The Journal of Social Environment

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The situation of sanitation in India: an overview on environmental and health issues

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Abstract

*The present study is an attempt to overview on the situation of sanitation facility in India from an environmental viewpoint by especially emphasizing on effects on human health. With a population of **1.21 billion**, India is the most populous country in the world. While keeping one of the most populous countries, India occupying the second place in the world just after China and accounting **for 16.7%** of the world population but India accounts for **only 2.42%** of the total world area. The density of population per sq.km in India was **77 person/ sq.km in 1901**, which is risen to **382 person/ sq.km in 2011**. When talk about individual state, Bihar and West Bengal hold a population density of 1106 person/ sq.km and 1028 person/ sq.kn respectively. From the above population statistics of India as a developing country it is easily say that basic problems related to sanitation already existed. The generation of human's waste in India is in alarming stage. So, a necessary emphasize must be given towards Sanitation situation. The term **'Sanitation'** is connected with keeping places clean and healthy to live in it especially by removing human's waste. NSS report asserted that 32% rural households have their own toilets and less than half of Indian households have a toilet at home. This report also asserted that **billion of people in the world who defecate in open place and more than 50% of them reside in India**. Many policies has failed to implement to face such problems and as the result of such overcrowding and poor sanitation led towards disease, low quality of life and many health impacts. On an average in India, the per capita **waste generation rate** is between 220 to 870 gm/ day and it is varies depending upon the topographical and regional location, life style, size of city etc. if the solid waste, waste water and other human generated mixed waste are not planned for safe and healthy disposal, the situation become more worse to environments and led towards more poor sanitation. In carrying out the study, secondary source of data is highly used from different governmental sources. One of the key objectives of this study is to highlight on present sanitation situation in India with special references to environmental aspects and health issues.*

Key words: *1.India- demographic profile, 2.Measures of sanitation, 3.Sanitation facility, 4.Rural-urban sanitation comparison, 5.Environmental quality, 6.Health issue, and 7.Service needed.*

Introduction

Sanitation is largely connected with keeping places clean and healthy by removing human waste and excretes. So, human population is highly responsible to play a vital role here. Well sanitation is the indicator of good and healthy environmental quality on the other hand bad or poor sanitation is the indicator of unhealthy and unhygienic environment. According to health economist **'Dean Spears'** "A large part of Indian's malnutrition burden is owing to the unhygienic environment in which children grow up stunted". About 48% of the total children in India are highly suffering from some **degree of unhygienic and malnutrition**. Based on UNICEF report, the water borne disease such as Diarrhoea and respiratory infection are the number one come for children death in India. Children weakened by frequent diarrhoea are more common and vulnerable to malnutrition and opportunistic infection such as **Pneumonia** (It is commonly a complication of a respiratory infection- especially the flu; itis an infection in one or both lung. It

can be caused by fungi, bacteria, or viruses from wastes and waste water. Pneumonia causes inflammation in lung's air sacs, or alveoli. The alveoli fill with fluid or pus, making it difficult to breathe). It is estimated that more than 638 million people defecating in open and **44% mother disposing their children's faeces in open places** in India and push all towards a very high risk of **Microbial contamination** (Microbiological contamination refers to the non-intended or accidental introduction of infectious material like bacteria, yeast, mould, fungi, virus, prions, protozoa or their toxins and by-products). This contamination of water causes many health problems including diarrhoea and fever in children. So, it can be said that the sanitation situation is not well develop in India where 68% people not use toilets and much more concentration must be given towards such burden.

Objectives

Human is the improved version of resource and the essential components of its development is the Health of population, which is a vital for a nation's growth and stability. The present study is also an attempt to qualify such health situation in India by highlighting on sanitation situation. The key objectives of this study include:

- To give emphasize on major issue related with sanitation like population growth, population density, waste generation, health status and their present situation.
- To highlight on environmental and health impacts due to poor sanitation in India.
- To identify and emphasize on pin point Government policies including their implementation, success and failure
- To make some applicable recommendation based on own perception to improve and better sanitation and water availability in India.

Methodology

This Paper is focused around a desktop research of literature on the subject by distinctive organizations and open source data accessible at entrances of government of India to evaluate the flow circumstance, determinants and effect of sanitation, hygiene and water. This review is based on online information from World Bank and United Nations, articles and research papers accessible on online databases such as Web of Science, PubMed, Google Scholar, etc. and data available at website of Water Aid India, **UNICEF/WHO/**Planning Commission (India) assessments which are focused around various government of India sample surveys.

There is an effort made to overview on the relation between sanitation situation and human health status in India based on Secondary data, usually this refers to existing documents. The secondary data collected from different sources, like magazines, books, Government's websites, memos, transcripts of conversations, annual reports on sanitation and health and above mentioned open sources.

India- Demographic Profile

In India, the population growth is mainly as the result of the natural increase of population. If we take population state- wise, Uttar Pradesh alone hold 200 million people and most populous state in India and accounting **16% of the total**. Nearly 42% of the population now live in the region covered by Uttar Pradesh, Maharashtra, Bihar, Uttarakhand, Jharkhand, Madhya Pradesh, Chhattisgarh and Rajasthan. Uttar Pradesh, Maharashtra, Bihar, West Bengal and Andhra Pradesh have all held on to the top five slots in term of their ranking in 2011.

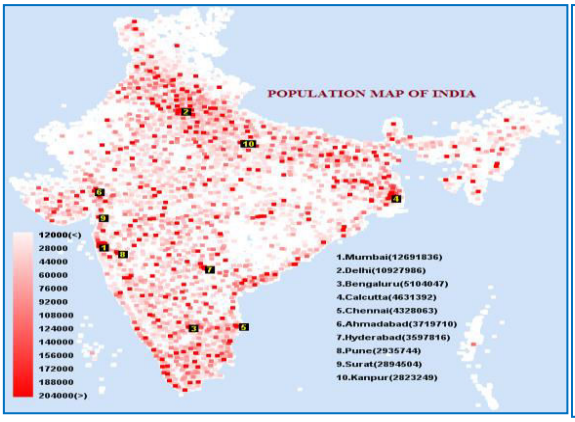
Table: 1. Demographic profile of India

Total Population	**1,236,344,631 (July 2014 est.)**
Age structure	**0-14 years:** 28.5% (male 187,016,401/female 165,048,695) **15-24 years:** 18.1% (male 118,696,540/female 105,342,764) **25-54 years:** 40.6% (male 258,202,535/female 243,293,143) **55-64 years:** 7% (male 43,625,668/female 43,175,111) **65 years and over:** 5.8% (male 34,133,175/female 37,810,599) (2014 est.)
Dependency ratios	**Total dependency ratio:** 51.8 % **Youth dependency ratio:** 43.6 % **Elderly dependency ratio:** 8.1 % **potential support ratio:** 12.3 (2014 est.)
Median age	**Total:** 27 years **Male:** 26.4 years **Female:** 27.7 years (2014 est.)
Sex ratio	At Birth: 1.12 male(s)/female 0-14 years: 1.13 male(s)/female 15-24 years: 1.13 male(s)/female 25-54 years: 1.06 male(s)/female 55-64 years: 1.08 male(s)/female 65 years and over: 0.91 male(s)/female total population: 1.08 male(s)/female (2014 est.) Overall: 943 male(s)/ 1000 females
Population density	All India: 382 person/ sq.km Highest: 1106 person/ sq.km (Bihar) Lowest: 17 person/ sq.km (Arunachal Pradesh)

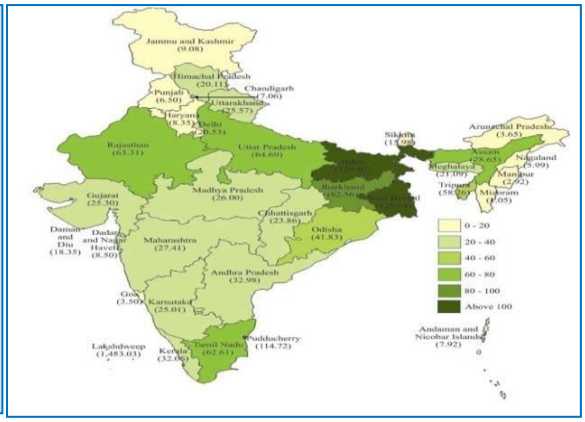
Note: est. = estimated

Source: www.indexmundi.com (India demographics profile 2014).

India's population increased by more than four times in 110 years, from about 238 million in 1901 to 1210.5 million in 2011 **(map. 1)**. The dependency ratio as a whole in 2011 was 652 (51.8%), compared to 794 in 1991 and 752 in 2001. Sex Ratio in India as overall average is 943 males/ 1000 females **(table. 1)**. The density of population has increased by 21.3% in 2011 as compared to 1991. Bihar is the highest densely populated state and Arunachal Pradesh is least densely populated state in 2011**(map. 2)**. With increasing population, major problems like land conversion, water pollution, sanitation, water crisis and other problems come face as a major issue to take up.



Map: 1. Population of India.



Map: 2. Population density of India

Note: Maps are drawn not to scale.

India- Waste Generation Profile

Currently, India has 53 cities with population greater than one million, generating 86245 tonnes Per Day (TPD) or says 31.5 Million TPD which is 46% of the SW generated in urban India. The remaining 313 cities generated 15.7 Million TPY (43000 TPD) or 23% of the total urban Sw. Urban India generated 188500 TPD of solid waste at per capita of 500 grams/day. The most waste generated cities are shown below **(Fig. 1)**

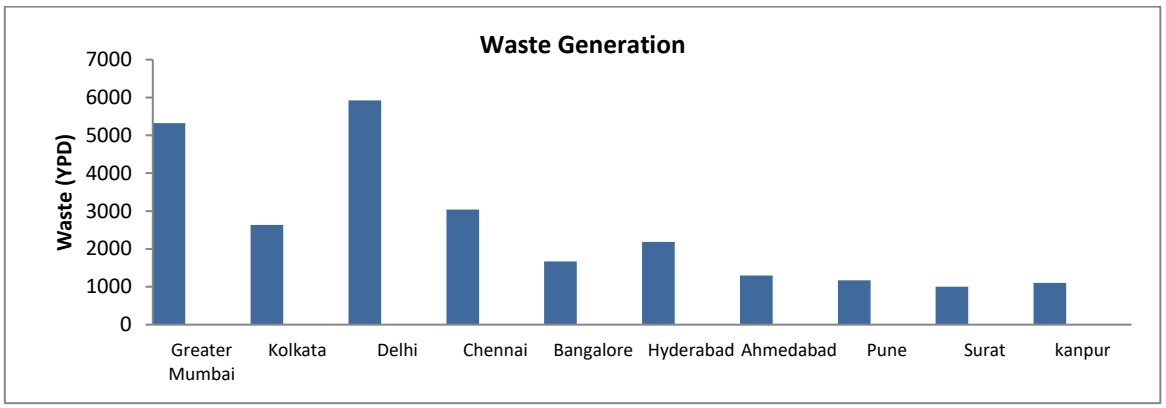


Fig: 1. Waste generation in Top cities in India

Municipal agencies in India spend 5 – 25% of their budget on SW management, which is Rs 75 – 250/ per/ capita/ year. In spite of the various measure to treat waste the LUBs are currently unable to satisfy fulfil their general duties. This has resulted in health problems, such as **Diarrhea, Cholera and Malaria** among the masses. The quality of life has depleted and man power has become less due to their increased disease frequency.

Current Sanitation Facility in India

Cairncross (2008) reveal that improved water supply & sanitation can contribute to 23% and 36% decreased morbidity due to diarrhoea. Moreover, finding from the meta-analysis by Fewtrell & Colford using hand washing and hygiene promotion data reveal that hand washing & hygiene promotion alone contribute to 44% and 42% reduction in morbidity due to diarrhoea, implying that hand washing at critical times can prove vital.

- **Sanitation situation in Rural India**

The sanitation programmes in rural India have traditionally relied heavily on high level for latrine construction. This effort has been criticised from various aspect for failing to motivate rural people for latrine construction. This effort has now been changed with the introduction of Total Sanitation Campaign (TSC) in 1999. This TSC reformed the principles that are demand driven and community led. The concept of sanitation which was limited previously to disposal of human excreta by open ditches, pit latrines or bucket system, has now changed and emerged to liquate and solid waste disposal, food hygiene, personal as well as environmental hygiene. But the basic question arise that how far it is applicable for rural India? Is the situation changed or not? The present rural situation of sanitation is not in an efficient stage **(Table. 2).**

Table: 2. Sanitation situation in Rural India

Rural sanitation				
Estimated coverage 2015 update				
Year	**Improved**	**Shared**	**Other unimproved**	**Open defecation**
1990	6%	1%	2%	91%
1995	10%	2%	2%	86%
2000	15%	3%	3%	79%
2005	20%	4%	3%	73%
2010	24%	4%	6%	66%
2015	28%	5%	6%	61%

Source: WHO/ UNICEF joint monitoring programme for water supply and sanitation (2015)

Rural sanitation was almost 1% before 1990. According to WHO and UNICEF joint monitoring report sanitation in India revealed that in 1990 only 6% of rural household had a latrine at home and 91% rural households used open defecation (photo frame. 1). This figure increased to 15% in 2000. The DDWSestimated coverage at 20% of households in 2001.UNICEF's Child Environment Programme showed that significant numbers of people, especially in below poverty line (BPL) households, **had not been using their latrines** because of lack of awareness of the importance of sanitation, water scarcity, poor construction standards, environmental and health impact. However the improved in sanitation has reached to 28%in 2015 and the practice of open defecation has now decreased to **61%** in 2015. But the question arise here, is rural India have well sanitation service? In answer it can strongly say that Rural India has a **very poor version of sanitation situation** as where still now more than 60% people use open defecation (**photo plates. 1**) and only about 28% people use improved toilets.

Photo plates: 1. Open defecation and poor sanitation facility in India.

- **Sanitation situation in Urban India**

Urban India will continue to undergo rapid changes up to 2015 as the twin trends of general population growth and increasing urbanisation continue to swell the number of people living in cities and towns. India's urban population was some 280 million in 2000 but will rise to almost 400 million by 2015. As per **un-habitat statistics**, the urban population of India will be approximately 32.5% of the total population in 2015, compared to 27.7% in 2000.

According to UNICEF/WHO/Planning Commission, India is almost on course to meet the MDG target for water and sanitation in urban areas by 2015 despite these rapid changes. During 1990-2000, India reached 8 million extra people per year with water and 7.7 million extra people per year for sanitation.Even if 61% of India's urban population had adequate excreta disposal facilities in 2000, inadequate sewage systems and wastewater treatment facilities along with a high quantum of solid waste generation is causing an impending health catastrophe **(Table. 3)**

Table: 3. Sanitation situation in Urban India

Urban sanitation				
Estimated coverage 2015 update				
Year	**Improved**	**Shared**	**Other unimproved**	**Open defecation**
1990	49%	16%	6%	29%
1995	52%	17%	5%	26%
2000	55%	18%	6%	21%
2005	57%	19%	7%	17%
2010	60%	20%	7%	13%
2015	63%	21%	6%	10%

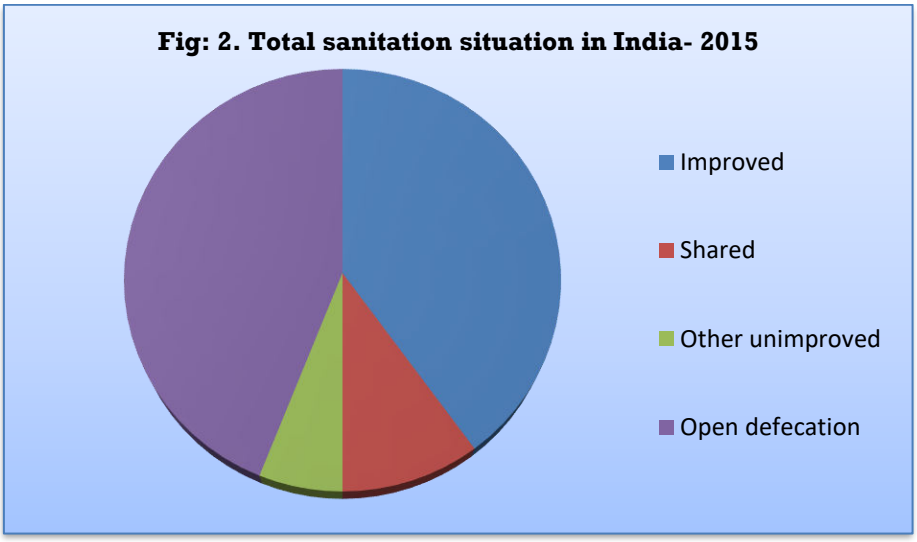
Source:WHO/ UNICEF joint monitoring programme for water supply and sanitation (2015)

It also found that urban sanitation was very poor, although 63% of the population had provision for sanitary excreta disposal facilities during 2015, but only 28% had sewerage systems (**photo plates. 2**). Where sewers were present, they generally did not have adequate treatment facilities. In the case of solid waste disposal, only about 60% of the generated waste was collected and disposed of and of this, only 50% was disposed of improved sanitarily. Separate arrangements for safe disposal of industrial, hospital and other toxic and hazardous wastes were found to be generally non-existent. Still now more than 10% open defecation are found in urban India. Even in India's capital, Delhi, many of the city's toilets are not connected to the sewerage system, which results in the pollution of groundwater and also make wastewater treatment plants difficult to run as they need minimum levels of sludge to operate. On an average the total sanitation situation in India (whole India including Rural & Urban) are not too improved **(table. 4)**.

Table: 4. Sanitation situation in India

Total sanitation				
Estimated coverage 2015 update				
Year		**Shared**	**Other unimproved**	**Open defecation**
1990	17%	5%	3%	75%
1995	21%	6%	3%	70%
2000	26%	7%	4%	63%
2005	31%	8%	4%	57%
2010	36%	9%	5%	50%
2015	40%	10%	6%	44%

Source:WHO/ UNICEF joint monitoring programme for water supply and sanitation (2015)

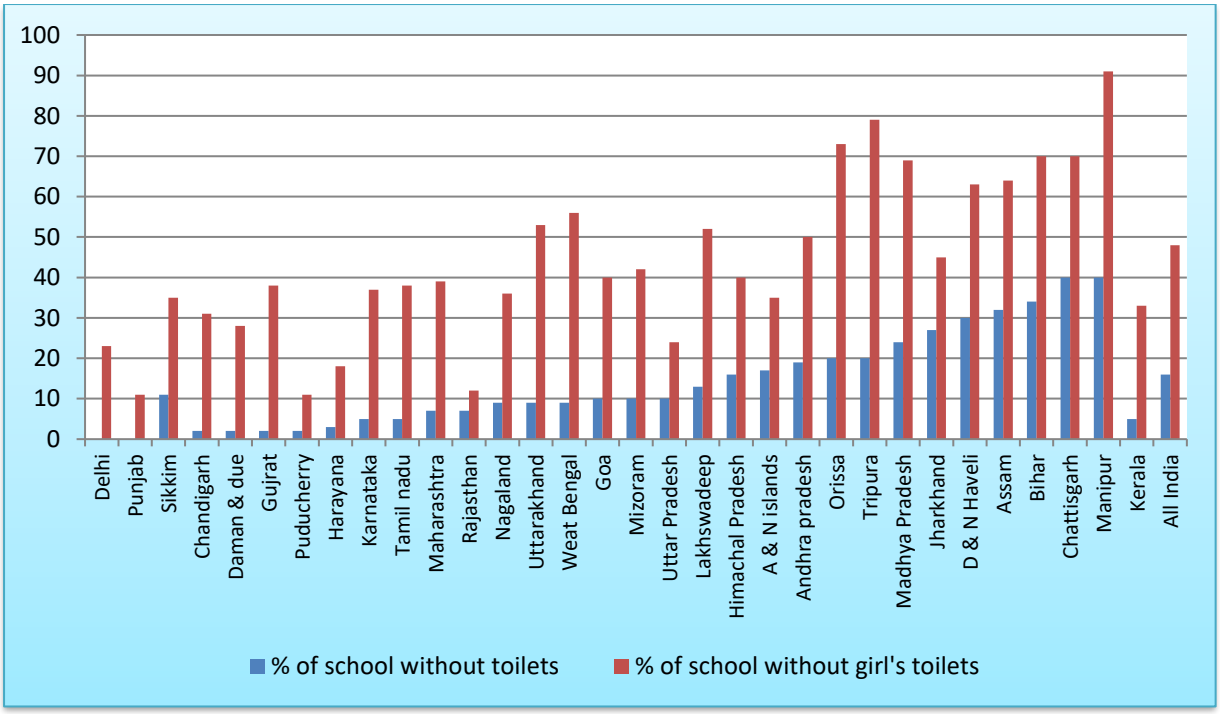


- **Sanitation situation in school in India**

The Total Sanitation Campaign supports the School Sanitation& Hygiene Education programme, launched in the year 2004-05 to improving the status toilets and sanitation situation in Indian School. At that **aim 1.22 million toilets** have been constructed in rural government's school in 2005- 2010.

Photo plates: 2. Overall example of sanitation situation in different cities of India.

Fig: 3. Percentage of schools without toilets



Source: The figure is drawn by author based on data compiled from DISE 2010- 11, NUEPA, New Delhi.

But the sanitation situation is not too good (photo frame 2.). The state like Manipur and Tripura where more than 80% school has been suffering from lack of girl's toilets in school. All over India 16% school in which have not any toilets facility and about 48% school in which not any toilets for girls. The situation is the key cause for many diseases among children. More than 4,000 children under age five die from diarrhea every day (UNICEF annual report- 2009).

The Environmental and Health Impacts of Poor Sanitation in India

A survey published by Indian Urban development Ministry (IUDM) shows that the basic infrastructure, especially sanitation can't keep up with the fast growing of Indian cities. The survey examined 1405 cities in 12 different states and found out that around 50% of these cities have not a proper water supply system. Concerning the sanitation system, the situation is too much worse. Over **more than 70% of households** of Indian cities don't have access to toilets but having access to mobile phone and television. This unhygienic environment is due to Indian's historic neglect of Public Health Service (PHS). The absence of an effective public Health Network (PHN) in densely populated country has resulted in an extraordinarily high disease burden. According to United Nations Children's Fund report (UNICEF), 626 million people in India practice open defecation. Poor sanitation, lack of access to clean water, and inadequate personal hygiene are responsible for an estimated **88% of childhood diarrhea in India**.There are **three identified direct pathways through which poor sanitation** (and associated open defecation) may adversely affect nutritional outcomes in children: diarrheal diseases, environmental enteropathy and nematode infections (**photo plates. 3**). Indeed, the World Health Organization estimates that as much as 50 per cent of childhood under nutrition is associated with poor WASH (Pruss-Ustun et al., 2008).

- **Diarrhoeal diseases**

Diarrhoeal diseases, subsequent malnutrition and their consequences may cause 2.4 million deaths per year. The relationship between diarrhoeal diseases and malnutrition is, however, complex (Brown et al., 2013). In low income settings, poor sanitation, the absence of a safe means of excreta disposal, often results in individuals' households and environments becoming contaminated with pathogen-ridden human faeces, when it passed through the faecal-oral transmission route, cause diarrhoeal diseases (Clasen et al., 2010, Briend, 1990).

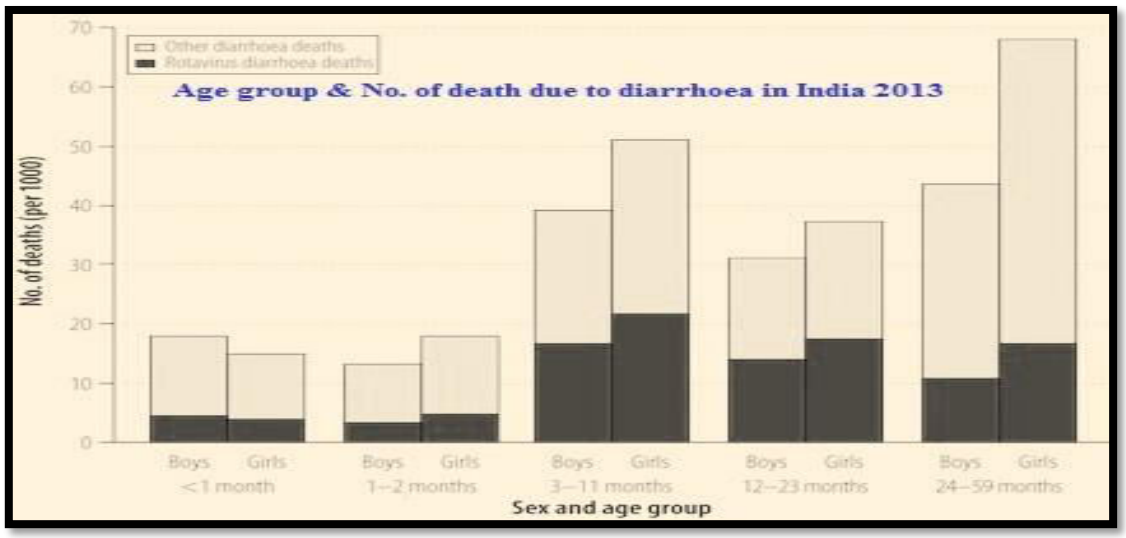


Fig: 4. Age group and no. of death due to diarrhea in India 2013

- **Environmental enteropathy**

Recently, it has been hypothesized that tropical or environmental enteropathy (EE), a subclinical condition of the small intestines resulting from the ingestion of faecal bacteria, and which increases gut permeability and malabsorption of nutrients, may be a primary causal pathway from poor sanitation to stunting.

- **Nematode infections**

The third direct pathway between poor sanitation and bad nutritional outcomes concerns soil-transmitted helminthes (STH) infections, such as Hookworm, Ascaris Lumbricoides and Trichuris Trichiura. These infections result in the malabsorption of nutrients and growth retardation or failure. The majority of worm-related infections are transmitted via contact with or consumption of soil contaminated with human faeces containing worm eggs (DFID, 2013, Geissler et al., 1998).

- **Underweight**

Underweight is a common problems led by malnutrition among childrens of age group between 2 to 9 years **(photo plates 3**).

- **Respiratory problems**

Poor sanitation produce degraded type of odors around surroundings, CH4 like gas and cause many chemical gases. These are the causes of respiratory problems among the age group of mainly 45 to above 59 (**photo plates. 3**).

88% identified infections are created by water, sanitation and natural contamination which prompt mortality and incapacity. Adults and children get diarrhoea and different diseases from ingesting the disease causing germs in human excreta, these results in dehydration, malnutrition, fever, and even death, particularly of children. Different types of diseases associated with faecal transmission are polio, hepatitis A and E, intestinal worms, skin diseases like scabies, and eye contaminations like trachoma that can result in visual impairment. Polio can occur due to **oro-fecal contamination**, and intestinal worms can result in cognitive hindrance and pallor physical distortions and inabilities, and hepatitis can induce liver disappointment. Every 20 seconds, a child dies of preventable waterborne disease. In India, 72 of the 1000 children failed to achieve their fifth birthday. The real executioners are gastrointestinal diseases, **pneumonia**, preterm birth complications, **diarrhoea and malaria**. Diarrhoea is the second highest reason for death among children under five internationally. Lacking accessibility and access to safe and clean drinking water, essential enhanced sanitation, and poor hygiene cause about 88 percent of all mortality due to diarrhoea.

Photo plates: 3. Mal-nutrition and causes of diseases transmission (photos taken from Kolkata, India)

25% of world populace is contaminated by HepatitisE. In an across the nation study led by the All India Institute of Medical Sciences (AIIMS) it was discovered that waterborne Hepatitis E was the essential reason for intense liver disappointment in almost 60% of pregnant ladies. Hepatitis E, a

preventable disease is transmitted basically through drinking water and can prompt demise by activating an intense liver distress. A methodical survey of the impact of **hand washing with soap** has demonstrated that basic measure is connected with a lessening of 43 percent in diarrhoeal sickness (**Table. 5**)

Table: 5. Major disease due to poor sanitation: morbidity & mortality rate in India

Diseases preventable by sanitation and water		Cause of diseases (Transmission)	Morbidity (2013)	Mortality (2013)	Prevention rate by sanitation and safe drinking water
Water born and sanitation	Acute Diarrhoea	Pathogens, including bacteria, viruses, rotaviruses and protozoa. (oro-fecal)	10762500	1535	88%
	Typhoid	Bacteria: Salmonella typhi (oro-fecal	1537118	361	32%
	Cholera	Bacterium Vibrio cholera (oro-fecal)	1127	5	80%
	Hepatitis A	Virus(oro-fecal)	104145	512	15- 45%
	Hepatitis E	Virus (oro-fecal)	7832	163	15- 57%
Water based disease	Malaria	Parasite: Plasmodium vivax, Plasmodium ovale	836916	359	24%
	Dengue	Virus	26000	168	28%
	Chikungunya	Virus:Chikungunya	18639	N.R	21%
	Japanese encephalitis	Virus: flavivirus	3458	199	19%
Sanitation and Hygiene	Trachoma	Bacterium Chlamydia trachomatis	22357	531	27%
Water based disease	Intestinal worms	Parasite: helminthes and protozoa (oro-fecal)	117180	N.R	29%
Air pollution and Hygiene	Pulmonary Tuberculosis	Bacteria: Mycobacterium tuberculosis	1416014	63261	21%
	Lower respiratory infection		31738762	3271	18%
	Pneumonia	Virus\Bacteria: Streptococcus pneumon	70352	2597	27%
	Over all child mortality				55%

Sources: The data is collected and Compiled by author from Central Bureau of Health Intelligence, Health status indicators **2013**, Ministry of Health and Family welfare, Annual report and WHO India Fact Sheet **2013** and other papers.

Governments of India's Effort to Improve Sanitation facility

Sanitation has been under India's Government's radar since it was added to the national agenda during country's first five year plan (1951-56), **Central Rural sanitation Programme (CRSP) in 1986** on rural sanitation came with the trust of the international water and sanitation decade in 1980. Later, the reputed **Nirmal Bharat Abhiyan (NBA)** was implemented in April 1st 2012. NBA Overrode **Total Sanitation Campaign (TSC) in 1999** with the objectives to accelerating the sanitation coverage in rural India.**Swachh Bharat Abhiyan (SBA)** is a national campaign by the

Government of India, covering 4,041 statutory cities and towns, to clean the streets, roads and infrastructure of the countrywhich aims to **eradicate open defecation by 2019**as a national movement. **Under Millenniums Development Goals (MDGs)** to halve by 2015, from 1990 levels, there is an attempt to improve the quality in the proportion of people without sustainable access to safe drinking water and basic sanitation

Suggestion and Recommendation

We can must ask question and also seek an answer as to why have the continuous efforts by the govt. of India in the past three decades failed or can say the least been insequential. **Where is the faulting among strategy implementation?** The Government of India tried and build a significant no. of toilets, then **why India come in the top chart of open defecation?** In this regards, some suggestion cum recommendation can be made to improve to some extent the existing sanitation situation system in the whole country.

- **Living to work together:**

The main problem related to sanitation comes from availability of usable toilets and source of drinking water, so, in order to improve the sanitation situation, the first step is to emphasize on toilets and drinking water. The Government of India should play a vital role here. In urban settings, for example, for public toilets to be fully functional, interdepartmental corporation should germane. The Water Supply Department **(WSD)**, Municipal Corporation **(MC)** and Public Body **(PB)** as an anonymous but responsible entity have to **work together**.

- **Living to funds sanction:**

The Government body have the only responsible for funds and for sanctioning money for constructing more toilets in rural area as still now 61% rural peoples has been using open defecation.

- **Living to motivate others:**

As a comparison **80% rural** populations are responsible for poor sanitation in India as 63% urban peoples use improver toilets and only 10% has been using open defecation. So, there need to motivate the rural population **towards hygienic condition** through elementary education and by organising sanitation programmes at village level.

- **Living to access health care:**

Maximum child deaths in India due to poor sanitation are occur because of insufficient access of health care, especially in rural areas. So, there should also be keep step to improve the availability and access to quality health care.

- **Living to build synergy:**

Under Total Sanitation Campaign (TSC, 1999), the government of India had sanctioned an **amount of 1916.32** crores during 2011- 2012 (NBA baseline survey, 2011- 12) to construct toilets in rural India, but 80% of these sanctioned money not effectively used by Indian rural people because of their **apathy attitude towards health and good health**. So, there should be build synergy between health and determinants of good health like nutrition, hygiene and safe drinking water.

- **Living to upgradation:**

There are more than 6% unimproved toilets in the whole country which is not used by anyone due to high odors and unusable condition, more than 10% tube well from which not pour a drop of

drinking water and more than 40% slums in India have unable to drink safe and fresh drinking water. All these exist due to not upgradation of infrastructure. So, high emphasize should be given **on upgradation of infrastructure.**

Conclusion

Overall situation of sanitation is not good throughout the country. It is due to various factors that have been discussed. Undoubtly it can be said that the Government's involvement and efforts are increasing towards sanitation, but the failure in strategy implementation are due to population growth and these facilities are not enough for vast growing populations. In India, still now 44% peoples use open defecation, 40% people unable to get safe drinking water, 16% school have not any toilets, 48% school have not girl's toilets and more than 70 million people live in slum area. As a developing country, India has been suffering from improver sanitation facility and as the result thousands of childrens has died with different viral disease.

In conclusion, it can be mentioned that this paper attempted to investigate and discuss impact of poor sanitation on different aspects of social life mainly environment and human health in India. Improved and adequate sanitation will have profound implications on human and society. Sanitation improvement programs should be aligned properly with the society to provide adequate benefits. Public Private Partnership (PPP), strong and well-designed policy and a sustainable framework with strong political commitment are must to bring the change in sanitation situation in India.

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