of proper infrastructure, rapid groundwater depletion, government oversight and unchecked water pollution. While discussing the seriousness of this problem, this paper explains the impact of water crisis, factors responsible for water shortage in India and government efforts to tackle the problem of water crisis.

Keywords: Water crisis, fresh water resources, scarcity, climate change, groundwater depletion

Introduction

Nursing encompasses autonomous and collaborative care of individuals of all ages, families, groups and communities, sick or well and in all settings. Nursing includes the promotion of health, prevention of illness, and the care of ill, disabled and dying people. Advocacy, promotion of a safe environment, research, participation in shaping health policy and in patient and health systems management, and education are also key nursing roles [1].

Nurses are one of the largest groups of professionals working in the health care system and they play a very important role, which helps in the speedy recovery of patients. In India, so far, they have remained insulated from being made a party in legal suits, primarily due to in house settlement of complaints by the hospitals and ignorance on the part of the patients. Those working in government or government aided hospitals have been provided with reasonable immunity. However, this situation is not going to remain same for long, as various legislations enacted by the government, notably The Consumer Protection Act and the Right to Information Act, are already in place. Hence, reliance is being placed on malpractice/negligence suits in USA and on cases that have been documented in India [2, 3].

Legal responsibility in nursing practice is becoming of greater importance as each year passes. Consumers are becoming increasingly aware of their legal rights in the health care, therefore a nurse should know his/her legal rights. Medical malpractice statistics for the USA in 2012 shows that 6,167 (4.2%) registered nurses, licensed practical nurses, licensed vocational nurses, nurse practitioners, nurse anesthetists, nurse midwives, clinical nurse specialists, advanced nurse practitioners, and doctors of nursing practice had a malpractice report made against them in the US (National Practitioner Data Bank 2012 Annual Report) [4]. In the health care field, the term malpractice originally encompassed only the negligent wrongs of a physician. In the past, a distinct division existed between a nurse and a physician. The nurse functioned within a much more defined framework. Rather than diagnose patients, treat symptoms, or prescribe medication, it was sufficient for the nurse to wait for and then simply implement a physician's order. In years past it was virtually unprecedented for a nurse to criticize a physician's order [5].

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Reckless use of Nature's one of the most precious gifts-water- over the years has led to the water crisis. Water is the basic necessity of every human being. But, water scarcity is a major issue that is rising very rapidly in modern-day India. The problem has become so severe that in many states the groundwater has almost dried up and people have to depend on water supply from other sources. In addition, water is one of the most misused commodities that we still waste. It is the central point of our lives but not the central point of our focus. Many large cities of India have experienced water shortages in recent years, with Chennai being the most prominent in 2019. The water shortage in Chennai city affected the entire city of 9 million people and resulted in the closure of several businesses, hotels and restaurants. According to a report by the National Institution for Transforming India (NITI Aayog), at least 21 major Indian cities (Delhi, Chennai, Hyderabad, Bengaluru and others) will completely run out of groundwater racing to reach zero groundwater levels by 2020. The report also noted that approximately 200,000 people die in India each year due to the lack of access to safe drinking water. Country's maximum population got affected by a severe drought after two consecutive years of weak Monsoons. With nearly half of the India's Population Grappling with drought-like conditions, the situation has been particularly grim year in the southern and western states that received below average rainfall.

However, 12 per cent of India's population is still living the 'Day Zero' scenario, thanks to excessive groundwater pumping, an inefficient and wasteful water management system and years of deficient rains. The CWMI (Composite water management index) report also states that by 2030, the country's water demand is projected to be twice the available supply, implying severe water scarcity for hundreds of millions of people. If we look into the past, people used to understand the value of water and plan their lives around it. Moreover, many civilizations flourished and lost on account of water. But, today we have knowledge but we still fail to understand the value of water. We need to promote a decentralized approach, with a key focus on water conservation, source sustainability, storage and reuse wherever possible. India is facing one of its major and most serious water Crisis.

Water Scarcity

Water scarcity is the lack of fresh water resources to satisfy demand of water. By fresh water, we mean any naturally occurring water except seawater and brackish water. Freshwater is categorized by low concentrations of dissolved salts and other dissolved solids. Freshwater includes water in glaciers, ice sheets, icebergs, ponds, lakes, rivers, streams and even underground water called groundwater. Fresh water is a renewable resource but finite natural resource. Fresh water can only be replenished through the water cycle process, in which water from seas, lakes, forests, rivers, land, reservoirs evaporates, forms clouds and returns as rainfall. The increase in the world population and the increase in per capita water use has put pressure on the finite fresh water resources.

Status of Water Availability in India

India receives 4000bcm (billion cubic metres) rainfall per year. After evaporation, the actual availability is only 1137bcm. There is a lot of temporal as well as regional

variations in the availability, even in this 1137bcm of available water. For instance, on the one side, there are water surplus states such as Uttar Pradesh, Himachal Pradesh and on the other side, there are water scarce regions like Karnataka, Tamil Nadu, Maharashtra, Rajasthan and parts of Gujarat. Also, in many Indian cities, water is not properly distributed. Some areas of mega cities like Delhi and Mumbai are privileged to get more than the standard municipal water norm of 150 litres per capita per day (lpcd) while other areas get 40-50 LPCD.

Magnitude of the water crisis in India

- Presently, the annual availability of water is 1123 BCM in India and the demand is around 750 BCM. However, by 2050 the annual demand for water will increase to 1180 BCM which will exceed the water availability.
- Nearly half of the Country, face severe water scarcity with around 2 lakh people dying every year due to inadequate access to potable water.
- 70% of India's water is contaminated.
- 84% of rural households do not have access to piped water.
- 75% of households do not have drinking water on its premises.
- 54% of the country's groundwater is declining rapidly than it is being replenished.
- 16% of the country is drought prone.
- India's water table is declining in most regions. Moreover, there is a presence of toxic elements like fluoride, mercury, arsenic, even uranium in our groundwater.
- 21% of country's diseases are water related.
- Over 329,000 children under five died due to diarrhea in India in 2015.
- Water level in major reservoirs of India have fallen down.
- Many small and seasonal rivers are perishing permanently.
- Major perennial rivers remain stagnant.
- Krishna River runs dry in her delta region for most of the year.
- Cauvery and its tributaries haven't met the ocean for decades, the upstream dams choke its flows downstream affecting people in Tamil Nadu.
- According to NITI Aayog's water quality index, India ranks 120th among 122 countries.

Impact of water crisis in India

People – Drinking water scarcity

The water scarcity in India affects most of the people across the country. A major portion of the population does not have a reliable and constant means of getting water for their daily needs. In June 2019, 65% of all reservoirs in India reported below-normal water levels, and 12% were completely dry due to insufficient rains in monsoon. Since tap water is unavailable in many cities, residents are reliant on alternative water sources. The country has scattered public water pumps but most of them are located away from the cities and their water flow is also intermittent and unpredictable. Most of the Indians are left with the option of spending money to buy drinking water but the poor and mainly the rural sections of the society are unable to afford buying water on a daily basis which creates a massive water scarcity problem for the rural population of India.

Insufficient water and limited accessibility to water poses a threat to the people's health. In the Latur city of Maharashtra, the depletion of water resulted in a major health crisis and thereby forcing people to dig borewells into the ground, exposing themselves to dangerous chemicals and risking contamination. People started showing symptoms of fever, infection, dehydration, vomiting, and kidney ailments. In addition to this health crisis, hospitals were unable to safely perform any surgery due to the increased threat of post-operative infections and complications resulting from a lack of clean drinking water. A similar crisis emerged in Chennai in 2019 resulting in violent incidents.

2019 Chennai Water Crisis

In the mid – hot summer of June 2019, Chennai faced an acute water shortage when its 4 main water reservoirs got completely dry. Chennai is India's 6th largest metropolis with a population of nearly 9 million people. The dire situation caused due to the shortage of water affected the huge population of Chennai very badly as hundreds of people waited in lines with empty water buckets for hours. Several hotels and restaurants in the city also shut down due to the shortage of water. Even the IT firms and automobile sectors were forced to ask their employees to work from home as the crisis worsened. Out of the daily requirement of 830 million litres of water per day (MLD), the city was only able to provide 525 MLD. The government responded by sending water tankers to residential areas. Water was also delivered to the city by a special train with the capacity to carry 10 million litres of water daily.

To exacerbate the situation of water Crisis, many water mafia or 'tanker mafia' have emerged. Tanker mafia refers to private water tank owners who take clean water illegally and sell it to local people at expensive prices. The tanker mafia is only worsening this problem by creating an atmosphere of social instability by targeting poor people.

Economic growth

According to a report by Niti aayog, the demand for water will be twice the present supply by 2030 and India could lose nearly 6% of its GDP during that time.

Ecosystem

The Water scarcity in India extensively affects the ecosystem and threatens the lives of wild animals across India. Due to the unavailability of water in forests, wild animals are forced to infiltrate villages and cities in India. When water bodies in nearby forests dry out due to insufficient rain conditions, eventually local wild animals like elephants, tigers, deer starts to sneak into the cities in search of water. All these wild animals pose a threat to the people as they can attack them.

Agricultural crisis

Agriculture is one of the most important Occupation in India. Around 44% of India's working population is employed in agriculture. Due to two consecutive years of weak monsoons, hundreds of millions of people have suffered by a severe drought. Failed rains are particularly devastating for farmers. The drought has dried up wells and destroyed crops, forcing rural people to move to cities. In the absence of water, farmers are unable to produce crops. The 2019 drought has destroyed the supplementary crops in

addition to the winter crops. A lot of valuable farmland has got completely useless due to the scarcity of water. As the agricultural industry suffered, the workforce was threatened to be unemployed, forcing rural people to move to the cities in search of jobs. This trend of rural urban migration adds pressure to the already strained infrastructure as the demand for water continues to increase.

Power Supply

Water shortages are affecting India's capacity to generate electricity as 40% of thermal power plants are situated in areas where water scarcity is high.

Conflicts over water

In India, there are conflicts between Gujarat and Madhya Pradesh over sharing of Narmada water, between Tamil Nadu and Karnataka over sharing of Cauvery waters, between Andhra Pradesh and Telangana over sharing of Krishna waters.

Reasons for the water shortage in India

Climate change

India has a huge dependence on monsoon rains to replenish water sources such as lakes, rivers, reservoirs and underground aquifers. Monsoon means seasonal reversal of winds accompanied by corresponding changes in precipitation. The South-West monsoon provides approximately 80% of rainfall, while the North-East monsoon is responsible for 10%-20% rainfall of the total rainfall in India. Therefore, the impact of climate change on the monsoon seasons is one of the important reasons for decrease in rainfall and water shortage in India. In recent years, monsoons in India have become more uncertain and sporadic while decreasing the number of rainy days and hence reducing the total precipitation.

Uneven distribution of water and rainfall pattern

Some regions have surplus water while others face perennial droughts for most of the year. For instance Rajasthan is one of the most drought prone areas of India. Drought is a recurrent phenomenon in Andhra Pradesh. There is uneven distribution of water in many Indian cities. Some areas of mega cities like Delhi and Mumbai are privileged to get more than that the standard municipal water norm of 150 litres per capita per day (LPCD) while other areas get 40-50 LPCD.

Increase in demand

The rapid Population growth, urbanization, industrialization, rising needs of irrigation and increase in domestic water usage have accelerated the water demand. As urbanization is increasing, water demand will also increase rapidly as city dwellers consume more water than rural people. Top of all this, are issues of leakage losses, metering of water and water pricing. Around 40% of piped water in urban areas are lost due to lack of maintenance of existing infrastructure.

Urbanization and water scarcity

Currently, 33% of India's population resides in urban areas and by 2050 it will increase to 50%. Rapid urbanization is adding to the water scarcity issue. Due to more buildings, cement roads, rainwater is not allowed to percolate underground. Therefore even in a city like Mumbai which gets good rains, rainwater is not retained in the area due to

paved out areas. Thus water required for cities is drawn from the neighbouring villages and far off rivers and lakes which threatens the water availability in those areas. Large cities also produce urban sewage which pollutes the freshwater resources.

Inefficient cultivation practices

Around 70% of the population is still dependant on agriculture for its livelihood. But inefficient cultivation practices have led to the flooding of fertile land which in turn has caused salinization, siltation of reservoirs etc causing groundwater reserves of main agricultural regions to be depleted at an alarming rate.

Shift to cash crops

The water usage in agriculture is being diverted from food crops to cash crops that consume a huge amount of water.

Overexploitation

India is the world's biggest groundwater user as nearly 89% of irrigation requirement is fulfilled by the groundwater sources. According to a report by NITI Aayog in 2018, "the country was suffering from the worst water crisis in the history". The report also pointed out that 21 Indian cities will run out of ground water by 2020.

Water pollution

Due to the lack of a long-term water management plan, many of the country's rivers either run dry or have been polluted. Release of domestic wastage, urban sewage and industrial wastage into rivers, lakes has polluted freshwater sources at an alarming rate in India. These fresh water sources are not fit for drinking or other activities.

Wasteful use of water for Agriculture

According to the Central Water Commission, even though climate change has resulted in a reduction in rainfall and thereby the water supply, the country still receives enough rainfall to meet the needs of over 1 billion people. However, India only catches only 8 percent of its annual rainfall due to poor rainwater harvesting. Due to rapid urbanization, a lot of the ponds used to capture water have been lost due to the rising population and inefficient implementation of city planning guidelines.

India has also been lacking in the treatment of wastewater for reuse. Approximately 80 percent of domestic wastewater is drained out as waste and ends up flowing into other water bodies which lead to salt water sources such as the Bay of Bengal and the Arabian Sea. India is one of the major food growers in the world. That produces tons of quantity of food to feed its population and export the surplus that is left.

In addition, producing this much food requires a lot of water too. The traditional method of irrigation wastes a lot of water due to evaporation, water conveyance, drainage, percolation, and the overuse of groundwater. Besides, most of the areas in India use traditional irrigation techniques that stress the availability of water. But, the solution to this problem lies in the extensive irrigation techniques such as micro-irrigation in which we provide water to plants and crops using a sprinkler or drip irrigation.

Solutions to the water crisis in India

Good Water Management Practises

- India receives adequate annual rainfall through south

west monsoon. Still most regions of the country are water deficient because of inefficient water management practices.

- Rainwater harvesting should be encouraged on a large scale, mainly, in cities where the surface runoff of rainwater is very high.
- Roof- top rainwater harvesting can also be used to recharge groundwater by digging percolation pits around the house and filling it with gravel.
- Active measures should be taken by the state governments to create awareness for the minimal use of water.
- Indian cities need to learn from cape town of south Africa which when faced the 2018 water crisis had announced "Day zero". On that day, people had to use communal water- taps as the main water –taps were closed. Restrictions on water use per person were also fixed.
- Treatment and reuse of wastewater- About 80% of the water that reaches households, leaves as waste and pollutes our water bodies and environment. There is a huge potential in reusing and recycling this treated wastewater at least for non-potable purposes, which is cost effective. According to WHO, an individual requires around 25 litres of water daily for meeting his/her basic hygiene and food needs. The rest is used for non-potable purposes like mopping and cleaning. This indicates that for most of the non-potable uses, a quality lower than drinking water is needed. Thus, for environmental sustainability and economic efficiency, water must be treated and supplied according to usage.
- Need to emphasize behavioral change- It is important to understand that managing the water crisis is not the job of only engineers but all stakeholders including economists, hydrogeologists, planners and most importantly, communities themselves. Community/ locals/ citizens have the most important part to play. We all can contribute by keeping in check our own usage and actions.

Interlinking of rivers: Interlinking of rivers is a topic that has been debated and discussed for several years as a possible solution to the water crisis in the country.

Coordination in aquifer usage: There should be laws and contracts for sharing of aquifers. There is an urgent need for coordination among users of aquifers. Groundwater aquifer mapping has started only recently in India which is a welcome step.

River Basin Authority: There should be a river basin authority for sharing information among states since most of the rivers in India pass through different states.

Good cultivation practices: changing the cropping pattern, crop diversification and encouraging water use efficiency in agriculture by moving towards food crops from cash crops.

Government efforts to solve water shortage in India

Establishment of a new ministry for water

The Government of India has reformed several departments and initiated several water supply projects in the recent years to respond to the country's growing water demand.

The reforms include the establishment of a new ministry for water known as the Jal Shakti Ministry.

In June 2019, Indian Prime Minister Narendra Modi launched a new plan, "Piped Water for All by 2024". The newly formed Jal Shakti ministry is responsible for making the policy guideline for water resources usage, regulating the water resources related projects, and dealing with the cooperation, facilitation, and negotiation of water resources both in between states and internationally.

Ganga River Cleaning Programs

River Ganga, a famous holy river in India, feeds millions of people in North India. In 2007, river Ganga was named as one of the 10 most dangerous rivers in the world due to water pollution. In 1985, the first Ganga river cleaning program (Ganga Action Plan) was started with an aim to tackle the problem of excessive water pollution in the river. However, the Ganga Action Plan has not shown any significant outcomes over the years. To combat the problem of government incompetence in solving the water crisis, the Modi government announced that it will be launching new projects with more investment along with formulating new policies to manage the pollution in Ganga and other rivers in India.

Non-governmental efforts

India has a number of Non Government Organizations that focus on solving water shortage problems for the people in affected areas. 'FORCE' and 'Safe Water Network' are some of the organizations that are actively involved in dealing with the water crisis in India. 'We are Water' and UNICEF are the international organizations that work very actively in alleviating the problems of basic water supply and sanitation in villages.

Most of the non-governmental organizations work on raising social awareness and developing water resources projects for the heavily affected parts of the country.

Raising Social Awareness

Most non-governmental organizations are actively involved in teaching the locals how to preserve the water resources and how to increase the water usage efficiency by installing new water gathering stations and improving their irrigation techniques.

'We are Water' publishes documentary films every year to raise social awareness about the severe water scarcity in India. These documents are especially relevant in rural areas as the residents don't have direct access to government schemes.

Establishing Water Resources Projects

A lot of non-governmental organizations in India are involved in establishing water harvesting structures in rural areas.

Solutions and technologies

Rain Collection

Rainwater harvesting is the name given to the innovative way of collecting rainwater in order to recharge the underground water. It should be encouraged on a large scale, especially, in cities where the surface runoff of rainwater is very high. A lot of houses have built their own rainwater harvesting structures in order to be self sufficient. Roof – top rainwater harvesting can be utilized to recharge

groundwater by digging percolation pits around the house and filling it with gravel. Therefore, it is time to go back and start using our traditional practice of rainwater harvesting — catching water where it falls. Currently, India captures only 8% of its annual rainfall, among the lowest in the world.

Desalination

Desalination is an advanced technique to solve the problem of water shortage, especially in coastal regions. It involves treating sea water to remove its salt content, making it fit for drinking. Israel has already developed a systematic method to desalinate the sea water into fresh water for industrial and domestic usage. India is already looking into installing desalination plants near the coastal regions to fulfill the water needs cities such as Chennai.

Irrigation Techniques

Nearly Upto 80% of the groundwater in India is used for irrigation. The Indian Agriculture Institute has been promoting the drip irrigation technology to solve the water scarcity problem in India for decades. The technology has the advantage of being applicable to all kinds of terrains in the country. Furthermore, the technique helps farmers use water more efficiently by modifying the water supply based on the moisture level of the soil. With the help of the Indian government, drip irrigation has seen a massive rise in implementation over the last 15 years. Currently, almost 3,51,000 hectares of irrigated land is under drip irrigation, compared to just 40 hectares in 1960s.

Conclusion

India is not a water deficit country, but due to the mismanagement and lack of monitoring of water resources, many regions in the country face water stress from time to time. Dirty aquifers and water scarcity are destabilizing the country. India is losing the capacity to safeguard public health, ensure farm productivity, grow the economy, and secure social stability, as its water reserves get dirtier and smaller. By failing to protect its water, India is courting disease and economic hardship as well as social upheaval. Thus it has become very important to focus on water conservation, source sustainability, storage and reuse wherever possible. The Jal Shakti (water) Ministry, has announced an ambitious plan to provide piped water connections to every household in India by 2024. Looking at the current scenario, we urgently need a transition from this 'supply-and-supply-more water' provision to measures which lead towards restoring/ recharging local Water bodies, improving water use efficiency, reducing leakages as well as applying for higher tariffs and ownership by various stakeholders. Water scarcity has become a serious problem. So, the Authorities and people have started working together to resolve this water crisis problem so that our future generations do not have to buy this necessity. The Government needs to balance the water demand with available supply for the future growth and economic development as well as for the sustenance of human life.

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