STATUS OF HEALTHCARE INFRASTRUCTURE IN INDIAN SUNDARBA

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	Abstract
Keywords: Disparities; Health care infrastructure; Quality of life; Shortfall; Viable policies.	Health is a fundamental human right and central to the concept of quality of life. Due to various socio-economic and political factors, there exists a widespread inequality in the distribution of health care facilities in India. The present study attempts to highlight on the existing health care infrastructure and also tries to analyse the inter-block disparities regarding health care facilities in Sundarban which is known as one of the backward region of West Bengal. To identify the regional pattern of health care infrastructure three broad categories have identified i.e. availability of health care infrastructure, performances of public health care centres and accessibility to health care infrastructure. There is a huge shortfall in the existing number of primary health centres and manpower under the public health system in Sundarban. Nearly 70% areas of Sundarban have suffered from very poor health care infrastructure. Only six blocks viz. Canning-I, Kakdwip, Jaynagar-I, Patharpratima, Mathurapur-I and Mathurpur-II have relatively better health care facilities than rest of Sundarban. The state Government needs to adopt viable policies and programmes and take some immediate actions to improve the health care infrastructure in Sundarban.

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1.   Introduction

Nobody would deny that a healthy community is the infrastructure of building an economically viable society. Sound health is the precondition for human development process to roll on smoothly, irrespective of caste, religion and region. Health is not just the absence of disease. It represents both physical and mental capability to enjoy living. Health care is a social determinant as it influenced by social policies. One of the objectives of eleventh five year plan is to achieve good health for people, especially the poor and the unprivileged. In view of this, the department of Health and Family Welfare has focussed its attention on improving the primary health services by channelizing adequate financial and manpower resources for making the health services more accessible and affordable to the poor people. In fact, after independence of the country, the health infrastructure of Sundarban has expanded manifold, still the physical health infrastructures are inadequate to extend quality health services to all the people.

Health is an integral part of development. The health care as a constitutive element of well-being and yet it has been one of the most neglected aspects of development in India[1]. Just as health status is influenced by the socio-economic factors, similarly health services are shaped by the socio-economic and political factors of any region [2]. Inequality in the distribution of health care facility is a common manifestation of these factors and a general feature of health care system in India. According to Rajeshwari and Sinha [3], the distribution of health care institutions in India is guided by locational preferences. Public health is nothing but, the practice of preventing disease and promoting good health within groups of people, from small communities to entire countries[4].

Sundarban is the southernmost part of West Bengal. It is bounded by the river Hooghly on the west, the Bay of Bengal on the south, Ichamati-Kalindi-Raimangal rivers on the east and the Dampler-Hodges line on the north. In this Ganga Plain delta building process is still very active. This active delta has a network of tidal channels, river creeks and numerous islands. The climate of the area is characterised by an oppressive hot summer, high humidity all through the year and well distributed rainfall during the monsoon season. The region is characterised by developmental constraints in terms of rapidly growing population, lack of appropriate

transportation, modern energy services, adequate health care delivery and education. Figure1 represents location of the study area.
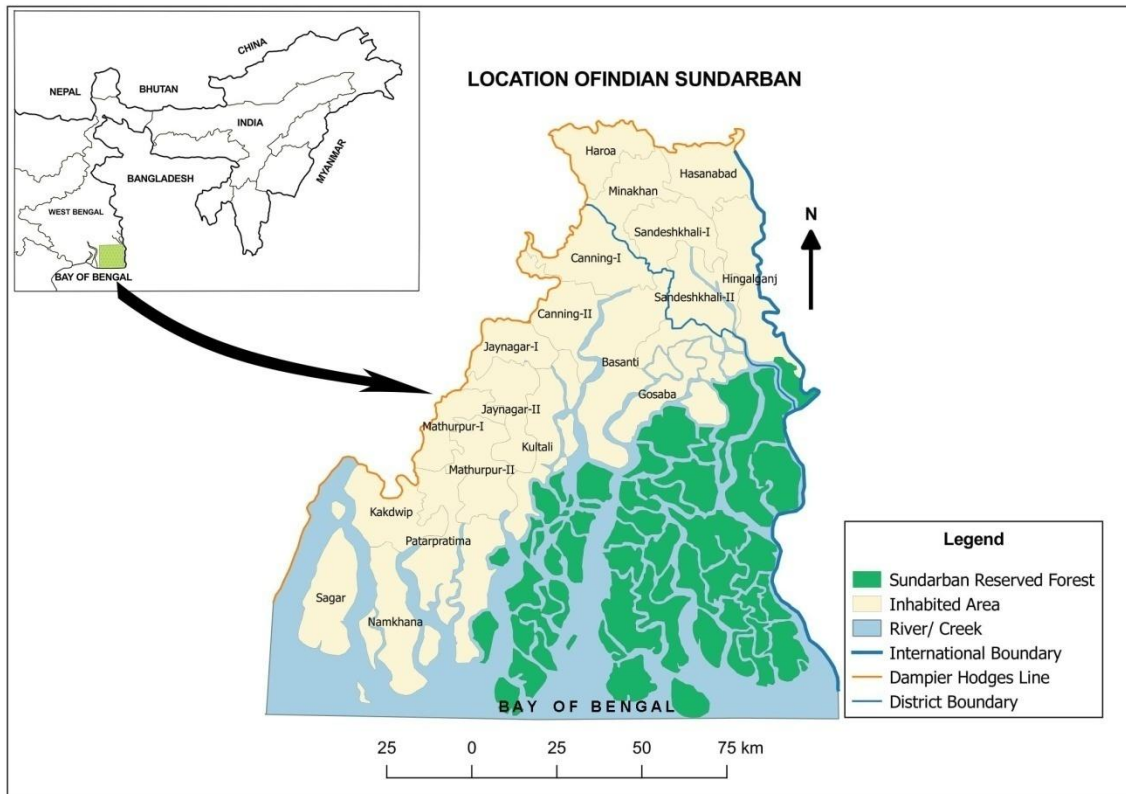
In this context, an attempt is made to examine the spatial distribution and status of health care infrastructure in Sundarban. It is not surprising that there is a tremendous pressure on existing health care system to meet the need of vast population. Hence an assessment of available resources is imperative for proper allocation and efficient utilization of health care services.

1.   Methodology

The present research work is entirely based on secondary sources of data collected from Provisional Census Abstract, 2011 and Bureau of Applied Economics and Statistics, Government of West Bengal, for the year 2011. Infrastructure can be measured either in terms of investment towards a particular service or in terms of physical quantity of the services available to the end users. In this study we have employed twelve indicators (Table I) of physical infrastructure services to construct the Healthcare Infrastructure Index for Sundarban. Table 1 shows the

selected indicators of health care infrastructure of Sundarban. These are grouped in following three categories under different heads:

- Availability of health care facilities

- Performances of public health care centres

- Accessibility to health care facilities

Table 1: Selected indicators of Health care Infrastructure of Sundarban

Availability of health care infrastructure	x^1	Doctor-population Ratio
	x^2	Population served per Primary Health Centre (PHC)
	x^3	Population served per sub-centre
	x^4	Number of Medical institutions per 1,00,000 population
	x^5	Number of beds per 10,000 population
Performances of public health care centres	x^6	Percentage of indoor patients to total indoor patients of Sundarban
	x^7	Percentage of outdoor patients to total outdoor patients of Sundarban
	x^8	Percentage of immunization to total immunization of Sundarban
	x^9	Percentage of institutional delivery to total institutional delivery of Sundarban.
Accessibility to Health care infrastructure	x^{10}	Number of Medical institutions per 100 sq. km.
	x^{11}	Number of sub-centres per 100 square kilometres.
	x^{12}	Percentage of villages with nearest PHC within 5 km (If not available within the village)

Source*:* Computed by authors

In the present work community development blocks have been taken as the unit of the study. The detailed methodology for preparing Healthcare Infrastructure Index (HII) runs as follow:

$$I_{ij} = \frac{X_{ij} - \min_j X_{ij}}{\max_j X_{ij} - \min_j X_{ij}} \ \dots\dots\dots\dots (1)$$

Iij is the infrastructure indicator for the jth block with respect to ith variable and Xij represents the value of the ith infrastructural development indicator in jth block, Minj Xij and Maxj Xij are the minimum and maximum values of X_{ij} respectively. However, if Xij is negatively associated with the status of infrastructural development, equation (1) can be written as:

$$I_{ij} = \frac{\max\limits_{j} X_{ij} - X_{ij}}{\max\limits_{j} X_{ij} - \min\limits_{j} X_{ij}} \ \dots\dots\dots\dots \ (2)$$

To identify the overall development regarding health care infrastructure, Healthcare Infrastructure Index (HII) have been computed. This is done by taking a simple average of the chosen indicators. It may be algebraically expressed as:

$$HII_j = \frac{\sum\limits_{i=1}^{n} I_{ij}}{N}$$

Where, N represents total number of selected indicators for healthcare infrastructure and HIIj denotes the health care infrastructure Index for j[th] block. The high values of HIIj indicate high level of development vice versa.

2.   Results and Analysis

Health infrastructure is the resources needed to deliver the essential public services to the people. Sound health infrastructure ensures efficient and effective utilization of essential public health services. The totality of the public health infrastructure includes all governmental and non-governmental entities that provide public health services to the people.

2.1.   Availability of health care facilities

The doctor-population ratio is perhaps the most important factor affecting the health care facility in an area. Sundarban is lagging behind far in terms of availability of doctors and also there is huge variation in population served per doctor. In 2010-11, population served per doctor in Kakdwip was 7621 while for Harora it was 53600. Table 4 depicts the overall scenario regarding doctor-population ratio in the study area which is frustrating enough.

Since independence India adopted the process of planning all round development of the country including raising the standard of living of the people. In such programmes one of the programmes was that of establishment of Primary Health Centres with three sub-centres and four to six beds per Primary Health Centre in community development block[6]. Primary Health Centres (PHCs) are the most important peripheral health service institutions. Unfortunately, not a

single block has been found where less than 30,000 persons are served by one PHC. In contrast, there are four blocks namely, Canning-I & II, Kakdwip and Jaynagar-I where population served per PHC is more than four times than the existing norm. Out of nineteen blocks there are seventeen blocks where the average number of people served by one PHC is more than 50,000 Table 2 reflects very poor condition of the supply side of health care system in the Sundarban.

Table 2: Population-PHC Ratio in the Blocks of Sundarban (2010-11)

Size of population served per PHC	Name of the Blocks
30,000 or less	
30,000- 50,000	Hinjaiganj,Namkhana
50,000-70,000	Hasanabad, Sandeshkhali-I, Kultali
70,000-90,000	Harora, Sandeshkhali-II, Basanti, Gosaba, Sagar, Patharpratima, Jaynagar-II, Mathurpur-II
90,000 or more	Mathurpur-I, Canning-I & II, Jaynagar-I,Kakdwip , Minakhan

Note: The national norm is one PHC for every 30,000 population in plain areas and for 20,000 population in tribal, hilly and backward areas.

Source: Computed from District Statistical Handbook of North and South 24 Paraganas, 2011.

In Sandeshkhali-I & II, Gosaba, Namkhana and Mathurpur-II, one sub-centre provides services 4000 to 5000 persons which is much higher than the existing norm of 3000 population. However it is evident from Table 3 that there are three blocks which are close to the norm of its provision. The average population served by one sub-centre in Sundarban is 5321.

Table 3: Population-Sub-centre Ratio in the Blocks of Sundarban (2010-11)

Size of population served per Sub-centre	Name of the Blocks
5000 or less	Sandeshkhali-I & II, Gosaba, Namkhana and Mathurpur-II
5000-6000	Basanti, Sagar, Patharpratima, Jaynagar-I & II, Mathurpur-I, Canning-I & II, Kakdwip , Minakhan, Hinjaiganj, Kultali
6000-7000	Hasanabad
7000 or more	Harora,

Note*:* The national norm is one sub-centre for every 5000 population in plain areas and for 3000 population in tribal, hilly and backward areas.

Source*:* Computed from District Statistical Handbook of North and South 24 Paraganas, 2011

In the present analysis medical institutions include medical colleges, district and sub-divisional hospitals, rural hospitals, PHCs, private medical institutions and those run by NGOs etc. It does not include sub-centres as they provide only minor health care facilities. The availability of medical institutions is measured in terms of number of medical institutions per 1, 00,000 population. It is highest in Mathurpur-II (5.0) followed by kakdwip (3.9). Canning-II is the most poorly served block where 1, 00,000 persons are served by less than one medical institution.

Population served per bed is an important indicator of health indicator. Total number of available beds in Sundarban is 1296 (2011). On an average, one bed served 3415 person in a year during 2010 - 11. The availability of beds in medical institutions is measured in terms of beds per 10,000 population. In Sundarban, it is highest in Kakdwip and lowest in Hasanabad. Table 4 highlights that there are twelve block where number of beds serving 10,000 persons is less than just three. So, it is quite evident that regarding population-bed ratio, the circumstances of study area is miserable.

Table 4: Health care infrastructures and Health care Infrastructure Index (HII) of Sundarban

Blocks of Sundarban	Availability of health care Infrastructure					Performances of public health care centres				Accessibility to healthcare centres		
	x^1	x^2	x^3	x^4	x^5	x^6	x^7	x^8	x^9	x^{10}	x^{11}	x^{12}
Haroa	53600	71467	7393	1.4	1.3	5.0	4.7	8.0	4.9	2.0	19.0	12.2
Minakhan	28441	99542	5105	1.5	2.1	3.0	4.9	4.5	4.4	1.9	24.6	30.7
Hasnabad	22585	67754	6159	2.0	0.9	0.9	0.9	1.2	5.0	2.6	21.6	18.9
Hingalganj	34909	43636	5455	2.3	1.4	1.7	1.1	1.6	2.9	1.7	13.4	27.3
Sandeshkhali -I	41116	54822	4699	1.8	1.4	2.2	5.5	7.4	3.5	1.6	19.2	6.7
Sandeshkhali -II	32195	80488	4599	1.9	2.2	1.6	1.5	2.2	3.3	1.5	17.7	45.8
Canning-I	12189	304724	5442	3.0	3.9	17.0	16.5	11.2	8.0	4.8	29.8	4.9

Canning-II	42087	126262	5612	0.8	1.6	2.2	4.5	1.6	7.1	0.9	20.9	6.8
Basanti	30611	84179	5345	2.4	2.3	2.3	2.3	2.1	8.0	2.0	15.6	24.6
Gosaba	49320	82199	4835	1.6	2.1	2.1	4.6	1.7	4.3	1.3	17.2	4.9
Kakdwip	7621	140982	5222	3.9	7.0	15.7	6.4	13.4	5.8	4.4	21.4	9.5
Namkhana	14064	36566	4941	3.8	3.9	5.1	1.1	3.6	3.8	1.9	10.0	18.9
Sagar	17670	70679	5049	2.4	3.9	6.7	6.2	6.7	4.5	1.8	14.9	16.5
Patharpratima	22122	82956	5105	3.6	3.0	3.4	6.0	5.4	7.7	2.5	13.4	33.3
Jaynagar-I	20242	131576	5263	3.0	2.7	5.6	6.2	9.5	5.6	6.1	38.2	18.0
Jaynagar-II	25216	84055	5365	2.0	2.3	4.7	8.8	3.3	6.4	2.7	25.2	1.7
Kultali	22905	57263	5327	3.1	2.7	5.2	9.2	3.6	5.7	2.3	14.0	7.7
Mathurapur-I	16259	97552	5273	2.1	4.2	6.8	6.9	5.5	4.1	2.7	25.1	28.4
Mathurapur-II	9202	73613	4908	5.0	5.2	8.9	2.7	7.5	5.0	4.8	19.8	1.7

Performance of hospitals, PHCs and sub-centres

To measure the performances of public health care system, we have identified four indicators which are illustrated in Table1. The performance of any health care unit can be denoted by the relative population pressure in the concerned unit. The numerical figures regarding performances of public healthcare centres are expressed in terms of the percentage.

The clinical attendance of patients and the use of medical facilities is another important indicator which reflects the utilization of public health services. The clinical attendance of patients has been analysed in terms of indoor and outdoor patients. In case of the treatment of indoor and outdoor patients, Canning-I and Kakdwip have able to manage a satisfactory position. Both blocks have served more than 32 percentages of indoor patients to total indoor patients of Sundarban. Canning- I have still contributed a good effort to serve the outdoor patients and Jaynagar-II also plays major role in this context. In respect of indoor and outdoor admission of patients Hasanabad stands in lowest position.

Women throughout the world play critical role in economic growth and development and their contribution have an impact on households, communities and national economies[7]. Poor health

has repercussion not only for women but also their families. Women in poor heath are more likely to give birth to low weight infants. They also are less likely to be able to provide food and adequate care for their children[8]. One important indicator of safe motherhood at the district level is the extent of institutional delivery**.** In respect of institutional delivery Horoa, Kakdwip, Canning-I, Jaynagar-I have achieved a considerable success in recent years. Though, the overall performance of Sundarban is far behind the target of 100% institutional delivery. Moreover, there are substantial variations in the extent of institutional delivery across the blocks. In Sundarban, the block Kakdwip occupies first rank with 13.4% institutional delivery to total institutional delivery of Sundarban, while Hasanabad is in lowest position with only 1.2% institutional delivery to total institutional delivery of the study area.

Immunization programme aims to reduce mortality and morbidity due to vaccine preventable diseases. Since ancient era emphasis has been given to the preventive aspect of health and it is well known that the prevention is better than cure[9]. Universal Immunization Programme (UIP) was launched in India 1985 to control diseases like measles, diphtheria, and tetanus and childhood tuberculosis[10].The analysis reveals wide differences in level and distribution of childhood immunization within blocks of Sundarban. In immunizing the child, favourable achievement is observed in Canning-I and Basanti block. Other good performing blocks are Canning II, Patharpratima and Hinjalganj found to be worst performing block.

2.2.   Accessibility of health care infrastructure

The provision of accessibility to health facility can ensure better health condition of the inhabitants. Table 5 reveals that Jaynagar-I ranks first with relatively high number of medical institutions per100 sq.km. Here one medical institution serves 16 sq.km. Canning-I and Mathurpur-II occupy second and third positions respectively where one medical institution serves 20.87 sq.km and 20. 67 sq.km respectively. In all other blocks the number of medical institutions per 100 sq.km is less than four and in Sandeshkhali-II and Canning-II the number is reduced to 1.5 per 100 sq.km and 0.9 per 100 sq.km.

Though sub centres are provide only minor health care facilities but it is very important to the rural poor. Jaynagar-I has higher accessibility to sub-centre as it located here at 2.6 sq.km apart from each other, while 10sq.km is the highest spacing has recorded in Namkhana.

In our country provision for comprehensive health care starts from the PHCs. In case of the accessibility of PHC within 5 km from village, the situation is satisfactory in Minakhan, Sandeshkhali-II, Hinjalganj, Patharpratima and Mathurpur-I where more than 25% villages have greater accessibility to PHCs. The numbers of PHCs have to be increased substantially in Jaynagar-II and Mathurpur-II.

2.3.   Kendall's Coefficient of Concordance (W) to study the degree of association among parameters

Kendall's coefficient of concordance (W) has been used to determine the degree of association among several parameters (k), of 19 blocks (N) of Sundarban. Value of Kendall's coefficient of concordance (W) is 0.2479. As, N (i.e. number of objects) is larger than 7, value of chi-square (x^2) has been procured to determine the significance of W. Table value of x^2 at 5% level for (N-1= 19-1=18) 18 degrees of freedom is 28.869 but the calculated value of x^2 is 53.546 and this is considerably higher than the table value. Twelve sets of ranking of selected parameters are calculated which is elaborated in Table 5. This rejects the null hypothesis that twelve sets of ranking of selected parameters are independent and accepts the alternative hypothesis of significance agreement of twelve sets of ranking.

Table 5: Block wise Rank for Health care Infrastructures and HII of Sundarban

Blocks of Sundarban	x^1	x^2	x^3	x^4	x^5	x^6	x^7	x^8	x^9	x^{10}	x^{11}	x^{12}	Health care Infrastructure Index(HII)	Rank
Haroa	19	7	19	18	18	9	11	4	11	10	11	11	0.274	18
Minakhan	12	15	7.5	17	13.5	12	10	10	13	12.5	5	3	0.401	12
Hasnabad	9	5	18	12.5	19	19	19	19	9.5	7	6	7.5	0.319	15
Hingalganj	15	2	16	10	16	17	17.5	17.5	19	15	17.5	5	0.289	16
Sandeshkhali-I	16	3	2	15	17	14.5	9	6	17	16	10	15	0.339	14

Sandeshkhali-II	14	9	1	14	11.5	18	16	14	18	17	12	1	0.368	13
Canning-I	3	19	15	6.5	5.5	1	1	2	1.5	2.5	2	16.5	0.663	2
Canning-II	17	16	17	19	15	14.5	13	17.5	4	19	8	14	0.278	17
Basanti	13	13	13	8.5	10	13	15	15	1.5	11	14	6	0.404	11
Gosaba	18	10	3	16	13.5	16	12	16	14	18	13	16.5	0.271	19
Kakdwip	1	18	9	2	1	2	5	1	6	4	7	12	0.685	1
Namkhana	4	1	5	3	4	8	17.5	11.5	16	12.5	19	7.5	0.432	9
Sagar	6	6	6	8.5	5.5	5	6.5	7	12	14	15	10	0.460	7
Patharpratima	8	11	7.5	4	7	11	8	9	3	8	17.5	2	0.521	5
Jaynagar-I	7	17	10	6.5	8.5	6	6.5	3	8	1	1	9	0.597	3
Jaynagar-II	11	12	14	12.5	11.5	10	3	13	5	5.5	3	18.5	0.430	10
Kultali	10	4	12	5	8.5	7	2	11.5	7	9	16	13	0.439	8
Mathurapur-I	5	14	11	11	3	4	4	8	15	5.5	4	4	0.501	6
Mathurapur-II	2	8	4	1	2	3	14	5	9.5	2.5	9	18.5	0.588	4

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2.4. Overall scenario of health care infrastructure in Sundarban

After a detail analysis of the aforesaid parameters, Health care Infrastructure Index (HII) for each community development blocks have been worked out to perceive the status of health care facilities in different blocks of Sundarban. Table 6 represents the Health care Infrastructure Index (HII) for Sundarban.This would enable us to identify the gaps in infrastructure development in healthcare facilities at the inter block level in Sundarban and also help to make suggestions for appropriate policy interventions for achieving balanced infrastructure development in this area.

There is a wide range of regional variations in levels of health care development among the blocks of Sundarban. So far, Kakdwip with the Composite Index 0.685 is at best position in providing health care services to its common people. It is followed by Canning-I, Jaynagar-I, Mathurpur-II having the rank of 2nd, 3rd and 4th respectively. On the contrary, the conditions of Canning-II, Haroa and Gosaba are very poor in health care services. The situation of Gosaba in health care services is really alarming. Table 7 portrays the overall scenario regarding health care infrastructure of Sundarban.

This level of variation in health care infrastructure may be arranged into five grades i.e. very high (above 0.6), high (0.5 to 0.6), moderate (0.4 to 0.5), low (0.3 to 0.4) and very low (below 0.3). Table 6 depicts the imbalances in the level of health care infrastructural development in

Sundarban. In this region, two blocks (10.5%) have able to achieve relatively advantageous position and just four blocks (Jaynagar-I, Patharpratima, Mathurapur-I, Mathurapur-II) have performed well in health care infrastructure. Out of nineteen blocks of Sunarban seven blocks (36.8%) reflect low level of heath care infrastructure. The Sundarban is geographically a remote area, criss-crossed by the rivers. Poor transport and communication network, lack of conventional electricity supply and scarcity of potable water are major problem of this region along with natural calamity like cyclones and storm surges. Apart from the indifferent attitude of the government, the above mentioned problems are associated with poor development of health care infrastructure in this region[11].

Table 6: Levels of Development in Health care Infrastructure in Sundarban

Levels of Healthcare Infrastructure	Indices	Number of Blocks	Name of the Blocks
Very High	>0.6	2 (10.5)	Canning-I, Kakdwip
High	0.5 to 0.6	4 (21)	Jaynagar-I, Patharpratima, Mathurapur-I Mathurapur-II
Medium	0.4 to 0.5	6 (31.7)	Namkhana, Basanti, Sagar, Jaynagar-II, Kultali, Minakhan
Low	0.3 to 0.4	3 (15.8)	, Hasanabad, Sandeshkhali-I & II
Very Low	<0.3	4 (21)	Hinjaiganj, , Canning-II, Haroa, Gosaba

Note: Figures in parenthesis indicate % to total number of blocks.

3. Conclusion

Health and nutrition are intimately and intricately connected. It must be noted that only institutions do not constitute a compressive health care system but it includes certain other elements, like the system of nutrition, provision of uncontaminated drinking water and healthy living environment. The present study only focuses on the infrastructural facilities of health care system of Sundarban. Nevertheless, this study provides valuable information on recent health care situation of Sundarban.

It focuses on the extreme shortages of health care institutions and manpower in the public health system. As majority of people in Sundarban depend on public health care system, the most important thing is to recruit the required number of doctors and staffs in the public health institutions. Government should open up new teaching hospitals to increase the number of doctors. It may be useful to encourage the non-allopathic system of medicine as large number of people, particularly in rural areas, depends on traditional system of medicine. The ongoing efforts of the government to build up private-public partnership and involve the panchayats more effectively in the participatory management of health services are expected to ensure better health care services.

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