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Review

Microbial Water Pollution in Pakistan

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Abstract*:Overall pollution of surface waters with microbial pathogens is of generous wellbeing concern. This review will focus on the health effects caused by microbial contamination. Furthermore, it also help us to determine quality and availability of water in Pakistan, various contamination sources as well as preventative measures at domestic and national level. At the end, recommendations are outlined for readers to overcome from the problem of microbial contamination.*

Keywords*: Microbial Pathogens; Bacteria; Viruses; Protozoa, pollution, Pakistan*

INTRODUCTION

Pakistan has been honored by nature with enough surface and groundwater assets. Industrialization, urbanization, and population explosion have put burden on water assets. In current social orders, wastewater produced from mechanical and metropolitan exercises contains an extensive variety of toxins including natural, inorganic, synthetic mixture and pathogenic microorganisms (Aslam M 1993, C. R. P 2000, Farooq A 2010, Mustafa K 2012). Among these contaminations, pathogenic microorganisms are of genuine wellbeing concerns. The microbial pathogens are by and large arranged into three noteworthy gatherings according to the characterization framework i.e. microbes, infections, and protozoa. For instance, microbes are in charge of looseness of the bowels, cholera and typhoid; infections can cause hepatitis, polio, and gastrointestinal sicknesses; and certain protozoa justification for giardiasis, diarrhea, and cryptosporidiosis. Ingestion of such pathogens comes about into irresistible infections. World Wellbeing Association has guaranteed that 80 % of human medical issues in the developing countries are because of natural sullying of drinking water

(Aziz J. A 2002, Awan M. A 2002, Arora D 2007, Bangash F. K 2001). According to WASH in health care facilities: global baseline report 2019, 896 million people use health care facilities with no water service and 1.5 billion use facilities with no sanitation services. Pakistan has been positioned at 80th position among 122 countries with respect to poor consumable water quality. Just 36 for every penny of the Pakistani populace by and large, incorporating 41% in urban regions and 32% rural regions, approaches safe savouring water (Husain S 2012, Alam M 2003, Ahmad T 2010). Pakistan National Conservation Strategy announced that water-related illnesses speak to 40% of the transmittable ailments. New-born child deaths caused by water-related disease are 60% in Pakistan as per International Union on Conservation of Nature (IUCN) report, which is the most noteworthy proportion in Asia. New techniques and method should be introduced for water issues (Sanjrani MA 2019, Howell T. A 2001, Chhatwal R 1990, Chilton P. J 2001, Hisam 2014). This review highlights the status of microbial contamination in Pakistan following several preventive measures and recommendations.

STUDY AREA:

Pakistan is arranged in southern Asia, flanking with India in the east, Afghanistan in the west, and China in the north. In the east of Pakistan, there exist heaps of Himalaya and Karakorum. In the north, Hindu Kush ranges exist, and slope areas (up to 4700 m) in the northwest and in the upland Baluchistan level exist. The climatic conditions are for the most part bone-dry to semiarid with shifting levels of normal rainfalls in various territories of Pakistan. Indus is the real waterway of Pakistan, spilling out of Karakorum reaches to south lastly falls in the Middle Eastern Ocean. Horticulture cultivating has a noteworthy part in Pakistan's economy. 27% of the aggregate land is under cultivating and the fundamental harvests are wheat, maize, rice, cotton and sugarcane. To satisfy the prerequisites of expanding populace, pesticides, and manures are connected to build the yields result. A large portion of businesses, for example, material, pesticide, and manure enterprises are available in significant urban areas (EPA Pak 2008, Shar A 2010)

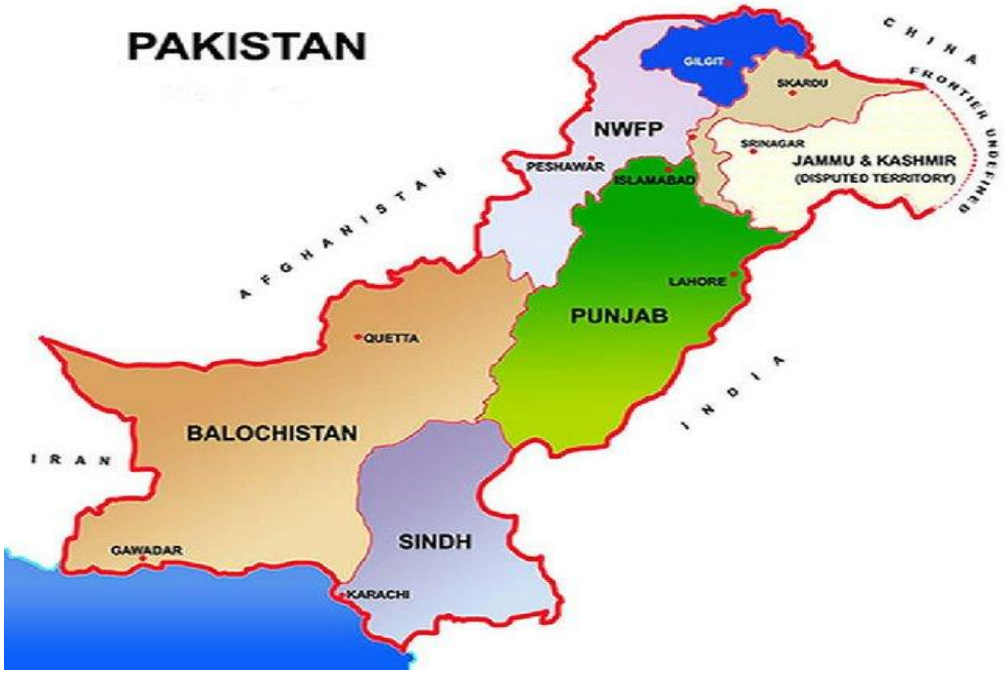

Figure 1: Map of Pakistan (Reference: Farooq Ahmad 2010)

CURRENT STATUS OF AVAILIBILTY AND QUALITY OF WATER RESOURCES

Pakistan once has surplus water is now water stressed country. As indicated by Jamshed Iqbal Cheema (Chairman: Pakistan Agriculture Scientists Association), the per capita water accessibility in Pakistan at the time of freedom was 5,600 cubic meters, which has been diminished by more than 406 percent from 5,260 cubic meters in 1951 to 1,038 cubic meters in 2010. On the off chance that business as usual proceeds with, at that point, by 2020, the water accessibility in Pakistan will additionally fall to 877 cubic meters for each annum and will additionally diminishing to 660 by year 2025 and will additionally go down to a disturbing level of 575 cubic feet in 2050. In Pakistan, the momentum water supply is around 79%. Sadly water quality has been deteriorated due to untreated discharge of synthetic compounds from urban networks and enterprises into water bodies. Poor sanitation, the spillage of pipe and intermixing of contamination from sewage lines into drinking water supplies, flooding and runoff further demolished the quality of water (Patoli A 2010, Bangash F. K 2001, EPA Pak 2008, Shar A 2010).

Currently, around 20% of the entire populace of Pakistan approaches safe drinking water. The staying 80% of populace is compelled to utilize dangerous drinking water because of the shortage of sheltered and solid drinking water sources. The quantity of diarrheal cases that are enlisted in Pakistan every year is around one hundred million. 20%– 40% of healing

centers of Pakistan are loaded with individuals that are experiencing waterborne disease, as indicated by United Nation International Children Emergency Fund (UNICEF) and also documented by several studies (EPA Pak 2008, Shar A 2010, Shuja S 1998, WHO 1996).

EFFECTS OF MICROBIAL WATER CONTAMINATION IN PAKISTAN

In terms of water borne diseases, the number of factors are responsible. For pathogens transmitted by the fecal– oral course, drinking-water is just a single of transmission. Tainting of sustenance, hands, utensils and garments can likewise assume a part, especially when residential sanitation and cleanliness are poor. The resistance of people likewise shifts significantly, regardless of whether gained by contact with a pathogen or affected by such factors as age, sex, condition of wellbeing and living vehicle conditions (Shuja S 1998, WHO 1996).

In Peshawar, the vast majority of water tests were observed to be defiled with coliform microscopic organisms. In Rawalpindi, the gastroenteritis was accounted for in 2000. Between November 2016 to 9 December 2018, 5 274 cases typhoid fever cases were reported by the Provincial Disease Surveillance and Response Unit (PDSRU) in Sindh province only (WHO 2018). In Islamabad and Rawalpindi, 4000 cases of hepatitis were enlisted. Dental fluorosis was additionally found in numerous regions of Pakistan such as Raiwind, Pattoki, and Kasur (Tahir M. A 1994, Kosek M 2003, Shuja S 1998, WHO 1996).

Besides human health microbial pollution also affected marine life. Dumping of waste and emptying sewerage water into ocean has gravely influenced angle in Karachi Pakistan detailed by paper media. There are six mechanical zones in Karachi just with around 10,000 modern units that fabricate everything from materials to synthetic concoctions and paints. The most contaminating, as far as substance squander, are the tanneries. Moreover, sewage seepage into ocean additionally influenced the marine life. Specialists appraise that Karachi creates around 500 million gallons for every day (MGD) of waste water. Around one fifth of water originates from these enterprises, while the rest is the residential or city sewerage. "Nearly the whole sewerage and modern waste water goes into ocean without treatment, which has brought a cataclysmic event, as we are losing our fish get and furthermore it is influencing marine life. We are attempting to determine the issue," conceded by priest of condition (USEPA, Soomro Z. A 2011).

MITIGATION MEASURES

Chlorination is the popular method for disinfection of drinking water. At domestic level, taste, odour and colour are basic physical parameter which can be observed by human senses. If water is contaminated, risk associated with the polluted water by treating it at home. Treatment of water include, primary treatment such as screening and filtration, secondary treatment as purification and tertiary treatment as disinfection. Three basic steps can also takes place at home. Such as sedimentation by adding alum following screening and filtration of water by simple and little filtration plant, purified and disinfected by boiling or adding chlorine or little amount of bleach. This can mitigate and prevent the risk of water borne disease associated with polluted water at domestic level (Pelczar M. J 2007, Prescott L. M 2002).

Nationally, administration procedures should cover assurance of sources from tainting, drinking water dispersion lines up degree and their legitimate support, and checking and attention to the general population.

- In order to improve water quality, Water and Sanitation Agency (WASA) should make a move with the assistance of private foundations to shield water assets and control contamination from its source.
- There is an absence of legitimate inspecting arrangement of the drinking water treatment plants. To guarantee safe drinking water as indicated by the quality benchmarks investigation, and testing of water two times per year should be done.
- Proper support of water conveyance framework and chlorination ought to be finished by the law and directions to slaughter pathogens. Government ought to give the most recent and dependable instruments and prepared personals for the drinking water quality examination.
- Government should make strict move for their modern emanating transfer as per the NEQS under the 1997 Act. In the event that any industry is observed to damage the principles, it ought to be rebuffed with overwhelming fine and detainment.
- Re-directing of circulation lines from sewage channels and Maintenance of corroded and spilled dissemination lines ought to be done to remediate water contamination.
- Construction of appropriate clean landfill destinations by government to manage the penetration of leachate
- Public awareness and education about microbial contamination and mitigation measures should be initiate by arranging seminars at school, college, universities and

in towns. Basic control strategies and hygiene habits should be taught to deal with water borne disease.

- Water preservation instead of wastage is another unthinkable advance to lessen water contamination.

CONCLUSION

Conclusively, currents status of water pollution in Pakistan, effects and mitigation measures were analyzed. Which demonstrates that water assets of Pakistan is tainted, fecal contamination is accounted for waterborne diseases because of the poor sanitation and sewerage framework. In addition to this, industrial effluents, material colours, pesticides, nitrogenous manures, arsenic, and different synthetic substances further worsen the situation. There is a need to keep up and overhaul normal assessment of officially exhibit treatment plants. The outcomes drew consideration that sewerage defilement with drinking water must be considered as an essential natural and medical problem.

REFERENCE

1. Ahmad, T., Waheed, Y., Tahir, S., Safi, S.Z., Fatima, K., Afzal, M.S., Qadri, I., 2010. Frequency of HEV contamination in sewerage waters in Pakistan. The Journal of Infection in Developing Countries 4, 842-845
2. Alam, M., Akhtar, Y., Ali, S., Ahmed, M., Atiq, M., Ansari, A., Chaudhry, F., Bashir, H., Bangash, M., Awais, A., 2003. Seasonal variation in bacterial pathogens isolated from stool samples in Karachi, Pakistan. JPMA. The Journal of the Pakistan Medical Association 53, 125-129.
3. Arora D. R. *Textbook of Microbiology*. 2nd. New Delhi, India: CBS Publishor& Distributor; 2007.
4. Aslam M., Ahmed M. An inquiry into the incidence and prevalence of water borne diseases: a case history of Faisalabad. *Journal of Animaland Plant Sciences*. 1993; 3:p. 101.
5. Awan M. A., Siddiqui M. T., Khan R. A., Shah A. H. Combined effect of salinity and industrial effluents on the growth of Eucalyptus camaldulensisdehnh. *Pakistan Journal of Agricultural Sciences*. 2002
6. Aziz J. A. *Report Submitted to The Asian Development Bank as Part of Water Resources Strategy Study, ADB, TA 3130 PAK*.Islamabad, Ministry of Water and Power; 2002. National water quality strategy.
7. Bangash F. K., Khan S. U. Aesthetic Quality Evaluation of Drinking Water of Peshawar Valley. 2001
8. C. R. P., Country Report, Pakistan, Global Water Partnership, Draft South Asia - Water Vision. vol. 2025, 2000.

9. Chhatwal R. *Dictionary of Environmental Chemistry*. New Delhi, India: Publication; 1990
10. Chilton P. J. *Scoping Study-Draft Final Report*. WELL Task 568. Loughborough, UK: Water, Engineering and Development Centre, Loughborough University and London School of Hygiene and Tropical Medicine; 2001. Pakistan water quality mapping and management project.
11. Chilton P. J., et al. Pakistan water quality mapping and management project. Pakistan Integrated Household Survey (PIHS) Islamabad, Federal Bureau of Statistics, Government of Pakistan, 2000
12. Farooq Ahmad[1], Mir Ajab Khan[1], Mushtaq Ahmad[1], Muhammad Zafar[1*], Tariq Mahmood[1], Asma Jabeen[2] and SarfrazKhan Marwat[1]. 2010, Ethno medicinal uses of grasses in Salt Range Region of Northern Pakistan. Journal of Medicinal Plants Research Vol. 4(5), pp. 362-369, 4 March, 2010.
13. Hisam A, Ur Rahman M, Kadir E, Tariq NA, Masood S J, Microbiological contamination in water filtration plants in Islamabad, Coll Physicians Surg Pak. 2014 May; 24(5):345-50.
14. Howell T. A. Enhancing water use efficiency in irrigated agriculture. *Agronomy Journal*. 2001; 93(2):281–289. doi: 10.2134/agronj2001.932281x.
15. Husain S. Water availability shrinking fast in Pakistan," study - thenews.com.pk." The News International, Pakistan. Shrinking- fast-in-Pakistan-study. 2012
16. Karim K. M. A., Khattak M. A., Shah R. A. Pollution studies of Kabul River and Kheshki Lake. *International Journal of Engineering and Applied Sciences*. 1985; 2:20–24.
17. Kosek M, Bern C, Guerrant RL Bull, The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. World Health Organ. 2003; 81(3):197-204.
18. Mustafa K. Pakistan's per Capita Water Availability Dwindling. 2012.
19. Pakistan Environmental Protection Agency, Ministry of Environment, National Standards for Drinking Water Quality (NSDWQ), 2008.
20. Patoli A. A., Patoli B. B., Mehraig V. High prevalence of Multi-drug resistant Escherichia Coli in drinking water samples from Hyderabad. *Gomal Journal of Medical Sciences*. 2010; 8:23–26.
21. Pelczar M. J., Chan E. C. S., Krieg N. R. *Microbiology*. 5th. New Delhi, India: Tata McGraw Hill; 2007.
22. Sanjrani, M. A. – Zhou, B. – Zhao, H. – Zheng, Y. P.– Wang, Y. – Xia, S. B.*, The influence of wetland media in improving the performance of pollutant removal in water treatment: a review, 2019, Applied Ecology And Environmental Research 17(2):3803-3818, DOI: http://dx.doi.org/10.15666/aeer/1702_38033818
23. Shar A. H., Kazi Y. F., Kanhar N. A., Soomro I. H., Zia S. M., Ghumro P. B. Drinking water quality in Rohri city, Sindh, Pakistan. *African Journal of Biotechnology*. 2010;9(42):7102–7107
24. Shuja S., Jaffar M. Drinking water quality guideline values, chemical and physical aspects. Proceedings of the National Workshop on Quality of Drinking Water; 1998;

Islamabad, Pakistan. Pakistan Council of Research in Water Resources & Chemical Society of Pakistan; pp. 25–28.
25. Soomro Z. A., Khokhar M. I. A., Hussain W., Hussain M. Drinking water Quality challenges in Pakistan. World Water Day. 2011:17–28.
26. Tahir M. A., Bhatti M. A., Majeed A. *Survey of Drinking Water Quality in the Rural Areas of Rawalpindi District*. Pakistan Council for Research in Water Resources, Islamabad; pp. 35–39, 1994.
27. United States Environmental Protection Agency Understanding the Safe Drinking-Water Act, Washington DC, 1999.
28. WHO. *Guidelines for Drinking Water Quality*. Vol. 2. Geneva, Switzerland: World Health Organization; 1996.
29. WHO. Typhoid fever – Islamic Republic of Pakistan. Available online at https://www.who.int/csr/don/27-december-2018-typhoid-pakistan/en/
30. World Health Organization and the United Nations Children's Fund (UNICEF) 2019, WASH in health care facilities: global baseline report 2019: ISBN 978-92-4-151550-4

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