



Analyzing the Floating Healthcare System in Indian Sundarbans

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ABSTRACT

The Indian Sundarbans, a geographically challenging deltaic region in West Bengal, presents significant barriers to conventional healthcare access for its inhabitants. Characterized by a sparse and isolated population across numerous river-locked islands, the area is prone to frequent natural calamities and is marked by widespread poverty. These factors contribute to a high disease burden and a public health infrastructure that is inadequate and inequitably distributed. In this context, the floating healthcare system, primarily delivered through mobile boat clinics, has emerged as a crucial and innovative solution. This research paper examines the system's role in mitigating health disparities by bringing essential medical services directly to remote communities. It analyzes how these clinics, staffed by doctors, nurses, and technicians, address critical challenges such as geographical inaccessibility and economic constraints. The services provided range from primary care and diagnostics to maternal and child health support, effectively bridging the gap between a vulnerable population and a formal healthcare system. While facing limitations related to funding,



logistics, and the scope of services, the floating healthcare system has a demonstrably positive impact on improving health outcomes and awareness. Its success serves as a compelling model for sustainable, community-centric healthcare delivery in other hard-to-reach environments globally. The system's continued development and integration with broader public health initiatives are essential for ensuring long-term health and well-being in the region. This article attempts to shed light on the nature and activities of the floating healthcare service in the Indian Sundarbans with the help of various sources.

Introduction:

The Indian Sundarbans in West Bengal is a huge, ever-changing delta. It's in the western part of the world's largest delta, created at the confluence of the Ganges, Brahmaputra, and Meghna rivers.¹ This area is known worldwide for its important nature, but at the same time, the people living there are very susceptible to a great number of social, economic, and environmental challenges.² This region is one of the most geographically challenging areas for healthcare delivery. The sparse and isolated population, coupled with frequent natural calamities and widespread poverty, significantly hinders access to conventional healthcare services. In this context, floating healthcare systems have emerged as a vital and innovative solution, bringing essential medical services directly to the doorsteps of the isolated communities.

Unique Geography

The Indian Sundarbans is a complex and constantly changing area with many tidal rivers, creeks, and mudflats cutting through land that's mostly less than one meter above sea level.³ This unique landscape has 102 islands, and people live on about 54 of them. The other islands are covered in thick, diverse mangrove forests, which is why the Sundarbans is famous for. These mangroves are a rare and vital ecosystem, acting like a natural shield that protects the land from cyclones, storm surges, and coastal erosion.⁴ However, this same complex geography also makes it very hard to travel by land. Most travel between islands and to the mainland is done by boat, which takes a lot of time, costs money, and can be dangerous, especially when the weather is bad or the tides are high.⁵



Despite its difficult environment, the Indian Sundarbans is heavily populated, with over 4.5 million people living there as of the 2011 Census.⁶ These residents are spread across 19 administrative areas, mostly in the South and North 24 Parganas districts. Some of these areas, like Gosaba, are incredibly crowded, with 831 people per square kilometer. A large number of the people living here are from marginalized communities, including Scheduled Castes and Scheduled Tribes, who made up about 35.76% and 5.56% of the population respectively in 2011.⁷ These communities rely heavily on the delta's vulnerable natural resources for their livelihoods. They mainly work in fishing, crab collection, honey gathering, and basic farming, all of which are very sensitive to environmental changes.

Vulnerabilities

The people in the Indian Sundarbans face many problems. These problems are made worse by the area's unique geography and the increasing effects of climate change.⁸ The sea level in the Sundarbans is rising much faster than in most other places. For example, Sagar Island sees a 12 mm rise each year, while the global average is 2 mm. This quick rise causes land to disappear under water, coasts to wear away, and islands to vanish. This forces people to leave their homes and become “environmental refugees.” Sundarbans provide a vital buffer against cyclones but the sea level rise are reducing their protective capacity and impacting diverse flora and fauna they support. The Sundarbans is known as a “cyclone hotspot” because it's often hit by strong cyclones (like Sidr in 2007), Bijli in 2009, Aila in 2009, Bulbul in 2019, Amphan in 2020, and Yaas in 2021 and Dana in 2024).⁹ These storms cause huge damage. They break river banks, flood large areas, destroy homes, force communities to move, and lead to major losses of jobs, animals, and lives.¹⁰ As sea levels rise and tidal surges increase, saltwater spreads into farmland and freshwater sources.¹¹ This seriously harms crop growth, threatening how much food is available. It also pollutes drinking water, leading to health problems like high blood pressure, issues during pregnancy, and more skin and infectious diseases.¹²

Many people here live in poverty.¹³ Their main ways of earning a living are easily affected by climate change and natural disasters. This means they often don't have enough food and face constant financial struggles.¹⁴ When homes are destroyed due to natural calamities and people lose their jobs, many, including women and children, are forced to move to cities to find work. This often puts them in dangerous living situations, with low-paying, unfair jobs, heavy debt, and a higher risk of human trafficking.¹⁵ Besides healthcare, the area lacks essential infrastructure. This includes safe drinking water, clean toilets, reliable electricity, and good communication. These shortages make living conditions even harder.¹⁶



The Indian Sundarbans faces significant health challenges. Many islanders have severely restricted or no access to doctors, essential medicines, and emergency services. This is due to geographical isolation, high transport costs, and a lack of adequate medical facilities. Challenging environmental conditions lead to a high prevalence of water-borne diseases like cholera and dysentery, and vector-borne diseases such as malaria and dengue.¹⁷ Malnutrition is also common, especially among children and women, leading to poor health outcomes.¹⁸ Living near dense mangrove forests and relying on forest resources exposes communities to dangers like snakebites and tiger attacks. Immediate medical attention, often difficult to access in remote areas, is crucial for these incidents. The unique and fragile geography of the Indian Sundarbans, combined with a densely populated and socio-economically vulnerable population, creates a complex situation. The increasing impacts of climate change worsen these existing vulnerabilities. Therefore, there's a critical need for adaptable and accessible solutions in all sectors, especially healthcare, to protect the well-being and resilience of the region's inhabitants. In this context, floating healthcare systems have emerged as a vital and innovative solution in Indian Sundarbans.

Floating Healthcare: A Vital Solution for the Indian Sundarbans

Floating healthcare systems offer a crucial and innovative solution to the significant healthcare challenges in the Indian Sundarbans. Given the region's unique geography and susceptibility to disasters, these systems—primarily specially equipped boat clinics—provide an adaptive and responsive approach to healthcare delivery. They directly address the critical lack of medical access for isolated and vulnerable communities. By delivering essential medical services directly to the island dwellers via waterways, floating healthcare has become an indispensable lifeline. It has transformed health equity and resilience in one of the world's most challenging environments. Their mobility and on-site service provision stand in stark contrast to static, often inaccessible, land-based facilities. This offers a beacon of hope and a practical model for ensuring continuous care amidst recurrent adversities.¹⁹

The rationale for adopting floating healthcare in the Indian Sundarbans is multifaceted. A significant portion of the Sundarbans population resides on remote islands, often accessible only by boat.²⁰ Traveling to mainland hospitals or even the nearest primary health center (PHC) can involve hours of arduous boat journeys, which are costly, time-consuming, and often perilous, especially during emergencies or adverse weather conditions.²¹ This geographical barrier severely limits access to timely medical intervention, leading to preventable complications and deaths.²² The Sundarbans is a climate hotspot, frequently battered by cyclones, floods, and tidal surges.²³ These events devastate existing



infrastructure, including roads and buildings, making land-based health facilities non-functional or inaccessible. Floating clinics offer a crucial advantage of mobility and resilience, enabling them to provide immediate relief and continue operations even in the aftermath of disasters. Despite governmental efforts, the number of PHCs and sub-centers in the Sundarbans is insufficient to cater to the large, dispersed population. Moreover, these facilities often suffer from a shortage of trained doctors, nurses, and essential medical supplies, further compromising their effectiveness. A study highlighted that many villages have access scores indicating less than one doctor per 1,000 pregnant women, and some villages have no access to maternal health facilities at all.

The region experiences a high prevalence of water-borne diseases (e.g., cholera, dysentery) due to contaminated water sources, vector-borne diseases (e.g., malaria, dengue) owing to stagnant water bodies, and respiratory infections.²⁴ Malnutrition, particularly among women and children, is a significant concern.²⁵ The environment also poses unique threats like snakebites and injuries from wild animals (e.g., tiger attacks for honey collectors and fishermen), demanding rapid medical response.²⁶ The inhabitants of the Sundarbans are largely economically disadvantaged, relying on fragile livelihoods like fishing and agriculture that are highly susceptible to climate change impacts.²⁷ The cost of transportation and private healthcare is often prohibitive, forcing many to rely on untrained local healers or forgo treatment altogether.²⁸

Operational Framework of Floating Healthcare Systems in the Sundarbans

Floating healthcare systems in the Sundarbans typically operate as integrated mobile medical units, providing comprehensive services through a well-defined approach, these are specially designed motorized boats, ranging from smaller, agile dispensaries to larger vessels equipped with advanced medical and diagnostic capabilities. They function as mobile clinics, carrying a dedicated team of doctors, nurses, pharmacists, lab technicians, and community health workers. These clinics offer a wide array of primary healthcare services, including general medical consultations, treatment for common ailments, management of chronic diseases (e.g., hypertension, diabetes), and minor surgical procedures. A cornerstone of their services includes antenatal and postnatal care, immunizations for children, nutrition counseling for mothers, and family planning services. While institutional deliveries are often facilitated at land-based community centers, the boat clinics play a crucial role in monitoring pregnant women and ensuring timely referrals.

Many floating clinics are equipped with basic diagnostic tools, such as mobile X-ray machines and pathological labs. This enables on-the-spot tests like blood sugar checks, hemoglobin levels, and



basic pathogen detection, which are crucial for prompt diagnosis and treatment. Essential medicines are provided free of cost or at subsidized rates, effectively addressing financial barriers to treatment. Beyond curative services, the medical teams actively engage with communities. They conduct awareness campaigns on hygiene, sanitation, disease prevention, nutrition, and the importance of seeking professional medical help. For critical cases requiring specialized care or hospitalization, the floating clinics stabilize patients and arrange for their swift transfer to larger hospitals on the mainland using dedicated speedboats, acting as crucial emergency transport links. Clinics typically follow a fixed weekly or monthly schedule, anchoring at designated points in various villages, which allows residents to plan their visits. They also conduct outreach camps in accessible community spaces

Key Initiatives and Organizations in Floating Healthcare

Several organizations, both non-governmental and governmental, have pioneered and sustained floating healthcare in the Indian Sundarbans.

Southern Health Improvement Samity (SHIS): Perhaps the most prominent and long-standing organization in this field, SHIS has been a lifeline for countless individuals in the Sundarbans. Founded by Mohammad Abdul Wohab, SHIS launched its mobile boat clinics in 1997.²⁹ SHIS boat clinics provide comprehensive primary healthcare, including general medical consultations and treatment for common ailments, chronic diseases like hypertension and diabetes, and infections. They are instrumental in maternal and child health, offering antenatal and postnatal check-ups, immunizations, and nutrition counseling. Diagnostic services like mobile X-rays and basic pathological tests are available on board. Minor surgeries and wound care are also performed. Crucially, they dispense free or subsidized medicines. SHIS also focuses on health awareness, and in coordination with the government, they have even administered COVID-19 vaccines. SHIS's four boat clinics cover 24 villages weekly, navigating approximately 2,000 square kilometers to reach millions of underprivileged inhabitants. They have treated over a million patients, highlighting their immense reach and impact. Support from philanthropists like Dominique Lapierre has been instrumental in equipping their boats and sustaining their operations. The organization also operates community centers on islands where institutional deliveries are facilitated, complementing the boat clinic services.

Government Initiatives: The Government of West Bengal has recognized the efficacy of floating healthcare. Recent reports indicate the state's commitment to launching more floating vessels to provide healthcare services in the remote parts of the Sundarbans, particularly in North and South 24 Parganas districts. These government-backed floating health units are designed to offer diagnostic facilities,



vaccinations, and services related to maternal and child health, including blood and sugar tests. This aligns with broader efforts under the National Health Mission to extend healthcare access to difficult terrains through mobile medical units. Collaboration with NGOs like SHIS, entrusting them with the implementation of some government health projects, further strengthens this network.

Foundation for Innovations in Health (FIH): FIH introduced a "floating digital health clinic" in the Sundarbans, integrating telemedicine capabilities.³⁰ Supported by software developed in association with Johns Hopkins University and affordable diagnostic devices from IIT-Kharagpur and IIT-Guwahati, these clinics enable remote consultations with specialists, bridging the gap for expert medical advice. This represents a significant step towards leveraging technology to enhance healthcare accessibility in remote areas.

Other NGOs and Partnerships: Organizations like Sabuj Sangha and Sundarban Social Development Centre (SSDC) also contribute to healthcare in the Sundarbans. While their primary focus might not solely be floating clinics, they often incorporate mobile health camps and outreach programs that require water-based transport to reach isolated communities. SSDC, for instance, has a strong focus on eye care, including a hospital and mobile boats for reaching patients for awareness campaigns and follow-up. These initiatives, sometimes in partnership with international bodies like Sight Savers International, complement the efforts of dedicated floating clinics.

Successes and Impact of Floating Healthcare

The floating healthcare system has demonstrably improved health outcomes in the Indian Sundarbans. By literally bringing clinics to the patient's doorstep, these systems overcome geographical barriers, ensuring that residents in the most isolated islands can access timely medical care. They focus on serving underserved communities, by docking close to these communities they bring healthcare directly to the people who otherwise have little or no access. The regular presence of medical professionals facilitates early diagnosis and treatment of common and endemic diseases, preventing complications and outbreaks. These boats provides regular screening and early diagnosis. Early detection and treatment in several cases reduces the severity and duration of ailment preventing complications and further infections. Consistent antenatal and postnatal care, immunizations, and nutritional support have a direct positive impact on reducing infant and maternal mortality rates and improving overall child health in the region. Through health education and counselling, communities gain better awareness of hygiene, sanitation, disease prevention, and the importance of institutional care, leading to improved health-seeking behaviours. The



mobility of floating clinics allows them to adapt to and provide crucial medical assistance during and after natural calamities, when fixed infrastructure is often incapacitated.

Challenges and Future Directions

Despite their successes, floating healthcare systems face ongoing challenges. Navigating the dynamic waterways, especially during extreme weather or low tides, remains complex and demands highly skilled boat operators. Maintenance and fuel costs are substantial. Most initiatives rely on external grants and donations, necessitating continuous fundraising to ensure long-term viability and expansion. Attracting and retaining qualified medical professionals willing to work in such remote and challenging conditions is a persistent difficulty. While excellent for primary care, floating clinics have inherent limitations in providing advanced diagnostics, complex surgeries, or prolonged inpatient care, requiring effective referral pathways. Ensuring seamless coordination and data sharing with government health departments is crucial for comprehensive care and effective public health planning.

Observations

The future of floating healthcare in the Sundarbans looks towards greater integration of technology, specialized services, and robust funding models. Expanding telemedicine capabilities, equipping boats with more advanced portable diagnostic equipment, and developing specialized floating units for specific health issues (e.g., eye care, dental care) could further enhance their impact. Strengthening community health worker networks for follow-up and basic care, and building more climate-resilient vessels, will also be vital to ensure these indispensable services continue to thrive in this unique and vulnerable ecosystem. This article wants to stress on the fact that floating health care system is a very innovative approach for geographically inaccessible areas but it should be kept in mind that this area still needs special attention in delivering health care services, such initiatives when improved can also be a learning platform for other similar fragile areas in India.

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