ACCESSIBILITY AND ROLE OF ICT IN THE HEALTH CARE SERVICES OF INDIA

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Abstract— Health is the most important indicators of quality of human life. On the contrary, the recent growing COVID19 pandemic becomes extremely dreadful for the world. In this case, it becomes highly necessary to check prevailing healthcare services in the country. In the delivery of health services, both government and private sectors plays most important role. In the developing countries like India, the health care service delivery hardly reaches to every recess and corner of the country. As per WHO report (2014), India stood 141 rank out of 190 countries in terms of Health Expenditure per Capita. This indicates that India has very poor health infrastructure. Even, India's public expenditure on health sector just 1.6% of GDP which is very low as compared to other countries. On the other hand, most of the people face hurdle in the access to health care services. So, what are the indicators that affect the accessibility of health care sectors in a country? How health care services can be provided in a best possible way? Is there any disparity either between rural and urban health care services or public and private health care services? Does this become impediment in the delivery of healthcare services? What role ICT plays in this case? All these remained research questions of this paper. This study tries to examine the indicators affecting the accessibility of health care facility. For this, the study uses the logistic regression model to determine the indicators affecting the accessibility of Health Care Facility.

Keywords— Health Care Services, ICT, Accessibilty

1   INTRODUCTION

Accessibility refers to the ability to access. WHO divided the term accessibility in health into three parts i.e. Physical accessibility, Economic accessibility or affordability and Information accessibility. Physical accessibility means the availability of good health services within reasonable reach of those who need them and of opening hours, appointment systems and other aspects of service organization and delivery that allow people to obtain the services when they need them. Similarly, Economic efficiency or affordability is a measure of people's ability to pay for services without financial hardship. Further, Information accessibility includes the right to seek, receive and impart information and ideas concerning health issues (WHO Report).

Health and human resource development are the essential components of the overall socio-economic development of a country. Health is the most important indicators of quality of human life. Equity, along with inter-sectoral co-ordination, community participation and appropriate technology has been described as the principles and pillars of primary health care (Ramraj Balaji and et al, 2016). Health of the citizens of the country affects the productivity of the labour force. Therefore, the performance of hospitals has a significant effect on the well-being of individuals. As more and more resources are allocated and spent on medical services, health policy authorities are becoming concerned about the performance of medical services (Hu et al., 2012). Besides this, health is considered as a fundamental right in many countries. The governments of different countries are striving to expand and improve their health care services. Health care for the prevention and promotion of health is one of the basic necessities for human life, as declared in the Universal Declaration of Human Rights (Article 25). This implies that government is responsible for facilitating health care services to its people and this becomes necessary for providing health services. It is fully realized that the best way to provide health care to the vast majority of underserved rural people and urban poor is to develop effective primary health care services supported by appropriate referral system.

In most developing countries such as India, utilization of basic health services is lagging behind even though there has been increasing public and private expenditure on the health care services. Increasing demand of primary health care along with the growth of population is a big challenge to the government of India. In the developing countries like India, the health care service delivery hardly reaches to every recess and corner of the country. Besides, utilization of basic health services has remained poor even though there has been increasing public and private expenditure on the provision of advanced health care. As per WHO report (2014), India stood 141 ranked out of 190 countries in terms of Health Expenditure per Capita.

Access to health care is an important component of overall health system and has a direct impact on the burden of disease. Accessibility of Primary Health care is influenced by various indicators. Moreover, Effective implementation of information and communication technologies can make health care services more accessible to all the sections of the society.

On the other hand, more than 65.97% people live in rural areas (UN, 2018). But health infrastructure in very poor in rural and so is the accessibility to health care services. How to tackle these becomes a big challenge. In the country, the key infrastructures for delivery of primary health care are PHC's, CHE's and SC's. So far very little research has been carried out in India on accessibility of primary health service.

The government of India has taken numerous steps to increase the accessibility of primary health service to improve health outcomes in the states. Still, country lacks in health care infrastructure and it hinders in the accessibility to the health care.

Moreover, Information Technology (IT) has the potential to improve the quality, safety, and efficiency of healthcare (Sampada S. Gulavani and et al, 2010). So, can effective implementation of information and communication technologies make health care services more accessible to all the sections of the society? What role ICT plays in this? How far India has come in the implementation of ICT to the health sector? These are the questions to be answered.

2 REVIEW OF LITERATURE

A faizi (1996) studied availability, accessibility, utilization and location of future primary health centre in Madhubani district of Bihar. According to him utilization of service have address the issue line availability, affordability, family characteristics (age, sex, family size), social structure (employment status of family heads, occupation, education, ethnicity, and culture).

Simon (2007) opines that accessibility of health service depends on availability, affordability, and acceptability of that service and these factors are influenced by caste, place of stridence, monthly per capita consumption expenditure, socio-economic states etc.

Oliver and Mossialos (2004) find that factors of accessibility can be grouped into three groups: - (i) Availability (ii) Acceptability and affordability (socio-economic-ethnicity, religion, gender, age, caste) and (iii) Geographical factors. GIS research in the health care field focuses on methodological development of geographic accessibility to maximize the access to healthcare (Higgs, 2004). Geographical information system (GIS) research emphasizes the spatial dimension i.e. accessibility (McLafferty, 2003).

Sampada S. Gulavani and et al, (2010) studied that IT enable doctors, paramedics, patients, insurers and regulators everywhere to become aware of new information quickly. A remarkable feature of IT is its capacity to establish and disseminate publicly accessible global databases of prices of healthcare commodities and services.

3 OBJECTIVES

The present study is based on the following objectives follows:
1. To study the present status of Health Care Services in India.
2. To investigate the various factors determining accessibility of health care service.
3. To study the role of ICT in health service delivery

4 METHODOLOGY

Data Source and Sampling Technique

This study is based on both the primary and secondary data. The secondary data has been collected from NITI AYOG Report, NSSO Report, World Bank report. The primary data has been collected from the Sonitpur district of India. The data has been collected with the help of well structured questionnaires, which were prepared keeping in mind the objective of the study. The sample has been selected using a multi-stage design. Dhekiajuli development block from the sonitpur district have been chosen for field study mainly on the basis of highest proportion of rural population. From the block, 2 gaon panchayat (GP) have been selected purposively. Next stage is to select the village from the GP 25 percent of village has been selected from the two GP on the basis of highest proportion of rural population. Four villages have been selected. Finally, 10% households from each of the selected villages are randomly selected. The total sample size of the study is 120 households. In this study, all the respondents who go to public or private hospital are categorized in "using the PHC" however, the respondent who used to take medicines from Pharmacy without Doctors' advice and do not go to any medical institution are categorized into "not using PHC".

5 RESEARCH QUESTION

This study is based on the following research questions-
1. What are the indicators that affect the accessibility of health care sectors in a country?
2. Is there any disparity either between rural and urban health care services or public and private health care services?
3. What role ICT plays in this case?

6 CONCEPTUAL FRAMEWORK

This paper tries to analyze the indicators that determine people's willingness to use health care service. In such situation where many factors may be responsible, so econometric techniques have been used to determine the relative strength of the various determinants. The variables have been selected in the context of existing literature. This has been done for find out proper justification for the selected variables.

Caste: Caste is an important determinant in deciding a health status of the society. Iyre (2005) discussed the influence of caste, class, and gender over treatment seeking decision for short-term and long-term sickness. The study found how class-based inequalities were more sharply defined than caste-based equalities.

Household size: Selwyn (1978) considered family size as a factor in utilization of health care service and found a positive relation among the two variables. On the hand, Wong et at (1987) examine the relationship between household size and utilization of health service, he found that consumption needs are more in large families and they may face resource constraint which act as a retarding factor of health service utilization.

Monthly per capita consumption expenditure (MPCE): MPCE is taken as the proxy for the income level of households. A very high correlation is seen between MPCE and access to health service. Households with higher consumption expenditure can enjoy a better standard of living. Higher purchasing power on the part of the household reflects better access to health service. Adler and Newman (2002) have showed a linked between the distributions of income within countries and states with rate of mortality. Su. Et. Al (2006) determined the factors responsible for household health care expenditure and determined the key determinants of health expenditure were economics status, household health care utilization especially for modern medical care, illness episodes and presence of a member with chronic illness.

Occupation: Occupation gives identity to an individual. Repetti et al. (1989) reviewed empirical evidence concerning about the effects of variations in employment on women's mental and physical health.

Distance and communication: In a study in Ghana by sulemana & Diney (2014) found that physical accessibility in terms of lack of good communication facility inhabiting access to health facility. On the other hand Mattson (2010) finding differs from those of other studies that have found a negative relationship between distance and health care use.

7 FINDINGS AND DISCUSSION

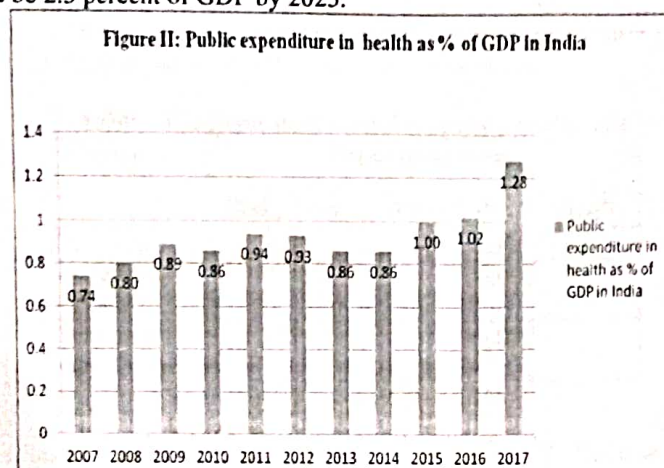## A. Present status of Health Care in India

The health care system in India follows universal health care coverage. India's Ministry of Health was established from the very beginning with the independence in 1947. In India, State government administrated the Health Care System and Indian Constitution emphasizes each state for providing health care services to its people. The National Health Policy was approved by Parliament in 1983 and the policy announces universal health care coverage by 2000, and the program was updated in 2002. The government has made health a priority in its series of five-year plans and could not achieve its target for universal health coverage. India's healthcare infrastructure is so developed to meet the burden of disease. India has just 90 beds per 100,000 populations against a world average of 270 beds. India also has just 60 doctors per 100,000 population and 130 nurses per 100,000 populations against world averages of 140 and 280 respectively. This is because of the fact that the percentage share of GDP in health sector is very low in comparison to other countries.
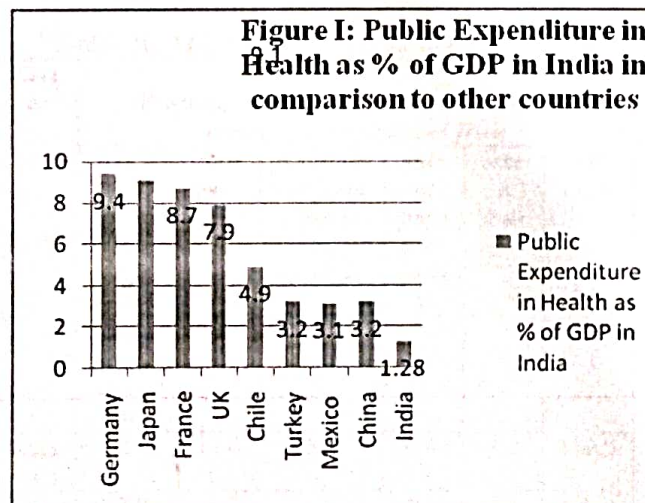
Figure I: Public Expenditure in Health as % of GDP in India in comparison to other countries

Source: ICHSS Team analysis based on World Bank data from: https://data.worldbank.org/indicator/SH.XPD.GHED.GD.ZS

The public expenditure in health as percentage of GDP in India in 2017-18 was just 1.28% which is very low in such a huge populated country as compared to the other countries like Germany with 9.4%, Japan (9.1%), France (8.7%), UK (7.9), Chile (4.9%), Turkey (3.2%), Mexico (3.1%), China (3.2%). Besides this, the public expenditure in health as percentage of GDP in India is more or less confined to 1% from 2007 to 2017 as shown in the table – II. As per the economic survey of India, the government expenditure on health is just 1.6% of GDP in 2019-20 and 1.5% in 2018-19. According to the National Health Policy – 2017, the health expenditure by government should be 2.5 percent of GDP by 2025.

Source: ICHSS Team analysis based on World Bank data from: https://data.worldbank.org/indicator/SH.XPD.GHED.GD.ZS

Access to healthcare depends on how the people finance in the health ailment treatments . India has the most privatized health sector in the world. This is the cause that a large part of population is still living either below poverty line or at subsistence level. Therefore, government should be the dominant player in both financing and delivering health care services to form equality in access to healthcare. But, according to NSSO report 2017-18, percentage of hospitalization cases where large part of expenses were financed from household income or past saving i.e. out of pocket expenditure is higher as compared to other sources. Out of pocket expenditure was 79.5% for rural areas and 83.7% for urban areas as shown on the table II. Even, as per the National Health Accounts (NHA) 2016-17 data, the out of pocket expenditure (OoPE) has declined from 64.2 percent in 2013-14 to 58.7 per cent in 2016-17. So, out of pocket expenditure is one of the biggest causes of people falling into poverty. Out-of-pocket expenditure on healthcare as a method of financing is both regressive and iniquitous, especially for poorer households.

The government has come to a long way in the reduction of Out of Pocket Expenditure by combination of policy initiatives that includes launching Ayushman Bharat and price controls of medications. Through Ayushman Bharat, the government targeted to cover half to provide health cover to 10.74 crore poor and vulnerable families upto 5 lakh per family per year for secondary and tertiary hospitalisation.

Table - II: Major source of finance of expenses in India

Sector	Percentage of hospitalisation cases where expenses were financed from					
	household income/savings/out of pocket expenditure	Borrowings	contribution from friends & relatives	sale of physical assets	other sources	all sources
Rural	79.5	13.4	3.4	0.4	3.2	100.0
Urban	83.7	8.5	3.8	0.4	3.4	100.0

Source: NSSO Report, 2017-18

Healthcare should be the basic right of every citizen but India has insufficient quality infrastructure, dearth of qualified medical functionaries, and not accessible to basic medicines and medical facilities. More than 70% population of India lives in rural areas where the health care is in distressful condition. Keeping in view this gloomy picture of Indian health care, there is an urgent need of new practices and procedures to ensure that quality and timely healthcare reaches the deprived areas of the Indian villages.

The health care system in India, at present has a three tier structure to provide health care service to the vast majority of rural people. The primary tier comprises three types of health care institutions i.e. Sub Centre (SC), Primary Health Centre (PHC) and Community Health Centre (1CHC) and it is based on following population norms.

Table - III: Population norm for primary health care

Centre	Population norm	
	Plain Area	Hilly/Tribal/Difficult
Sub Centre	5000	3,000
Primary Health Centre	30,000	20,000
Community Health Centre	1,20,000	80,000

Source: RHS report, (2014-2015)

There were 1, 56,231 Sub Centres functioning in the country as on 31st March, 2017. There were 25,650 PHCs functioning in the country as on 31st March, 2017. At the national level, there is an increase of 2414 PHCs by 2017 as compared to that existed in 2005. The allopathic doctors at PHCs have increased from 20308 in 2005 to 27124 in 2017, which is around 33.6% increase. There is 11.8% Shortage of allopathic doctors in PHCs according to the requirement for existing infrastructure. As on 31st March, 2017, there were 5,624 CHCs functioning in the country.

National Urban Health Mission (NUHM) is a sub-mission under an overarching National Health Mission (NHM) for providing equitable and quality primary health care services to the urban population. NUHM targets to improve the health status by facilitating their access to quality primary healthcare. NUHM covers all the cities and towns with more than 50000 population and district and state headquarters with more than 30000 populations. The health care infrastructure in urban areas consists of the Community Health Centres and Primary Health Centres. Population norms for urban health infrastructure
- Community Health Centres - 2,50,000 population (5 Lakh for metros)
- Primary Health Centres - 50,000 population

As on 31st March 2019, there are 5190 U-PHCs are functional in the country. Out of these U-PHCs a total of 1734 PHCs has been upgraded as HWCs. There is about 44.4% shortage of U-PHCs as per the urban population norms. About 70% of UPHCs are located in the government buildings, 27% located in the rented buildings and 3% are located in the rent free buildings. As on 31st March 2019, 350 U-CHCs are in operation in the urban areas of India. About 96% of U-CHCs are located in government buildings and 4% in rented buildings.

There are 4457 Doctors, 3549 Pharmacists, 1933 Lab Technicians and 5938 Staff nurses available at U-PHCs. At U-PHC level shortfall has been observed in all the posts. There is a shortfall of 44.3% ANMs at PHCs & 57 SCs. There is a shortfall of 16.7% of Doctors, 24.3% of Pharmacists, 50.9% of Lab Technicians and 22.2% of Staff nurses at U-PHCs [1].

Disparities in healthcare services have been seen in rural and urban areas and in public and private healthcare services. The rural-urban health care disparities in India are often attributed to urban bias in allocation of resources and location of health-care services. Therefore, the bed population ratio is higher in urban areas and that those regional inequalities have not seen any significant decline over time. Due to lack of adequate health coverage in health care system in India, many people choose to go to private health care providers, although, this is inaccessible to the poor. But if we see the percentage share of hospitalization cases, the private hospitals plays major role which handle 55.3% cases of hospitalization both in rural and urban areas of India. On the contrary, government hospitals handle only 42% cases. Further, in urban areas, government hospitals handle only 35.3% of hospitalization cases while private hospitals handle 61.4% cases of hospitalization.

Table - IV: Percentage share of hospitalization cases in India

Types of Hospital	Percentage share of hospitalization cases		
	Rural	Urban	Total (Rural + Urban)
Government/Public Hospital	45.7	35.3	42.0
Private Hospital	51.9	61.4	55.3
Charitable/trust t/NGO-run hospital	2.4	3.3	2.7
All	100	100	100

Source: RHS report, (2014-2015)

Public Health Expenditure is an important indicators of the health status of the population and higher public health expenditure is generally associated with better health outcomes (Barenberg et al., 2015) (Deolalikar et al., 2008). Disparities in the delivery of health services are also seen in India across different states. Disparity in health prevails in India due to uneven distribution of health infrastructure across Indian States.As per the Report 2019 of NITI Ayog, Kerela performs best and Uttar Pradesh performs worst in NITI Ayog's Health Index. Punjab performs second best on health, while Tamil Nadu and Gujarat secure the third and fourth. Odisha, Bihar and Rajasthan secure the bottom three positions. Table IV interprets the percentage share of government hospitals in hospitalization cases. In many states, government hospitals plays major role for exam in Assam 76.7% hospitalization cases are handled by government hospitals in rural areas, similarly it is 75.1% in Odisha, 74.1% in West Bengal, 59.6% in Chhattisgarh, 56.9% in Tamil Nadu and 50.8% in Rajasthan. O the other hand, the majority of hospitalization cases are handled by Private hospitals. Less public expenditure in health care leads to inequality and burden among the poor who cannot afford their health expenses.

Table - V: Percentage share of government hospitals in the major States

States	Percentage share of govt. hospitals in hospitalization cases	
	Rural	Urban
Assam	76.7	47.7
Odisha	75.1	55.5
West Bengal	74.1	58.9
Chhattisgarh	59.6	37.6
Tamil Nadu	56.9	42.2
Rajasthan	50.8	49.7
Madhta Pradesh	48.3	46.8
Jharkhand	43.2	36.8
Gujrat	40.1	21.3
Kerala	40.0	35.8
Bihar	38.5	32.4
Haryana	37.1	20.3
Karnataka	32.3	17.1
Punjab	29.4	29.3
Uttar Pradesh	28.4	24.1
Andhra Pradesh	25.8	31.7
Maharastra	25.7	17.9
Telengana	24.0	17.3

Source: NSSO Report, 2017-18

An average household medical expenditure per hospitalization cases, excluding childbirth, at private hospitals was 7 times more expensive than that of government hospitals in India. In the government hospital the average medical expenditure is 4,452 Rs (in

rural area, it is 4,290 Rs and in urban areas it is 4,452 Rs), while it is 31,845 Rs in private hospital (27,347 Rs in rural areas and 38,822 Rs in urban areas). This indicates average expenditure per hospitalization is very high in private hospitals.

Table - VI: Average Medical Expenditure per hospitalization cases

Type of Hospital	average medical expenditure (Rs.) per case		
	Rural	Urban	Total (Rural + Urban)
Government/public	4,290	4,837	4,452
Private	27,347	38,822	31,845
all (incl. charitable/ NGO/trust-run)	16,676	26,475	20,135

Source: NSSO Report, 2017-18

One of the most important factors that have significant accessibility of health care service is average medical expenditure either for hospitalization or non-hospitalized cases. Table VII interprets that there is significant difference in the components of medical expenditure either by rural-urban or by private-public. Table VI reveals that expenditure in various medical components is high in Private hospitals as compared to public or government hospital. For example if we compare the doctor's fees then it is 197 Rs in government hospitals and 6,280 Rs in Private hospitals in urban areas. On other hand, it costs 172 Rs in government hospitals and 5,340 Rs in Private hospitals in rural areas. As doctor's fee is primary fee for ailment treatment but there others too.

Table VII: average medical expenditure in Rs for hospitalization

Component of Medical expenditure	Average medical expenses (Rs.) during hospital in			
	Public Hospital		Private hospital	
	Rural	Urban	Rural	Urban
Package component	427	867	6,631	15,380
Doctor's/surgeon's fee	172	197	5,340	6,280
Medicines	2,220	2,100	6,818	7,035
Diagnostic Test	800	770	2,802	3,403
Bed Chareges	118	152	3,377	4,176
Others	553	752	2,379	2,544
Total	4,290	4,837	27,347	38,822

Source: NSSO Report, 2017-18

Table VII shows about the expenditure on treatment of ailments not involving hospitalization cases. It is seen that even if government hospitals cost very low price in healthcare service, there is not so much disparities among different hospitals in case of treatment of non-hospitalization. Average medical expenditure on treatment of ailments is just 325Rs in rural and 344 Rs in urban areas in government hospital as against private hospital, it is very high 1,081 Rs in rural and 1,038 Rs in urban areas. Except private hospital, average medical treatment expenditure is not so much difference to the government hospital expenditures.

Table - VIII: Expenditure on treatment of ailments not involving hospitalization

Sector	Average medical expenditure per treated ailment by healthcare service provider				
	Govt./ Public Hospital	Private Hospital	Trust /NGO-Run	Private doctor/clinic	informal healthcare	All

			hospital	ic	providers	
Rural	325	1,081	624	566	487	592
Urban	344	1,038	863	414	1,035	710
All	331	1,062	732	624	552	636

Source: NSSO Report, 2017-18

Health insurance is an insurance plan in healthcare that offers financial coverage for medical expenses when the policyholder is hospitalized. Health insurance seeks to attain several desirable objectives, including increasing access to healthcare services, reducing the risk of catastrophic healthcare expenditures, and improving health outcomes (D Erlangga, 2019. Increased in health insurance coverage generally results in the increase access to health care facilities, improves financial protection and improve health status. Table VI shows that percentage of persons not covered in health is quite high in India for example 85.9% people in rural and 80.9% people in urban areas are not covered in health insurance. On the contrary, 14.1% people in rural areas and 19.1% people in urban areas are protected by health insurance either government insurance or many other insurance. This clearly indicates that health insurance has very insignificant impact on health expenditure in India since it has fewer roles in health care finance and there is still a long way to achieve the success in health coverage.

Each of the private and public health expenditures has different effects on the health status. Increase in out of pocket health expenditure, which is one of the private health expenditures, increases the number of catastrophic expenditures and may lead to more poverty. Higher private health expenditures lead to increase the costs of the insurers' management and marketing and they must take much more money from their customers. Increasing the public health expenditure may increase the budget shortage, but it decreases the number of catastrophic expenditures. Public health expenditure improves the society's health and eventually improves human capital and leads to economic growth.

Table IX: Percentage of persons by health expenditure coverage type

Sector	Percetage of persons not covered	Percentage of persons covered by					
		govt. sponsored insurance scheme	govt./PSU as an employer	Employer supported health protection (other than govt /PSU)	arranged by household with insurance companies	Other	All
Rural	85.9	12.9	0.6	0.3	0.2	0.1	100.0
Urban	80.9	8.9	3.3	2.9	3.8	0.2	100.0

Source: NSSO Report, 2017-18

B. Model Formulation for health care accessibility

To examine the factors determining the accessibility of health care facility a binary logistic analysis has been made where use of primary health centre is taken as the dependent variable and caste, education, occupation, monthly per capita consumption expenditure, distance and communication facility are taken as explanatory variables.

The following logistic regression model has been applied to examine the above mentioned indicators determining the accessibility of primary health care service. The binomial logistic model applied here can be written as

$$Y_i = \ln(P_i/1-P_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + U_i \text{----------------------- (1)}$$

$$i = 1,2,3.....n$$

Where,

Dependent variable:

Y_i = Whether to use primary health care service not.

          1= Using PHC

          0= Not-using

Independent variable:

X_{1i} = Caste of the ith respondent

X_{2i} = Size of the household of the ith respondent

X_{3i} = Education of the ith respondent

X_{4i} = Occupation of the ith respondent

X_{5i} = Distance between the place of residence and

          PHC of the ith respondent

X_{6i} = Communication facility between the place of

          residence and PHC of the ith respondent

X_{7i} = Monthly per capita consumption expenditure of the ith respondent

U_i = Error term, where $U_i \sim (0, \sigma^2)$

β_0 represents the constant term includes in the model.

$\beta_1, \beta_2.......... \beta_7$ are regression coefficient for each of the explanatory variables.

Rewriting the equation (1) as

$$Y_i = \beta X + U_i \text{------------------ (2)}$$

Where,

$$\beta X = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i}$$

Even if the dependent variable is a binary variable taking the value of 1 (User) and 0 (Non-user), Linear Probability Model (LPM) cannot be used. This is because of the following reason –

1. In LPM model, the probability value must necessarily lie between 0 and 1. But there is no guarantee that the estimators will lie between 0 and 1. So this is the real problem with OLS estimation of the LPM.

2. The error term in LPM deals with heteroscedasticity which makes its significance test doubtful.

As such, LPM model cannot be used for modeling dichotomous variable. The other models to analyse the above are the logit and probit (Gujarati, 2015). While dealing with binary response variable logit model is highly suitable, so this study also follow the same technique.

Since the decision of using or not using Primary Health Care service depends on an unobservable frequency of vulnerable to disease Index I_i depending on the above explanatory variable that is caste, size of the household, education, occupation, communication and monthly per capita expenditure of the respondent. The index can be written as

$$I_i = \beta X + U_i \text{--- (3)}$$

Here, i= i^{th} respondent, U= Error term

$$\beta X = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i}$$

So, it can assume that $Y_i = 1$ (Respondent uses PHC), if $I_i \geq 0$

          $Y_i = 0$ (Respondent doesnot uses PHC), if $I_i \leq 0$

This means if Respondent's disease Index I exceeds minimum level index I, the respondent uses PHC but if it is less than I, the respondent doesnot use PHC.

          To make this willingness operational, the willingness to use PHC i.e. (Y=1)

$$P_i(Y_i=1) = P_i(I \geq 0) = P_i(\beta X + U_i) \geq 0 \text{----------- (4)}$$

$$= P_i[U_i \geq -(\beta X)]$$

Since the distribution of Y_i impacts this probability and the distribution of Y_i rely on the probability distribution of U_i, let us assume that this probability distribution is symmetrically around its mean value. So the equation becomes

$$P_i(U_i \geq -\beta X) = P_i(U_i \leq \beta X) \text{----------------------- (5)}$$

As such, $P_i = P_i(Y_i=1) = P_i(U_i \leq \beta X) \text{------------------------(6)}$

Since the logit model follows the cumulative logistic distribution, so the the equation of using PHC is

$$P_i = 1/1+e^{-Z_i} = e^Z/1+e^Z \text{-----------------------------} (7)$$

Here, P_i means the probability of using PHC ($Y_i=1$)

$$Z_i = \beta_1 + \beta_2 X_i + U_i \text{-----------------------------} (8)$$

On the other hand, the equation of not using PHC is

$$1-P_i = 1/1+e^{Z_i} \text{-----------------------------} (9)$$

Since Z_i ranges from $-\infty$ to $+\infty$, P_i ranges between 0 and 1 so, P_i is nonlinearly related to Z_i.

Thus, we can write taking equation (8) and (9)

$$P_i/1-P_i = 1+e^{Z_i}/1+e^{-Z_i} \text{-----------------------------} (10)$$

Here $P_i/1-P_i$ is simply odd ratio in favour of using PHC i.e the ratio of the probability that a respondent wishes to use PHC to the probability that it will not use PHC.

Taking the log of equation (10), we get

$$L_i = \log (P_i/1-P_i) = Z_i = \beta_1 + \beta_2 X_i + U_i \text{---------------} (11)$$

Here, L_i is known as the odds ratio which is linear function of X_i, β_1 and β_2.

Table -X: Description of the explanatory variable

Variable	Definition	Value
Dependent variable	Whether people go to PH or not	1 if they use, 0 if they do not use
Use of PHC		
Explanatory variable	Caste of the sample households	1 if general, 0 if otherwise
1. Caste (X_{1i})		
2. Size of the household (X_{2i})		
3. Education (X_{3i})	Education of the Respondent	1 if up to 6 and 0 if 6 and above
4. Occupation (X_{4i})	Occupation of the respondent	1 if service, 0 if otherwise
5. Distance (X_{5i})	Distance between the place of residence and PHC	1 if upto 10 km, 0 if above 10 km
6. Communication (X_{6i})	Communication facility between the place of residence and PHC	1 if own vehicle, 0 if otherwise
7. MPCE(X_{7i})	Monthly per capita consumption expenditure in Rs	

In the above table 1.2, the results of the estimated logistic regression model present. The independent variable caste, size of the households, education, occupation, distance, communication are constructed as dummy variable and for each category of variables, one reference group is given. That is, the result shows the impact of one characteristic of the individual on the probability of seeking primary health care service, in comparison with reference category. The category, for which value has been assigned as 0, represents the reference category. For the dependent variable monthly per capita consumption expenditure log transformation has been done.

Table - XI: Determinants of Accessibility of Primary Health care facility Dependent Variable-Accessibility of PHC.

Regressor	B	Wald	Exp. B
Caste (C_i)	-.151	.032	.832
Size of the family (S_i)	-.726	.972	.472
Education (E_i)	-1.732	3.859 **	5.580
Occupation (O_i)	-.092	.013	1.034
Distance (D_i)	-1.536	4.219 **	.195
Communication (Co_i)	2.897	1.884**	16.738
MPCE (M_i)	-25.576	23.946 ***	.000
Constant	93.013	23.314	1.459E42

Source: SPSS Calculation

Cox & Snell R^2 = .739
Nagelkerke R^2 = .864
Hosmer and Lemeshow Goodness of fit test statistic = .973

*** implies 1% level of significant
** implies 5% level of significant

Estimated result of the logistic regression model shows that out of the 7 influencing variable included in the model, only 4 variables such as education, communication, distance and MPCE are found to be significant factors dermining the accessibility of primary health care facility. However, Nagelkerke test and Hosmer and Lemeshow goodness of fit test statistic shows that model is good fitted.

The study found that an increase in the education of the respondent decrease the accessibility of primary health care facility by 1.732 units.

So far as relationship of distance between the place of resident and PHC with accessibility of primary health care facility is found to be significant. The coefficient for distance is being -1.536. The negative sign indicates if the distance between the place of residence and PHC increases the likelihood of accessibility of primary health care facility decrease. Another factor which is found to be highly significant is the MPCE. It is also found to be negatively significant with the accessibility of primary health care facility. It is found that if MPCE increase accessibility of primary health care facility decrease by -25.576 units. This reveals that increase in consumption expenditure increases the ability to purchase health care necessities. So, with improved ability, people switch from public to private facility.

C. Role of ICT in health care sectors

Role of ICT is indispensible in the present world, since the technology has changed the world's scenario transforming into a sophisticated world. The growing importance of ICT has considerable effects on healthcare. The use of ICT increases the quality of healthcare services, enhances the patient's security and decreases the operation and administrative cost. The user friendly telecommunication devices by a majority people have reduced the communication gap. As such, people find convenient while availing health care services since accessibility to information has become easy using ICT. Today, healthcare sectors has faced numerous problems such as storing the medical record of the patient, maintaining Hospital Information System, maintenance of medical equipment, medication error and so on. A poor ratio of doctor to patient results in an inefficient and expensive delivery of health care services. Information and Communication Technology (ICT) could play an important role in improving the efficiency and making healthcare more affordable. Through ICT the distance between urban and rural have been can be shortened. Right communication channel would become easy for a doctor to deliver treatment to the patient living anywhere around the world.

The study found that one of the most important indicators of accessibility to health care service is distance between the place of resident and the place of hospital. So, in general, rural areas do not have adequate and well-developed hospitals and so it lacks proper health care awareness. Poor Communication and transportation also become a disadvantage for the rural patients to arrive at hospitals on time. This can be reduced by installing proper communication channel and a numerous life can be saved.

The use of ICT in healthcare can be categorized into four as follows,

- Health & Education
- Hospital Management System
- Health Research
- Health Data Management

The application of ICT in Health education leads awareness among the public about the communicable diseases, health status, prevention measures and various current diagnostic & therapeutic procedures. This gives a freedom to the people to choose the best hospitals and doctors to approach for treatment and to have their life in a healthy way.

The use of ICT can make the Hospital management successful. The successful Hospital management helps to conquer the challenges faced by the Hospital. ICT improves the patient safety and satisfaction through proper management, get updated to the latest technology.

Through the use of ICT in healthcare research, it is possible to take the preventive measures to cure and reduce the spread of diseases. Further, new technology in diagnosis reduces the time and cost. The effective health care service can be possible through the use of ICT and helped in the elimination of traditional healthcare systems.

The ICT can also help for electronic storage of medical data. Information can easily be recovered through ICT. With the help of ICT, the data can be transferred to the patient or to the Doctors for consultation.

India has many success examples in the application of ICT in healthcare. This is because of using latest technologies in different field.

The use of Personal Digital Assistants (PDA), a pilot based project, is a perfect example of this by ANMs who are important links in the primary healthcare system as seen by the NRHM. This has reduced paperwork and increased data accuracy by making it certain that the data is available in electronic form, even in rural areas with restricted broadband connectivity. The PDA transfers data through wireless communication networks which will be entered into a larger database using the internet later on.

In Tamil Nadu, HIS has strengthened the information practices in primary healthcare with the objective to improve processes concerning healthcare delivery for the rural community in an effective and efficient way. This system helps the health staff to work on computers which in turn leads to better management of the health sector and improves the delivery of healthcare services to the needy people.

Aarogyam is a health programme which was launched in UP as an end-to-end community-based digital health mapping project. This project allows the citizens residing anywhere in India to access their health profile information using any telecom network. The programme helps for a future healthcare strategy by providing a health database.

Gram vaani is another such technology in the delivery of health care services which has built innovative voice applications for organizations working in health care sector to automate and manage their processes efficiently.

Under NRHM, Mother and Child Tracking System (MCTS) is another project which focusses on keeping a track of each pregnant woman, from registration to post-natal care.

Another example is GVK EMRI which handles medical emergencies through the 108 Emergency Service. It is an emergency call response centre which provides free service to the people. This 108 ambulance service has been seen across various states of India like Goa, Andhra Pradesh, Uttarakhand, Gujarat, Tamil Nadu, Assam,1 Karnataka, Madhya Pradesh, Meghalaya, Chhattisgarh and Himachal Pradesh. Therefore, it is believed that this GVK EMRI has improved the Healthcare services remarkably in these states, especially in remote areas.

Another such example is eVIN (Electronic Vaccine Intelligence Network) which is an indigenously developed technology system in India that digitizes vaccine stocks and monitors the temperature of the cold chain through a smartphone application. eVIN supports the Government of India's Universal Immunization Programme and provides real-time information on vaccine stocks and flows, and storage temperatures across all cold chain points in these states.

Thus, Information & Communication Technology has pivotal role in the development of Healthcare system. So, the health sector too has to use ICT efficiently to bring in more changes and elevate the healthcare to a much higher level which is important for the country's development.

CONCLUSION

From the above it can be concluded that Government hospitals are unable to cater to the healthcare needs of such a large population of India and therefore private players are making significant investments in the hospital industry. Large investments by private sectors are likely to contribute significantly to the development of India's healthcare, which covers majority of the total market in the year to come. But, since private health care is not accessible to poor or economically weaker section, government should play a significant role to ensure health protection of weaker section.

The key challenges in the delivery of healthcare service are low quality of care, poor accountability, lack of awareness, and limited access to facilities. In this case, technology plays a crucial role to facilitate this. The main purpose of the present study is to study the indicators determining the accessibility of health care service. The primary health centre can be considered the institutional core of the rural health services in such a vast populated country. They are created to function as important elements of the overall economic and social development programmes. Government as well as private sector comes forward so far till today to meet the demand of the

rural people. Although Poor or economically weaker patients cannot bear the expenses of health care so they prefer to go to rural health institutions. On the contrary, those institutions could not fulfill the satisfaction of economically well people as those who can incur higher health care expenditure often choose urban centric private health care. From the above discussion it can be concluded that education, communication, distance between the place of residence and primary health centre and monthly per capita consumption expenditure were significant element for determining accessibility of primary health care service. The government should think about the public expenditure to improve the health infrastructure for the betterment of at least those who cannot bear health care expenses, since health is most important factor that determines human capital of a nation. So, it can be said, "Health is wealth and so good health of citizens is the wealth of a nation".

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