

Building Blocks of Wellness: Kerala's Healthcare Infrastructure Developments and its Role in the Kerala Model

***Radeena. D.N & Dr. Sanathanan Velluva**

- Radeena D N, Assistant Professor of Economics, Govt. Arts and Science College Calicut, Kerala (Research Scholar –Part Time, Department of Economics, St. Joseph's College Devagiri Calicut, Affiliated to the University of Calicut)
- Dr. Sanathanan Velluva, Associate Professor and Head, Department of Economics, St. Joseph's College Devagiri, Calicut, Kerala

Abstract

This paper examines the development of health infrastructure in Kerala, India, and its role in the state's remarkable healthcare achievements. Kerala boasts a unique blend of allopathic, Ayurvedic, and homeopathic medical practices, offering residents a broad spectrum of healthcare options. Since its formation, the state has prioritised healthcare spending, resulting in an extensive network of hospitals, medical colleges, and well-trained personnel. This robust infrastructure, coupled with a focus on preventive care and accessibility, has significantly improved Kerala's health outcomes. However, challenges remain, including the unequal distribution of resources across districts. Despite these issues, Kerala's healthcare model serves as an inspiration for other developing regions seeking to improve population health.

Keywords: Healthcare infrastructure, Healthcare Achievements, Allopathy, Ayurveda, Homeopathy, Public Health Initiatives

Introduction

Kerala occupies an extremely important position in the health map of India. Kerala's achievements in healthcare have been cited as role model for the country. Many of the health indicators of the state match with many of the developed countries. The state has a greater health standard with low birth and death rates, low infant and maternal mortality rates. Under all major indicators, Kerala has already achieved what the country has targeted for achieving 'Health for all by 2000 AD' (Kerala.gov.in). India's first ever Human Development Report published in 2002, placed the Southern state of Kerala on top of all the other states in India, because of easy accessibility and coverage of medical care facilities. In the state, private health sector, both indigenous and Western systems of medicine have played a crucial role. High level of education and greater health consciousness among people, have played a key role in the attainment of good health standards in Kerala. The mushrooming of private hospitals that offer quality services matching international standards, the healthcare in Kerala is growing by leaps and bounds. The article discusses the development of health infrastructure in Kerala and its role in the attainment of a special place in Indian healthcare scenario.

Components of Healthcare Infrastructure

Health infrastructure is of utmost significance as it not only provides individuals with the resources, materials, and facilities necessary to promote good health and well-being but also equips communities, states, and the nation with the capacity to prevent diseases, promote health, and respond to emergencies, chronic diseases, severe health problems, and other health challenges. It serves as the foundation for planning, delivering, evaluating, and improving public health (Radhika Kapur, 2020).

The provision of public health services relies on the presence of basic infrastructural facilities (Public Health Infrastructure, 2020). The components of health infrastructure include hospitals, clinics, medical equipment, healthcare professionals, support staff, health information systems, supply chains for medications and supplies, transportation infrastructure for emergency medical services, and communication networks (Ni et al., 2015). According to Radhika Kapur, the five components of health infrastructure are a skilled workforce, integrated electronic information systems, public health organizations, resources, and research (Radhika Kapur, 2020). These components work together to ensure the availability, accessibility, and quality of healthcare services. A strong and efficient health infrastructure is crucial to achieving positive

healthcare outcomes and providing quality care to individuals (Afshari, 2014). Without these essential components, healthcare achievements may be compromised, leading to inadequate healthcare services, longer wait times for treatment, limited access to care, and higher rates of medical errors and adverse events.

Healthcare Achievements and Budget Prioritization in Health Sector

Kerala has a long history of organized healthcare. According to historical records, by the time the state was formed in 1956, the foundation for a medical care system accessible to all citizens was already in place. The easy accessibility and extensive coverage of medical care facilities have played a dominant role in shaping the health status of Kerala. Many hospitals in Kerala are more than 50 years old. Health has been a major area of budgetary spending since the early years of the state (Kerala Travels).

Until the late 1970s, the state government's share of health expenditure in the total budget was consistently higher than in other states. The annual growth rate of the state's health expenditure during the first three decades was 13.04 percent. Despite the growth rate of the state's GDP being 9.81 percent, the state's share of health spending has been steadily decreasing since the 1980s (The Hindu, October 9, 2016). The following table provides a broad overview of the percentage of health expenditure in the state budget relative to the total budget during various years in Kerala.

Table 1

Allocation in State Budget for Health and Family Welfare

Year	Amount of rupees in lakhs	Percentage of health expenditure in the state budget
1960-61	541	8.24
1965-66	981	8.74
1975-76	4627	7.71
1980-81	7879	6.82
1985-86	12681	6.56
1990-91	27850	4.18
2003-04	106200	4.1
2005-06	116574	3.73
2009-10	200815	3.8
2011-12	328957	4.01
2017-18	1102378	5.88
2018-19	1200698	5.91

Source: State government budget in various years

The data on state budget allocation for health and family welfare from 1960-61 to 2018-19 shows substantial growth in the absolute amount allocated, increasing from 541 lakhs to 12,00,698 lakhs. However, the percentage of the state budget dedicated to health and family welfare has fluctuated over the same period. It began at 8.24% in 1960-61, peaked at 8.74% in 1965-66, and then generally declined, reaching a low of 3.73% in 2005-06 before recovering slightly to 5.91% in 2018-19. The initial higher percentages suggest that health and family welfare were significant priorities in the early years. The decline in percentage allocation over time, despite the increase in absolute amounts, may be attributed to larger overall budget increases, economic growth, inflation, and shifting policy priorities that allocated more resources to other sectors. Recent years show a modest recovery in the percentage allocation, indicating renewed focus on health and family welfare, albeit not to the levels seen in the early 1960s. This analysis reveals the dynamic nature of budget allocation, influenced by economic conditions, policy changes, and evolving government priorities.

Health Infrastructure in Kerala

Health infrastructure is a crucial indicator for assessing healthcare policy and welfare mechanisms, reflecting the investment priorities in creating healthcare facilities. It encompasses the essential support needed for the delivery of public

health activities. Key components of health infrastructure include the number of hospitals, availability of beds, and the presence of doctors, nurses, and other medical personnel across various categories. Additionally, it involves academic institutions that train medical and paramedical professionals. In Kerala, a brief analysis of health infrastructure facilities under the Allopathy, Ayurveda, and Homeopathic systems of medicine provides insight into the state's commitment to diverse healthcare practices and its capacity to meet the health needs of its population.

Diverse Healthcare Systems: Infrastructure Analysis of Allopathy, Ayurveda, and Homeopathy in Kerala

Kerala offers a unique blend of allopathic, Ayurvedic, and homeopathic medical practices, providing residents and visitors with a broad spectrum of healthcare options. Kerala is likely the only state in India where Ayurveda is used as a mainstream medicine. The state is home to numerous Ayurvedic medical colleges and hospitals, boasting the largest number of Ayurveda colleges and practitioners in the world (tourmyindia.com). Concurrently, Kerala features cutting-edge allopathic facilities that offer advanced medical treatments and procedures, ensuring that both residents and tourists have access to the latest advancements in modern medicine. Additionally, the widespread availability of homeopathic clinics and practitioners provides an alternative pathway for those seeking natural and gentle remedies. The health infrastructure across these three medical systems is discussed below.

Government Hospitals in Kerala

The foundation of health infrastructure lies in the availability of medical institutions. Under the public allopathic system of medicine, these institutions primarily include general hospitals, district hospitals, public health centers (PHCs), 24/7 public health centers categorized as modern medical institutions, community health centers, and specialty hospitals dedicated to women and child health, mental health care, and leprosy treatment. Additionally, there are centers specialized in treating tuberculosis, Taluk hospitals, and other facilities such as mobile dispensaries, tribal mobile units, jail dispensaries, health clinics, and police hospitals and dispensaries. Among these, the Primary Health Centre (PHC) is the cornerstone of rural health care. The following table provides an analysis of the growth of the public healthcare system over the past ten years.

Table 2

Distribution of Government Hospitals in Kerala under Three Systems of Medicine

Years	Number of Hospitals under various system of medicine					
	Allopathy Hospitals (GH+ DH +TH)*	Total Allopathy Institution	Ayurveda Hospital	Total Ayurveda Institution	Homeopathy Hospital	Total Homeopathy Institution
2008	86	1248	117	864	31	556
2010	99	1254	117	864	30	570
2012	106	1255	119	887	30	611
2014	113	1281	127	942	31	692
2016	117	1282	127	942	33	692
2018	117	1280	127	946	34	693

GH- General Hospital, DH- District Hospital, TH- Taluk Hospital

Source: Economic Review, Various years

The table clearly reveals that the Government of Kerala has established an extensive and comprehensive network of medical institutions. A comparison of various types of government medical institutions from 2008 to 2018 shows that the number of hospitals under the allopathic and Ayurvedic systems of medicine in Kerala is almost equal. However, there has been a comparatively larger increase in the number of hospitals under the allopathic system. The total allopathic institutions comprise Public Health Centres (PHCs, including 24x7 centers), Community Health Centres (CHCs), specialty hospitals, tuberculosis centers, as well as general, district, and Taluk hospitals. In contrast, the total Ayurvedic and homeopathic institutions primarily consist of hospitals and dispensaries.

Kerala's fourteen districts vary significantly in terms of social and economic development. Some districts are highly developed, both socially and economically, while others, particularly hilly regions like Wayanad and Idukki, lag behind in these aspects. The distribution of government medical institutions across different districts, reflecting these disparities, is analyzed in the following table.

Table 3

District-wise Distribution of Government Hospitals in Kerala

Districts	Number of Hospitals (Excluding Dispensaries) under Different Systems of Medicine		
	Allopathy	Ayurveda	Homeopathy
Thiruvananthapuram	114	15	4
Kollam	88	9	3
Pathanamthitta	67	5	1
Alappuzha	90	11	3
Kottayam	83	10	3
Idukki	65	3	2
Ernakulam	116	14	3
Thrissur	117	17	1
Palakkad	112	7	1
Malappuram	125	11	4
Kozhikode	92	8	3
Wayanad	42	3	1
Kannur	108	9	2
Kasaragod	61	5	3
TOTAL	1280	127	34

Source: Economic Review, 2018

The table clearly indicates that hospitals in Kerala are unevenly distributed across its fourteen districts. A higher number of government hospitals are located in municipal corporations and economically developed districts, while districts with more marginalized populations, such as Idukki and Wayanad, have fewer hospitals. This disparity highlights the need for a more equitable distribution of healthcare facilities to ensure all regions have adequate access to medical services.

Availability of Beds in Government Hospitals in Kerala

When analyzing health infrastructure, besides the number of hospitals, another crucial aspect is the availability of beds for patients. Larger institutions typically boast better infrastructures, including ample bed capacity. Understanding how these beds are distributed within each district and across different categories of public hospitals in the past year is essential.

Table 4

District-Wise Distribution of Availability of Beds in Hospital in 2019

Districts	Gen.H osp	Dist. Hos.	PHC	CHC	Speci alty	TB C	TH	24 x 7	Other	Total
Thiruvananthapuram	1183	562	158	692	975	508	688	67	46	4879
Kollam	0	537	32	443	273	50	939	114	0	2388
Pathanamthitta	714	210	264	222	0	0	432	96	10	1948
Alappuzha	400	487	54	424	1095	36	674	254	0	3424

Kottayam	1064	0	30	734	150	0	550	288	0	2816
Idukki	0	274	122	282	0	0	254	164	0	1096
Ernakulam	1049	227	60	775	132	0	1453	848	0	4544
Thrissur	456	117	262	806	1021	0	691	166	0	3519
Palakkad	0	544	414	623	157	0	668	206	10	2622
Malappuram	501	483	140	492	0	52	497	302	36	2503
Kozhikode	550	210	80	283	1032	0	577	88	0	2820
Wayanad	250	500	24	267	0	0	186	140	0	1367
Kannur	541	616	394	305	100	0	744	244	46	2990
Kasaragod	212	400	0	223	0	0	84	168	0	1087
TOTAL	6920	5167	2034	6571	4935	646	8438	3145	148	38004

Source: Economic Review

In 2019, the total number of beds available for inpatients in government hospitals in Kerala amounted to 38,004. Thiruvananthapuram district stood out with the largest number of beds, totaling 4,879, surpassing all other districts, followed closely by Ernakulam and Alappuzha. A categorical analysis of bed availability within districts reveals interesting insights. Among the general hospitals in Kerala, those in Thiruvananthapuram have the highest number of beds, although it's worth noting that Thiruvananthapuram has two general hospitals. Kannur district boasts the highest number of Primary Health Centers (PHCs) at 70, and it ranks second in bed availability within PHCs, with 394 beds. This translates to an average of only four to five beds per PHC. Palakkad, on the other hand, leads in the number of beds available in PHCs compared to other districts. In 2017, taluk hospitals in Ernakulam had the highest number of beds, totaling 1,453, which is significant considering there are 11 taluk hospitals in Ernakulam.

Medical Education in Kerala

In Kerala, Medical Education is imparted through both public and private ownerships. The Kerala is having a vast network of medical institutions providing medical and para-medical courses under various managements. A separate university for medical education, Kerala University of Health Sciences was established as per the Kerala University of Health Science Act, 2010 with the aim of ensuring proper and systematic instructions, teaching, training and research in modern medicine, homeopathy and Indian system of medicine and allied health sciences in Kerala. The number of institutions affiliated to University (upto October, 2020) is 310 with 38 Government colleges, 6 Government aided colleges and 266 self-financing colleges. The colleges fall under all systems of medicine such as modern medicine, ayurveda, homeopathy, sidha, unani, yoga, naturopathy, nursing, pharmaceutical science and paramedical courses. The total intake of students in 2019-20 is 22,024 (4,121 boys and 17,903 girls) under various health sciences stream (Economic Review, 2020). Details of medical institution distributed in Kerala are discussed in the following table

Table 5

Details of the Government, aided, and unaided colleges affiliated under various streams

Stream	Government	Aided	Unaided	Total
Modern Medicine	10	0	21	31
Ayurveda Medicine	3	2	12	17
Homeo Medicine	2	4	0	6
Dental	5	0	20	25
Sidha Medicine	0	0	1	1
Unani Medicine	0	0	1	1
Nursing	7	0	116	123
Paramedical	6	0	46	52
Pharmacy	5	0	49	54
Total	38	6	266	310

Source: Economic Review, 2020

Medical and Para-medical Personnel under Department of Health Services in Kerala

We know, resources in any institution comprises of human and non-human resources, where human resources can attract all customers to the institution. In healthcare system human resources comprises of medical and para-medical personnel. Medical personnel includes doctors who have completed MBBS or PG which are categorised as medical officers, then dental doctors, head and staff nurses. The distribution of medical personnel working under Department of Health Services in Kerala in the last ten years is discussed in the following table.

Table 6

Medical Personnel Information in Kerala under DHS from 2008-2017

Year	Medical Officers	Dentists	Head Nurse	Staff Nurse	TOTAL
2008	3862	80	1699	7163	12804
2009	3686	85	1707	7113	12591
2010	3868	72	1438	6345	11723
2011	4299	72	1547	6345	12263
2012	4299	72	1547	6345	12263
2013	4480	73	1554	6370	12477
2014	5214	83	1592	6506	13395
2015	5214	83	1592	6506	13395
2017	5367	98	1507	6081	13053

Source: Economic Review

In the year 2017 total number of medical personnel working under DHS are 13053, out of which 47% are staff nurses. 41% is the share of medical officers. When we analyse the number of medical officers in Kerala over the last ten years, we can see that their number has increased only by 1500. Also the number of dentists has increased by a total of 18. When we compare with the number of BDS students completing in a year, they got appointment in government hospital is very less. Though there is a slight increase in the number of government hospitals in Kerala, the number of nurses, both head nurses and staff nurses had decreased by 1274. A graphical representation of the number of medical personnel in Kerala from 2008 to 2017 is given below

The other kind of human resources working in medical institutions are para-medical staffs mainly comprises of health inspectors, pharmacists, and Junior Public Health Nurses. An account their distribution in Kerala over the last ten years is discussed in the following table.

Table 7

Para- Medical Personnel Information in Kerala under Department of Health Services

Year	Health Inspectors	Lady Health Inspectors	Pharmacists	JPHN	JPHI	TOTAL
2008	857	966	1612	5571	3509	12515
2009	858	932	1645	5556	3501	12492
2010	860	963	1576	5560	3502	12461
2011	860	963	1576	5560	3502	12461
2012	860	963	1576	5560	3502	12461
2013	860	963	1596	5561	3607	12587
2014	1465	1107	1599	6244	3638	14053
2015	1465	1107	1599	6244	3638	14053
2017	897	771	1609	5599	3634	12510

Source: Economic Review, Various years

Among para-medical staffs, health inspectors constitutes a major share which comprises of male health inspectors, female health inspectors, and junior primary health inspectors (JPHI). The more appointments are done in junior primary health inspectors. When we analyse their numbers over the last ten years, it is clear that in all the three categories their numbers neither increased nor decreased much. The number of female health inspectors has reduced considerably in the last year when compared to 2008. The number of pharmacists working under Department of Health Service is almost same over the last ten years, but the number of junior public health nurses has increased very slightly. The health facilities are not distributed equally across districts. In the following table, an analysis is made to understand the district-wise distribution of medical and paramedical personnel working under Department of Health Services.

Table 8

District-wise Distribution of Medical and Para-Medical Personnel under DHS in 2018

Districts	Medi cal Offic ers	Medical Officers (administra tion)	Den tists	Head Nurse	Staff Nurse	Health Inspect ors	Lady Health Inspector s	JPHN (AN MS)	JPHI	Total
Thiruvanantha puram	544	26	20	194	788	98	41	515	98	2324
Kollam	307	47	3	99	391	73	NA	427	73	1420
Pathanamthitta	277	13	5	78	321	44	44	266	44	1092
Alappuzha	376	31	7	111	456	53	70	376	53	1533
Kottayam	368	14	10	110	442	55	56	341	55	1451
Idukki	220	42	8	45	183	55	59	314	55	981
Ernakulam	495	30	4	181	736	63	75	427	63	2074
Thrissur	420	28	10	119	472	79	99	484	79	1790
Palakkad	370	26	1	116	463	72	80	515	72	1715
Malappuram	455	41	11	111	445	83	98	589	83	1916
Kozhikode	334	41	1	119	476	72	74	417	72	1606
Wayanad	183	16	10	45	187	31	34	208	31	745
Kannur	428	26	0	130	522	74	NA	426	74	1680+
Kasaragod	199	10	8	49	199	38	41	294	38	876
TOTAL	4976	391	98	1507	6081	890	771	5599	890	21203

NA= Category-wise not available

Source: Economic Review

When we analyse the number of medical and paramedical personnel working under DHS in various districts, we can see that Thiruvananthapuram districts has more numbers followed by Malappuram and Ernakulam. Wayanad followed by Kasaragod and Idukki has least number of medical and para-medical personnel in the state. It is very contradictory to see in Kerala that the more needy districts have the least number of medical officers, nurses and other medical personnel. Though Malappuram district has more number of medical institutions in Kerala Thiruvananthapuram district has the highest number of medical officers other than in administrative service, both head and staff nurses, dentists, and health inspectors including junior public health inspectors.

Role of Health Infrastructure in Healthcare Achievement of Kerala

Improvement in health status of the people is one of the crucial indicators of social development. Kerala, a small state in South India, has been celebrated as a development model by scholars across the world for its exemplary achievements in

human development and poverty reduction despite relatively low GDP growth. The Kerala model of development is often hailed as a successful approach to achieving socio-economic progress and improving human development indicators in the Indian state of Kerala (Brownie et al., 2014). Kerala has achieved a good health status compared to other States in India. Easy accessibility and coverage of medical care facilities, apart from other factors like high literacy rate, well-functioning public distribution system, have played a leading role in influencing the health system in Kerala. (Economic Review, 2018)

At the time of Kerala state formation in 1956 the northern region (Malabar) lagged behind the southern region (Travancore-Cochin) in development indicators, inter-regional disparities reduced considerably in ensuing decades. The reduction in regional disparities is typically attributed to modern Kerala's welfare policy regime, which emphasized greater growth of infrastructure facilities (Jacob S., 2014). Much emphasis was given to health sector after the formation of the state. Just twenty years after the formation of the state, good foundation was already laid. The Peoples Campaign for decentralised planning initiated in 1996 helped to improve infrastructure and service in primary and secondary healthcare institutions and widened healthcare delivery. In Kerala, both modern medicine and indigenous systems play a crucial role in providing universal access and availability to the poorer sections of society. (Economic Review,2018). The establishment of healthcare institutions, the provision of developed diagnosis facilities has contributed to the improvement of the health infrastructure in Kerala One of the critical factors contributing to the success of Kerala's development model is the development of a robust health infrastructure (Quartey, 1996). Furthermore, the state has made significant strides in implementing comprehensive healthcare policies and programs aimed at promoting preventive care and ensuring equitable access to medical services across all segments of society.

The emphasis on primary healthcare through an extensive network of community-based clinics and outreach initiatives has played a pivotal role in addressing the healthcare needs of even the most remote and underserved communities. Kerala's commitment to investing in healthcare education and training has also been instrumental in maintaining a steady supply of skilled healthcare professionals. The state's medical colleges and nursing institutions have garnered national and international recognition for their high standards of education and research, contributing to the overall quality of healthcare delivery. Additionally, the integration of traditional and modern healthcare systems has facilitated a holistic approach to wellness, catering to the diverse healthcare preferences of the population. This harmonious coexistence of different healthcare modalities has fostered a comprehensive and inclusive healthcare ecosystem, further solidifying Kerala's position as a model for healthcare excellence.

Conclusion

Health is a fundamental determinant of human capital, and the health status of individuals often serves as a strong indicator of overall development. Since its inception in 1956, Kerala has placed a high priority on health within its development agenda. Historically, the state's budget allocations have underscored this emphasis on healthcare, establishing a robust foundation for accessible and equitable medical services. This commitment is evident in the widespread availability of healthcare facilities across Kerala, spanning various medical systems such as allopathy, Ayurveda, and homeopathy. Kerala stands as a beacon of success in healthcare achievements, serving as a role model for other states in India. Behind Kerala's relative success lies a network of robust public institutions, including comprehensive medical facilities, skilled healthcare professionals, and extensive public health initiatives. This legacy of the "Kerala model" has been built over many years, contributing significantly to the state's overall development and well-being.

References

1. Brownie, S. et al. (2014). Public health service options for affordable and accessible noncommunicable disease and related chronic disease prevention and management. *Journal of multidisciplinary healthcare*.
<https://doi.org/10.2147/JMDH.S72636>
2. CPPR, (2017), 'Public and Private Healthcare Institutions: Preference and Expenditure', Working Paper-1 under Dr. Martin Patrik, <https://www.cppr.in/wp-content/uploads/2017/06/Public-and-Private-Healthcare-Institutions-Preference-and-Expenditure-Pattern.pdf>

3. Economic Review 2020 | State Planning Board, Thiruvananthapuram, Kerala, India. <https://spb.kerala.gov.in/economic-review/ER2020/>
4. George, A. V., (1999), "Health Care System in Kerala a Case of Primary Health Centres in Kozhikode District", Ph.D Thesis, Department of Economics, Dr. John Matthai Centre University of Calicut <http://shodhganga.inflibnet.ac.in/handle/10603/38631>
5. H. Afshari& Q. Peng (2014), Challenges and Solutions for Location of Healthcare Facilities, Industrial Engineering and Management, Vol 2014, PP. 1-12, DOI:10.4172/2169-0316.1000127 <https://www.semanticscholar.org/paper/Challenges-and-Solutions-for-Location-of-Healthcare-Afshari-Peng/d3189fc81e9f84c4f6f299ff43eefb2e93119e45>
6. J. Ni, Y. Chen, J. Sha and M. Zhang, (2015) 'Anatomy of Functional Components of Healthcare Information System', Eighth International Conference on Internet Computing for Science and Engineering (ICICSE), Harbin, China, pp. 172-180, doi:10.1109/ICICSE.2015.39. <https://ieeexplore.ieee.org/document/7422476>
7. Jacob, S. (2014). The Kerala Regime and Regional Disparities in Health Infrastructure Versus Outcomes, India Review, Vol 13. Pp. 58-77 <https://doi.org/10.1080/14736489.2014.873680>
8. Kapur, Radhika., (2020),Significance of Health Infrastructure, University of Delhi,https://www.researchgate.net/publication/342832865_Significance_of_Health_Infrastructure
9. Mathew, K. J., (1979), "Health Care in Kerala", Social Scientist, Vol. 8, No. 3, pp. 56-59
10. Rajan, S. Irudaya, and James, K. S., (1993), "Kerala's Health Status: Some Issues" Economic and Political Weekly, Vol. 28, No. 36, pp. 1889-1892.
11. S.R, Sudha. (2015), "Health Infrastructure and Health Care Expenditure in Karnataka : A Case Study of Shimoga District"., Ph.D Thesis, Dept. of Economics, Kuvempu University, <http://hdl.handle.net/10603/85270>
12. Sadanandan, Rajeev., (2001), "Government Health Services in Kerala: Who Benefits?" Economic and Political Weekly, Vol. 36, No. 32, pp. 3071-3077.
13. Suryanarayana, M. H., (2008), "Morbidity and Health Care in Kerala: A Distributional Profile and Implications", Working Paper 4, Indira Gandhi Institute of Development Research, Mumbai.
14. T.D. Simon, (2007), "Health care accessibility and socio-economic groups: A study of Kerala" Ph. D Thesis. Department of Economics, Dr.John Matthai Centre, University of Calicut.
15. The Hindu, <https://www.thehindu.com/todays-paper/tp-national/tp-kerala/Health-allocation-takes-a-dip-in-State/article15183647.ece>, Oct-9-2016
16. <https://www.homeobook.com/homeopathy-in-kerala-current-status-and-future-plans/>
17. <https://www.indiatimes.com/news/india/here-are-8-facts-about-india-s-health-infrastructure>
18. <https://www.keralatourism.org/highresolutionimages/ayurveda/>
19. https://www.researchgate.net/publication/303013285_An_Overview_of_the_Current_Status_of_the_Homeopathic_System_of_Medicine_in_India_and_the_Need_to_Achieve_its_Best