Original Article

Monitoring the Family Health Centres in Kerala, India: Findings from a facility survey

Hari Sankar[1], Jaison Joseph[1], Jyotsna Negi[2], Arun B. Nair[3], Devaki Nambiar[1,3,4,5]

[1]Health Systems and Equity Division, Health Equity Action Lab, The George Institute for Global Health, New Delhi, India, [2]PhD Scholar, School of Public Health University of San Diego, United States of America, [3]Health Systems Research India Initiative, Thiruvananthapuram, Kerala, India, [4]Faculty of Medicine, University of New South Wales, Sydney, Australia, [5]Prasanna School of Public Health, Manipal Academy of Higher Education, Manipal, Karnataka, India

Abstract

Introduction: Kerala, a south Indian state, has often been cited globally as a model for better health outcomes at low cost but faces unique challenges in achieving Universal Health Coverage (UHC). To propel the efforts in achieving UHC, the Government of Kerala announced the "Aardram" health reform initiative, emphasising improving the quality of primary care service delivery. The reforms started in 2017, and in the first stage, 170 of 848 Primary Health Centres (PHCs) were upgraded to Family Health Centres (FHCs). The facilities were provided with additional doctors, nurses, and paramedical staff; the working hours were extended, and the range of services offered increased. In support of these processes, we carried out a facility assessment to assess differences between upgraded FHCs and existing PHCs. **Materials and Methods:** We conducted a facility-based cross-sectional assessment in eight primary care facilities of Kerala, FHC (N=4) and PHCs (N=4) from June to October 2019. A structured questionnaire covering utilisation and coverage of selected priority services for various populations and health outcome data was filled out by health staff to report data for the financial year 2018-19. Data were analysed in Microsoft Excel spreadsheets for easy analysis and replication by state stakeholders. **Results:** Coverage indicators such as full antenatal care and full immunization coverage were not appreciably different in FHCs as compared to PHCs. However, key reform-related differences were observed. On average, FHCs had 0.8 medical officers and one staff nurse per 10,000 population, whereas PHCs had 0.7 medical officers and less than 0.4 staff nurses per 10,000 population, even as the size of populations served by these human resources varied greatly across both types of facilities. The number of outpatient department visits per 10,000 population annually was 11,343 persons in FHCs and 9,580 persons in PHCs. FHCs also provided additional services such as screening for depression and chronic obstructive pulmonary disorders. **Conclusion:** Aardram primary healthcare reforms are still in their early days and appear to be associated with improved service coverage at the institutional level. However, some patterns are uneven: reforms should be carefully documented, and population-level impacts monitored over time.

Keywords: Facility survey, Family Health Centre, health system, Kerala, primary health care, UHC

Introduction

The Astana Declaration of 2018 reaffirmed the global commitment to strengthen primary healthcare as it is the most inclusive, effective, and efficient approach to enhancing people's physical and mental health and social well-being.[1] Primary care reforms in India, starting from the Bhore Committee recommendation in 1946, have stressed investment in primary care and tracking the progress regularly.[2]

The recent Ayushman Bharat program of the Government of India (GOI) has sought to advance the commitment to universal health coverage (UHC) through the provision of comprehensive

Address for correspondence: Dr. Hari Sankar, The George Institute for Global Health, Jasola District Centre, New Delhi - 110 025, India.
E-mail: hsankar@georgeinstitute.org.in

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primary healthcare through a wide network of health and wellness centres along with the provision of health insurance coverage to the citizens.[3] Health is a state subject in India and different states have rolled out primary care reforms to cater to the needs of its people.[4]

Kerala has a legacy of achieving good health at low cost owing to its investment in education and health sectors over the years.[5,6] To build on this existing strong network of public health infrastructure, Kerala launched the "Aardram" health reform initiative in 2016[7] as part of a larger series of governance reforms under the Nava Kerala Mission.[8] A major component of this initiative was increasing the scope and quality of primary healthcare services through Family Health Centres (FHCs). In 2017, the Department of Health started upgrading 170 of 848 Primary Health Centres (PHCs) to FHCs in the first stage by i) increasing health human resources to achieve coverage of one doctor per 10,000 population (meaning three doctors in a typical FHC catering to an average population of 30,000 people, along with three staff nurses, a lab technician and a pharmacist), ii) creating electronic health records to capture patient information, iii) introducing new components of care such as speciality clinics for depression screening, Chronic Obstructive Pulmonary Disease (COPD), iv) training in clinical protocols to ensure the quality of treatment, v) upgrading facility infrastructure in terms of standardising the availability of patient waiting areas, toilets, functional labs and well-stocked pharmacies and vi) extending working hours with the extension of outpatient (OP) clinic hours from 2 pm to 6 pm.[9,10]

With key UHC-linked reforms such as this, there is a concomitant need for research and monitoring progress, as iterated in the World Health Report (2013).[11] The facility-based component of current reforms focused on institutional delivery of care, requires monitoring, ideally in formats and processes that are already used and underway. In partnership with the state Aardram Task Force and the State Health Systems Resource Centre, Kerala, we undertook a baseline rapid assessment to capture the incremental change brought by primary healthcare reforms in the state, drawing from a similar assessment in the neighbouring state of Tamil Nadu.[12]

Materials and Methods

Study design

Facility assessments were conducted using a cross-sectional study design from June 2019 to October 2019 in eight PHCs and FHCs of four selected districts in Kerala. A pilot-tested structured questionnaire was used to collect data from these selected facilities.

Study tool

The present study is part of a 5-year health system research project guided by the Kerala Department of Health and Family Welfare, which began with the creation of an indicator shortlist to monitor newly set up FHCs in Kerala.[13] The developed indicators were field tested and information from facilities and households was compared to arrive at a better understanding of health service utilization and morbidity status.[14]

The questionnaire used in the current study was created after a literature search and using indicators from national and international monitoring tools such as the Service Provision Assessment (SPA) developed by the United States Agency for International Development (USAID) and the Service Availability and Readiness Assessment (SARA) developed by World Health Organization (WHO).[15,16] We also used an indicator shortlist[13] developed by our team to monitor FHCs in Kerala, Government Orders (GOs) with prescribed standards for FHCs and Key Perfomance Indicators (KPIs) for PHC suggested by the National Health Systems Resource Centre (NHSRC).[17-19] The details of the indicators and their sources are detailed in Annexure 1.

The assessment domains for this study were 1. demographics and patient visit dynamics of the population covered by each facility as reported by staff and observed by our team, 2. conformance of health facility, laboratory and pharmacy infrastructure to relevant standards (PHC and FHC aggregate comparison), 3. human resource availability, 4. laboratory costs, local-self-government support for medicines and turnover and 5. Utilisation of 13 services across four sentinel service delivery domains: reproductive, maternal, neonatal and child health (RMNCH), non-communicable diseases (NCDs), communicable diseases (CDs), general services–all these indicators were prioritised as part of an earlier process, documented elsewhere.[13]

Selection of facilities

Kerala has a population of 33 million spanning over 14 districts. There were 678 PHCs and 170 FHCs in the state in 2019. The districts were randomly selected from district groups, created based on morbidity burden and systems performance data of the state from the latest round National Family Health Survey (NFHS 4) 2015–2016.[20] The detailed methodology of creating the health system performance index and randomly selecting the districts and facilities in Kerala are detailed in Annexure 2.

The study team visited all the selected eight health facilities, which comprised four FHCs and four PHCs. The lead author (HS) first met with the staff at the facility and explained the purpose of the study. A Microsoft Excel-based form was shared with facility staff to input data for the financial year 2018–2019. The manual registers maintained in the facility were used as the key source of information. Health Management Information System (HMIS), Reproductive and Child Health (RCH) portal, as well as, all the available digital databases were used when available. A team of two investigators were assigned to each of the eight facilities for collecting data. More specifically, aggregated facility-level service delivery information such as outpatient (OP) numbers and population-level data on the utilisation of services

were sourced from records maintained at the facility. The field investigator collected data on the availability of services to patients through observation and assisted the health staff in compiling the information about service delivery in prescribed formats. Data regarding the infrastructure and patient waiting time were collected through direct observation by data collectors from the facilities. All data were collated and annual estimates for all indicators were prepared in Microsoft Excel.

Data analysis

The data collected in the facility survey for each domain were collated for each health facility annually. Annual compilation of outpatient department and case tallies of field-level population-based services were used for studying the utilisation between facilities. Data compiled through direct observation were used to study the quality of service, patient amenities and facility infrastructure. To understand the progress of FHCs when compared to that of existing PHCs in the reference year 2018–2019, the data for indicators were compiled FHC and PHC-wise. To understand the institutional level variation among selected districts, facility-level compilations were also used. Individual PHC and FHC names were replaced by district names for analysis.

Ethics and permissions

Ethical approval for the study was granted by the Institutional Ethics Committee of the George Institute for Global Health (Project no. 05/2019). Administrative permission for the study was granted by the Department of Health and Family Welfare (DHFW) in Kerala. While conducting the study, the Medical Officer-In-Charge (MOIC) of each health facility and concerning local self-government were briefed about the purpose of the study and permissions were taken.

Results

1. Demographics of the population covered by each facility

The facility survey collected data from four FHCs, which jointly served a population of 1,61,317 people and PHCs, which jointly served a population of 1,11,685 people [see Table 1]. In 2018–2019, FHCs jointly managed 1,82,994 OP visits and PHCs managed 1,07,000 OP visits. Females were the predominant users of OP services in our sample, across both FHCs and PHCs [see Table 1]. Aggregated annual facility OP visits per 10,000 population served were observed to be higher in FHCs (11,343) when compared with PHCs (9,581). The average time spent by patients was more in FHCs (56.8 min) compared to PHCs (38.4 min). The average doctor–patient interaction time was 2 min longer in FHCs [see Table 1].

2. Conformance of health facility, laboratory and pharmacy infrastructure to relevant standards

The basic amenities prescribed by IPHS and state government for an outpatient department such as separate OP rooms ensuring privacy, and patient waiting areas with chairs and television were in place at both FHCs and PHCs [see Figure 1].

Most FHCs were better equipped with precheck areas, separate toilets for visitors, a token system, and electronic health records compared to PHCs. A designated area for breastfeeding was not found in either FHCs or PHCs.

A designated pharmacy room was present in all eight facilities, out of which seven had air-conditioned storerooms. The only medicine stock out reported for the period was insulin stock out reported by a PHC in Kollam. The provision of an uninterrupted supply of drugs and consumables was reportedly robust in all the facilities.

Seven out of eight facilities (87%) surveyed had a functional lab with test capability in place. However, sputum test capabilities for tuberculosis were available only in two of the eight surveyed facilities [see Figure 2]. All PHCs with a functional laboratory had an HbA1c test facility. Laboratories in FHCs were not fully equipped to offer all the prescribed laboratory services mentioned in the GO of the FHC program.

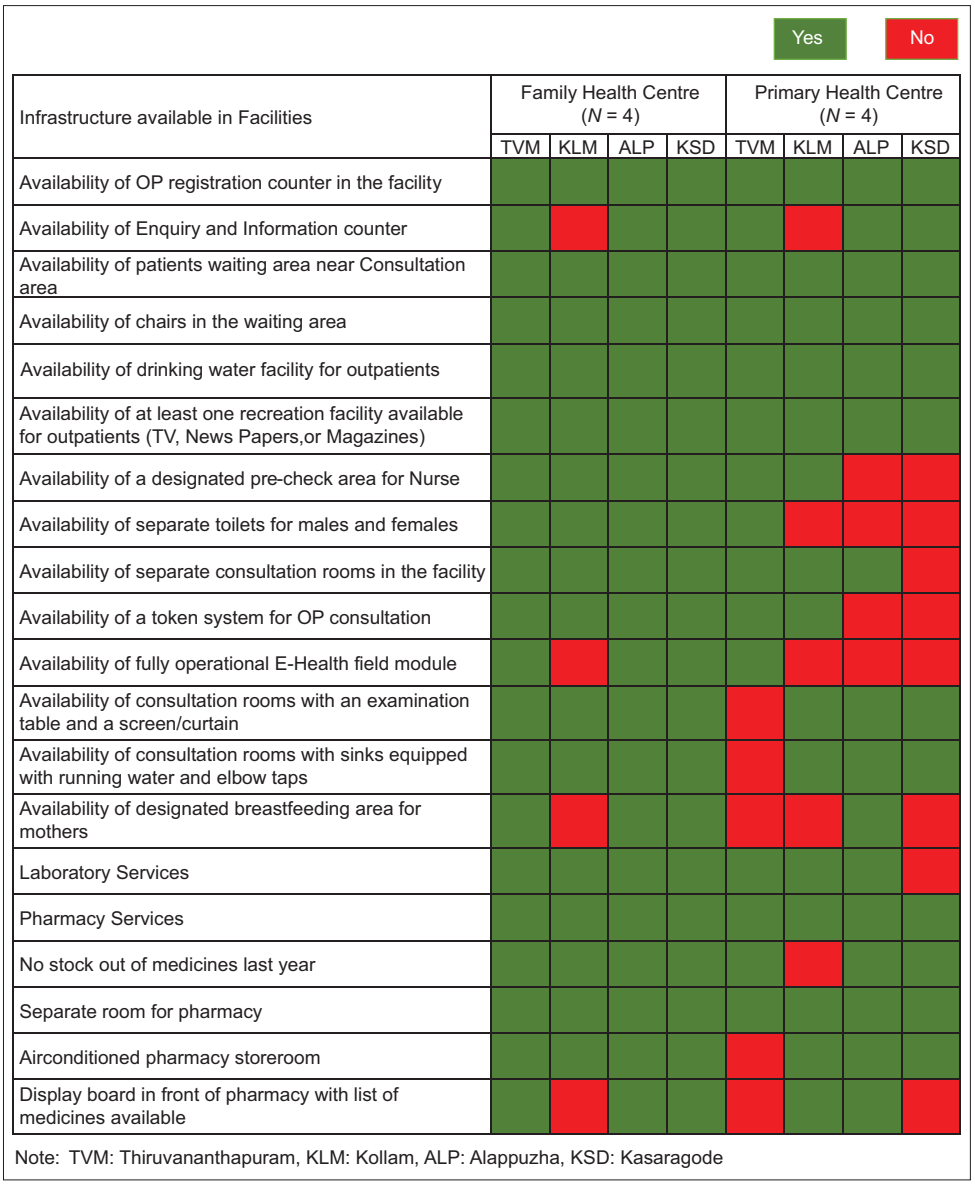
3. Facility-generated costs and turnover

FHCs, when combined, had performed more tests and generated more income in the year 2018–2019; however, at the facility level, the PHC in Thiruvananthapuram had catered to the maximum

Table 1: Annual outpatient numbers (2017–2018) and population catered by FHCs and PHCs (2018–2019)

Districts	Family health centres (FHCs)				FHCs overall	Primary health centres (PHCs)				PHCs overall
	TVM	KLM	ALP	KSD		TVM	KLM	ALP	KSD	
Outpatient male (%)	26,322 (39)	13,309 (41)	19,993 (44)	17,787 (48)	77,411 (42)	20,907 (45)	14,157 (41)	6,004 (35)	4,164 (45)	45,232 (42)
Outpatient female (%)	41,437 (61)	19,158 (59)	25,597 (56)	19,391 (52)	1,05,583 (58)	25,060 (55)	20,271 (59)	11,362 (65)	5,075 (55)	61,768 (58)
Total OP	67,759	32,467	45,590	37,178	1,82,994	45,967	34,428	17,366	9,239	1,07,000
Total population	61,326	29,541	43,691	26,759	1,613,17	20,505	48,151	14,135	28,894	1,116,85
Average monthly outpatient visits per 10,000 population	11,049	10,990	10,435	13,894	11,344	22,417	7,150	12,285	3,198	9,581
Average doctor–patient interaction time in minutes	7.3	5.5	8.6	13	8.6	3	5	10	6.6	6.1
Average duration of total patient visits to facility in minutes	62	48.3	59	58	56.8	31.5	34.7	49	24	34.8

Source: Authors, compiled from OPD register of health facilities. Note: TVM: Thiruvananthapuram, KLM: Kollam, ALP: Alappuzha, KSD: Kasaragod



Infrastructure available in Facilities	Family Health Centre (*N* = 4)				Primary Health Centre (*N* = 4)			
	TVM	KLM	ALP	KSD	TVM	KLM	ALP	KSD
Availability of OP registration counter in the facility								
Availability of Enquiry and Information counter								
Availability of patients waiting area near Consultation area								
Availability of chairs in the waiting area								
Availability of drinking water facility for outpatients								
Availability of at least one recreation facility available for outpatients (TV, News Papers,or Magazines)								
Availability of a designated pre-check area for Nurse								
Availability of separate toilets for males and females								
Availability of separate consultation rooms in the facility								
Availability of a token system for OP consultation								
Availability of fully operational E-Health field module								
Availability of consultation rooms with an examination table and a screen/curtain								
Availability of consultation rooms with sinks equipped with running water and elbow taps								
Availability of designated breastfeeding area for mothers								
Laboratory Services								
Pharmacy Services								
No stock out of medicines last year								
Separate room for pharmacy								
Airconditioned pharmacy storeroom								
Display board in front of pharmacy with list of medicines available								

Note: TVM: Thiruvananthapuram, KLM: Kollam, ALP: Alappuzha, KSD: Kasaragode

Figure 1: Conformance of infrastructure available in health facilities to state government order and Indian Public Health Standards (2019)

number of people and collected more than five and a half lakh rupees in revenue [see Table 2]. FHCs on average received nearly 10 times more financial assistance from local self-government for medicine purchases than PHCs for the financial year 2018–2019. The PHC in Alappuzha reported the lowest cost per person (Rs. 17) for laboratory services.

4. Human resource availability

FHCs had three MBBS doctors per facility as mandated by the program on average, whereas PHCs had two, and on average, four staff nurses were posted per FHC. Notably, FHCs had more permanent positions in all categories of health staff. There was no marked difference between staff strength when comparing field-level workers (Junior health inspectors, junior public health nurses and staff in support services such as hospital attenders, drivers, part-time sweepers [see Table 3]. The ratio of doctors per 10,000 population in FHC (0.8) and PHC (0.7) was also not very different but FHCs had 1 staff nurse per 10,000 compared to 0.4 in PHCs [see Table 4].

5. Service utilisation

Maternal and child health services

All the facilities, which provided data, reported delivering full Ante Natal Coverage (ANC) for all pregnant women in their catchment population. Full immunisation coverage of all facilities was above 80%, with two PHCs achieving 100% immunisation. The proportion of newborns with low birth weight (> 2500 gm) was highest in FHC in Kasaragod (11%).

Non-communicable disease management services

When it came to NCD screening, the FHC in Trivandrum had screened nearly 30% of its population for hypertension and

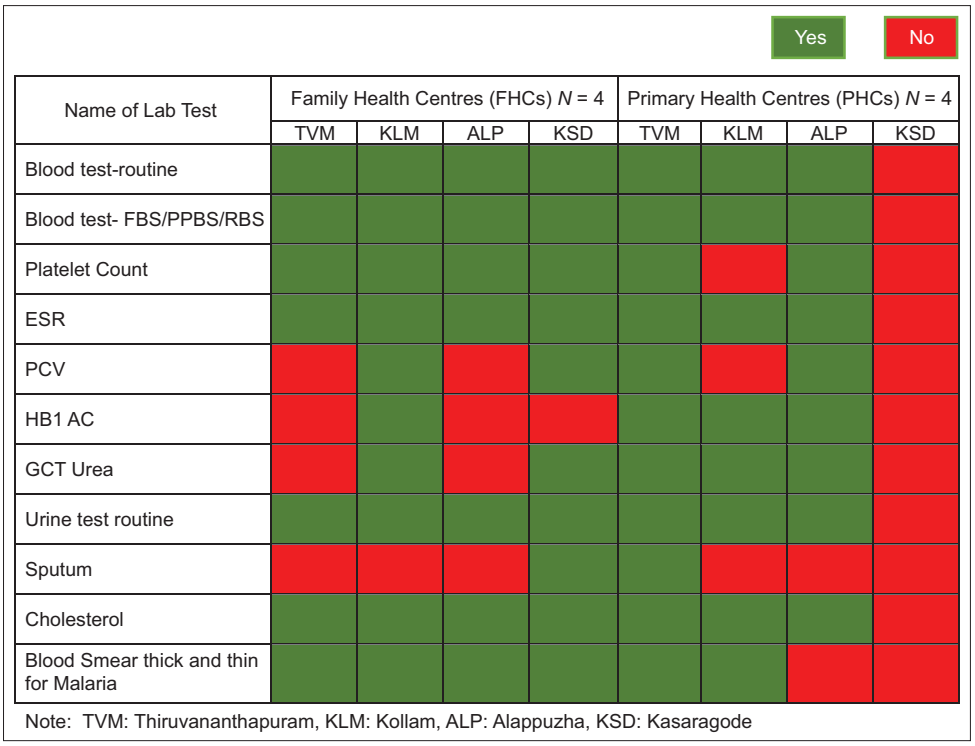


Figure 2: Availability of laboratory tests in FHCs and PHC 2018–2019

Table 2: Laboratory utilisation, cost and LSG fund allocation for medicine purchase in FHCs and PHCs for the financial year (2018–19)

	Family health centres (FHCs)				FHC overall	Primary health centres (PHCs)				PHC overall
	TVM	KLM	ALP	KSD		TVM	KLM	ALP	KSD	
Lab visits in facilities	8,613	4,966	7,350	8,587	29,516	13,690	1,920	1,382	NA*	16,992
Annual turnover in Rs	2,85,835	2,08,195	1,29,000	1,95,260	8,18,290	5,62,050	55,940	23,651	NA*	6,41,641
Average cost per patient in RS	33	42	18	23	28	41	29	17	NA*	37
LSG fund approved Rs	12,20,000	3,65,000	4,50,000	2,00,000	22,35,000	250000	0	0	0	2,50,000

*Lab facility not available at PHC in Kasaragod. Note: TVM: Thiruvananthapuram, KLM: Kollam, ALP: Alappuzha, KSD: Kasaragod. Source: Authors calculation based on data from lab registers of health facilities

Table 3: Human resource details of FHCs and PHC (2018–2019)

Designation	Family health centres (FHCs)				Primary health centres (PHCs)			
	Sanctioned posts	In position posts	Contractual posts	Total position	Sanctioned posts	In position posts	Contractual posts	Total position
Medical officer	10	10	3	13	4	4	4	8
Pharmacist	7	6	2	8	4	4	0	4
Lab technician	3	2	3	5	0	0	3	3
Staff nurse	13	13	3	16	1	3	4	7
Nursing assistant	4	4	0	4	4	4	0	4
Hospital attendant	4	4	1	5	4	4	0	4
Clerk	4	4	0	4	4	4	0	4
Part-time sweeper	4	4	1	5	4	4	0	4
Health inspector	3	4	0	4	3	4	0	4
Lady health inspector	2	2	0	2	3	3	0	4
Junior health inspector	21	21	0	21	16	15	1	16
Junior public health Nurse	23	23	0	23	20	20	1	21
Driver	0	0	0	0	0	0	1	1
Office attendant	4	4	0	4	4	4	0	4

Source: Calculated by authors by review of facility records. Sanctioned refers to permanent positions employed by the state government, in position refers to out of sanctioned, how many are filled, contractual posts can be post-funded by NHM, HMC or Panchayath, which are for a year and then get renewed

Table 4: Health human resource per 10,000 population

Designation	Family health centers (FHCs)				FHC overall	Primary health centres (PHCs)				PHC overall
	TVM	KLM	ALP	KSD		TVM	KLM	ALP	KSD	
Medical officer	0.5	1.0	0.7	1.5	0.8	2.0	0.2	0.7	0.7	0.7
Staff nurse	0.7	1.4	0.9	1.5	1.0	1.0	0.2	0.7	0.3	0.4
Pharmacist	0.5	0.7	0.5	0.4	0.5	0.5	0.2	0.7	0.3	0.4
Lab technician	0.2	0.3	0.2	0.7	0.3	0.5	0.2	0.7	0.0	0.3

Note: TVM: Thiruvananthapuram, KLM: Kollam, ALP: Alappuzha, KSD: Kasaragod

Table 5: Annual estimates for selected indicators on RMNCHA, CD, NCD prevention, control and process indicators for FHC program (2018–19)

Si	Indicator	Family health centres (FHC)				Primary health centres (PHC)			
		TVM	KLM	ALP	KSD	TVM	KLM	ALP	KSD
1	The proportion of pregnant mothers who received full ANC	NR	119%	102%	104%	103%	112%	134%	106%
2	Full Immunisation coverage rate	86%	84%	97%	99%	85%	98%	100%	100%
3	Low birth weight among newborns	3.8%	7.8%	10%	11%	7.3%	NA	5.3%	9.2%
4	The proportion of outpatients receiving pre-check service by staff nurse[#]	40%	85%	NA	100%	NA	NA	NA	65%
5	The proportion of total outpatients seen in the evening OP	NA	17%	NA	14%	27.5%	NA	NA	NA
6	The proportion of the population screened for blood pressure >30 years[##]	30%	2%	16%	7%	15%	4%	10%	15%
7	The proportion of the population screened for blood sugar >30 years[##]	30%	2%	16%	3%	4%	6%	1%	12%
8	Number of cases diagnosed with asthma or COPD*	NA	154	NA	145	55	NA	NA	NA
9	Number of cases diagnosed with depression*	30	71	15	59	NA	NA	NA	NA
10	Number of patients receiving palliative care services	1685	114	2829	3105	1294	3256	5200	118
11	Number of patients who completed tuberculosis (TB) treatment	NA	11	17	4	8	24	8	10
12	Number of children under 15 years of age among all new Leprosy cases detected	0	0	0	0	0	0	0	0
13	Number of malaria cases detected	0	0	0	0	0	0	0	0

Note: NA refers to services not available in facilities, and NR refers to data not received from the facility as part of this assessment. *The COPD and depression screening clinics were introduced as part of the FHC program and were not operational throughout the entire reference year of 2018-2019. [#]Precheck by staff nurses was introduced as part of the FHC program. Some PHCs have started delivering these services and some FHCs were not offering these services during the prescribed period for data collection. [##]National guidelines recommend population-based screening of all aged 30 and over for hypertension, diabetes, as well as oral, breast and cervical cancer. In Kerala, blood pressure screening is carried out for all adults in many facilities as part of regular check-ups. Moreover, age-disaggregated data on eligible populations per facility was not available. Therefore, we have used the overall population as the denominator of each facility to determine this proportion

blood sugar, whereas the FHC in Kollam reported the lowest, that is, only 2%, the highest population screening rate for blood pressure among PHCs was reported in Trivandrum (15%) [see Table 5]. Screening for depression was introduced as part of "Aardram" reforms and was reported in all the FHCs in the study. The FHC in Kollam reported the highest number of depression cases from the screening clinics. Screening for COPD was operational in two FHCs and one PHC among the institutions surveyed: the highest detection from the screened population was from the FHC in Kollam [see Table 5].

Communicable disease management services

Surveyed facilities reported neither a single case of leprosy in those under 15 years old nor any cases of malaria. The number of TB cases was very low in almost all facilities. PHC in Kollam has the highest, 24 cases, and the FHC in Kasaragod had the lowest, 4 cases. FHCs and PHCs at the time of assessment followed the national protocols for communicable disease surveillance and treatment.

Services such as pre-check by a staff nurse (recording vitals and history before meeting the doctor and feeding to E-health) were found to be operational only in three FHCs and one PHC where the utilisation was the highest. The PHC in Thiruvananthapuram had 65% of its outpatients receiving precheck services [see Table 5].

Discussion

This analysis examined key population and service coverage indicators related to newly introduced FHC reforms in facilities across four districts in the state of Kerala.

Our study corroborates media reporting that FHC upgradation in Kerala as part of Aardram reforms has attracted people to the public sector[21,22]: Outpatient visits per 10,000 population were more in FHCs than in PHCs. The FHC program has people-centredness and patient-friendliness as its goals, which warranted infrastructural upgradation and adequate staff capacity. Pre-check services handled by staff nurses as part of the new reform appear to be contributing to the increased time spent in FHCs. The increase in doctor–patient interaction in FHCs is a positive sign; however, it is too early to state as it might also be due to the newly introduced E-health platform, which requires doctors to enter the details of patients into their computers. Further study is needed to understand this.

Upgradations in infrastructure and the provision of additional human resources in FHCs were also observed in our study. Our observations are consistent with the fact that nearly 60 FHCs have been accredited with the National Quality Assurance Standards for PHC level and 12 of the best-performing primary health facilities

in the country in 2020 were Kerala FHCs.[23] Every FHC and most PHCs today in Kerala are equipped with a functional laboratory capable of performing basic blood routine and NCD screening tests. It is crucial to build on this and develop FHCs as the first contact centres for healthcare among people. Ensuring an uninterrupted supply of medicine in public facilities is vital in reducing healthcare costs for people. The Kerala Medical Service Corporation (KMSCL) supplies medicines to all the public health facilities in Kerala, also set a financial cap for the purchase of medicines by type of facilities. We learned from our field interactions that facilities have a provision for purchasing additional medicine, that is, based on the morbidity pattern of the local area using funds available from LSG. Nationally, drugs and diagnostics contribute to half of the out-of-pocket expenditure incurred in accessing healthcare services[24]: This is a critical area of further intervention and impact in FHCs. The Aardram mission and FHC with the provision of good-quality services at low or free of cost are expected to reduce the burden of out-of-pocket expenditure faced by the state.

Our study found that FHC program has established additional permanent health staff positions in FHCs. Permanent government postings provide financial stability, enable longer service periods, and provide opportunities for in-service skill-building, resulting in job satisfaction and security: important determinants of staff retention.[25] Secure and long-standing health human resources can establish deep and abiding links with communities, and truly serve them as part of "Family" health centres.

Kerala has separate primary health centres for Modern Medicine and Ayurveda Unani Siddha and Homeopathy (AYUSH) system, and the study reports PHCs and FHCs in Kerala are better equipped in terms of human resources when compared to the rest of the country[26] as well as the WHO recommended norms.[27] According to the 2020–2021 economic survey, Kerala had the highest health worker concentration of 65 per 10,000 population (comprising doctors [AYUSH and modern medicine] nurses and midwives).[28] We did, however, also note that the emphasis of human resourcing was on medical staff; frontline and field teams were not expanded. In addition to the initial emphasis on the medical staff, FHC reforms are hoping to leverage the creation of health volunteers, or Arogya Senas across the state (our parent study did determine that awareness about this initiative is low across locations, however). Greater emphasis on the field component is likely required to ensure that FHC reforms do not lead to an institution-centric, medicalized model.

That said, Kerala enjoys an existing strong network of PHCs and enablers such as local self-government support for health institutions that have played a major role in providing financial support for primary care.[29] FHC reforms were structured to capitalise on these gains and the stewardship of FHCs–left to the discretion of local self-government institutions—was designed to help jumpstart this.

PHCs in Kerala have historically offered quality maternal and child health services such as immunisation and antenatal care, which bears out in our assessment as well. A study by Moosan *et al*.[30] in Kerala found that the utilization of MCH services was high in Kerala and was comparable among mothers and children of the general and tribal community. The coverage rates reported in our study for both these indicators in the survey did not vary much between FHCs and PHCs but were higher than the estimates reported on these indicators by the National Family Health Survey (NFHS)-4, which reported a full ante natal coverage of 61% and full immunisation coverage of 82% for Kerala in 2016.[20] This difference is expected as NFHS employs a house-to-house data collection technique, whereas our study sourced administrative coverage data generated by health facilities. Our study findings of low birth weight (LBW) of children report by facilities were consistent with 13.3% of LBW reported by United Nations Children's Fund (UNICEF) in 2018.[31]

One of the key strategies of the FHC program was to improve NCD surveillance and care, our study found that NCD risk factor screening in FHCs has increased, and the program is reaching out to a larger population when compared to PHCs for the same reference period. An earlier study by Vishwanathan *et al*. in Kerala had reported a self-reported prevalence of 2.82% (95% confidence interval [CI] 2.52–3.12) for asthma and 6.19% (95% CI 5.76–6.62) for bronchitis, which suggests that Kerala's COPD screening services in FHCs were needed.[32] Their uptake and impact also should be assessed going forward.

Our study also reported a low prevalence of communicable diseases like Malaria, Leprosy and TB at the surveyed facilities which are consistent with other studies from Kerala. Annual cases of Malaria in Kerala as per the Department of Health data are less than 2,000 in the state with a population of 3.3 crores people in 2017–2018.[34] A recent state-wide campaign to detect leprosy in school children as part of the leprosy eradication initiative yielded only 131 new leprosy cases.[35] The India TB report by the central TB division reports the incidence in the state as 67 cases per 100,000, which is less than half of the country's incidence reported as 138 per 100,000 population.[33,36] There was no notable difference in FHCs and PHCs in CD-related service utilization indicators. This low prevalence of CDs over the years in the state may be attributed to the successful implementation of existing national programs and might have influenced the decision not to give additional focus to CD control and field-level activities in the FHC program in the first stage.

Aardram reforms seek to reduce both burden and cost: Kerala's draft State Health Policy, 2018, envisioned FHCs as a gatekeeper for health promotion, prevention and early detection, resulting in a reduced patient load in tertiary care facilities.[37] Further, the sustainability of a health program in Kerala with an established decentralised governance system would depend on the acceptance by local self-governments, the program at present enjoys support from LSGs evident from the increased fund inflow to FHCs. Given that FHCs were selected with inputs from LSGs, it remains

to be seen when a wider swathe of PHCs are upgraded, whether such investments will continue to be made and sustained across all facilities, to the benefit of all population groups.

Conclusion

Aardram primary healthcare reforms are still in their early days and appear to be associated with increased population and service coverage at the institutional level. However, some patterns are uneven: reforms should be carefully documented, and population-level impacts monitored over time and at the community level.

Limitation

The current study was part of larger health system study which involved community level quantitative and qualitative data collection which limited our sample size of facility survey to just eight facilities which are not big enough to provide insights to understand the extend of of execution of health reform adoption, rather it provides first level understanding of the process of execution and provides a tool which could be used for larger sample of facility survey.

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Conflicts of interest

There are no conflicts of interest.

[1] We noted patient waiting time for four patients per facility by shadowing them and recording the time taken at various points inside the facilities.

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Annexure 1

Table 1: Indicators, method, and source of data of items in the data collection tool

Assessment domain	Method of data collection	Source
Number and proportion of outpatient visits related to communicable, Non communicable, maternal and child health services	Aggregated data for reference year 2018-19 collected by investigator in prescribed format from health staff in charge of data compilation	SARA, SPA questionnaires, FHC monitoring Indicator KPI NHSRC
Infrastructure for patient amenities Availability of patient waiting areas, separate toilets for men and woman etc.,	Observation by investigator	IPHS, FHC GO
Lab and pharmacy services Type of services available % of Stock out of essential drugs and financial information on service utilization	Aggregated data for reference year 2018-19 collected by investigator in prescribed format from health staff in charge of data compilation	IPHS, FHC GO,
Human resource for health Number of doctor's, staff nurses, pharmacist field and support staff, Health human resource per 10,000 population	Provided by clerical staff at facility	IPHS, FHC GO, WHO
Time taken by patient in health facility	Time motion study	KPI NHSRC

Note: Essential FHC infrastructure in Department of Health G.O and IPHS for PHCs were used to assess the infrastructure in health facilities Source: Authors, data collected by direct observation by visiting the health facility

Annexure 2

Process of selecting institutions for Facility survey in Kerala

The fourteen districts in the state were first grouped into four clusters (see Table 1). Clusters were made using Principal Component Analysis (PCA) on Stata 12 software. PCA is a dimension-reduction tool that is used to reduce a large set of variables to a small set that contains most of the information in the large set. Set of variables that were used for making clusters of the districts were i) Household with electricity, ii) Improved drinking water iii) improved sanitation, clean fuel for cooking, insurance, iv) Women with 10 or more years of schooling (%), v) High glucose in women and men, vi) Women whoever had cervix examination, vii)Women with below normal Body Mass Index (BMI), above-normal BMI, viii) Children with full immunization, ix) Hypertension in men and women x) Children who reported Diarrhoea in last 2 weeks. Using Composite factor scores (first), all 14 districts of Kerala were ranked and grouped from least to most performing as mentioned below. From each of the four clusters, one district was selected randomly. All the FHCs and PHCs in the selected districts were listed and one PHC and one FHC in each district were further selected randomly using an open-source randomiser tool

Table: 1 Facility selection from district grouping

	District Groups	Selected district
1	Kasargode Kozhikode Palakkad Wayanad	Kasargode
2	Alappuzha Idukki Kannur	Alappuzha
3	Ernakulam Malappuram Pathanamthitta Thiruvananthapuram	Thiruvananthapuram
4	Kollam Kottayam Thrissur	Kollam

Source: Authors classification based on performance index created from NFHS 4