

A historical review and current perspective of Maternal and Child health in India

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Abstract: While maternal and child mortality in India is widely discussed and analysed subject, components of health system, historical approach of policy development etc., remain largely overlooked. The review article provides comprehensive insight of maternal and child health and also a holistic view of the health system components mainly associated with maternal and child health. Maternal and child health is discussed in terms of mortality rates and health systems is discussed based on 6 basic building blocks defined by World Health Organization (WHO); health infrastructure, health workforce, health information system, essential medicines and health finance. The article is based on information and data from national health surveys (NFHS, SRS, DLHS), peer reviewed research papers, government reports etc. Data was analysed at temporal as well as geographical scale to understand and explore the trends and state wise disparity in maternal and child health care status, services, infrastructure and finance in India.

Keywords: Maternal and Child health, Health system, spatial variation, India.

I. HISTORY OF MATERNAL AND CHILD HEALTH (MCH) POLICIES AND SERVICES IN INDIA

The history of medical services in India dates back to 1600, when the first medical officers arrived in India along with the British East India Company's first fleet as ship's surgeons and later on established first medical department in 1764 for providing health services to troops and servants of the company [1]. Initially hospitals were established for general illness at major focal points of their power, trade and commerce, namely in Bombay, Madras and Calcutta. During, pre-independent era, there were no hospitals to cater the need indigenous and care of women and practice of midwifery were totally in the hands of indigenous village 'dais' which also acted as consultants for any maternal illness. Medical missionary women from England brought to India, upon realizing the need of maternal and child health institution. This lead to establishment of the first training school for dais in 1877 by Miss Hewlett, an English missionary of the Zenana Missionary Society [2].

Training of Dais (1880), Advisory committee on maternal mortality (1937), Bhore committee (1946) were some of the earliest efforts to improve MCH during pre-independence, which established the foundation for MCH services in India. The Bhore committee which is also known as the "*Health survey and Development Committee report*", was a detailed plan for National Health Services in the country to provide universal health coverage. A report by Ravi Duggal [3], discussed the recommendation of Bhore committee with the post-independence health practices by Government. The report says that "Bhore committee" was the most comprehensive health policy and plan document ever prepared in India. It also points out that post-independence, first National health report published in 1948 under the Planning commission, lacked detailed analysis and adequate strategies and planning to improve the health status of country [3].

Post-independence, establishment of Planning commission (1950) was the first step towards improving the Maternal and Child health care services. It was chaired by Shri Jawaharlal Nehru, the first prime minister of India, to promote a rapid rise in the standard of living of the people by efficient use of the limited resources. Under the planning commission, the first 5- year plan was launched in 1951, largely for the purpose of training and research. It was revealed that 40 % of the total deaths occurred among children of age below 10. As a result, second 5-year plan reformed to include the "Health service". With time and experience successive five year plans were improved and upgraded for larger coverage and achieving the universal health.

Within 2 years of establishment of Planning commission, India introduced National Family Planning Programme (NFPP) (1952) to reduce birth rate and stabilize the population consistent with the requirement of the national economy. During the initial two decades after independence, country wide multiple schemes, policies and programs were deployed to improve the health care system.

To monitor and evaluate health status and undertake health care planning and policy implementation, Ministry of Health and Family Welfare (MoHFW) was formed in 1976. MoHFW has two departments 1) Department of Health Research: deals with health care, including awareness campaigns, immunization campaigns, preventive medicine, and public health and 2) Department of Family welfare: responsible for reproductive health, maternal health, pediatrics, information, education and communications; cooperation with NGOs and international aid groups; and rural health services.

By this time, there was a growing need to reduce morbidity and mortality in the children due to preventable diseases. As a result, Children Immunization programme was introduced in 1978 as “Expanded Immunization programme (EIP)”, which was later transformed into “Universal Immunization programme (UIP)” during 1985-86. Under the UIP government of India provided vaccination to prevent 11 preventable diseases nationally, i.e. Diphtheria, Pertussis, Tetanus, Polio, Measles, severe form of Childhood Tuberculosis and Hepatitis B and Meningitis & Pneumonia caused by Haemophilus influenza type B; and against Rubella & Rotavirus Diarrhea in selected states and Japanese Encephalitis in endemic districts. Significant progress was made under the Programme in the initial period when more than 90% coverage for all the six antigens was achieved [4]. Realizing that maternal health is an integrated component of Child health, UIP programme became a part of Child Survival and Safe Motherhood (CSSM) programme in 1992, and Reproductive and Child health (RCH) programme formed in 1997.

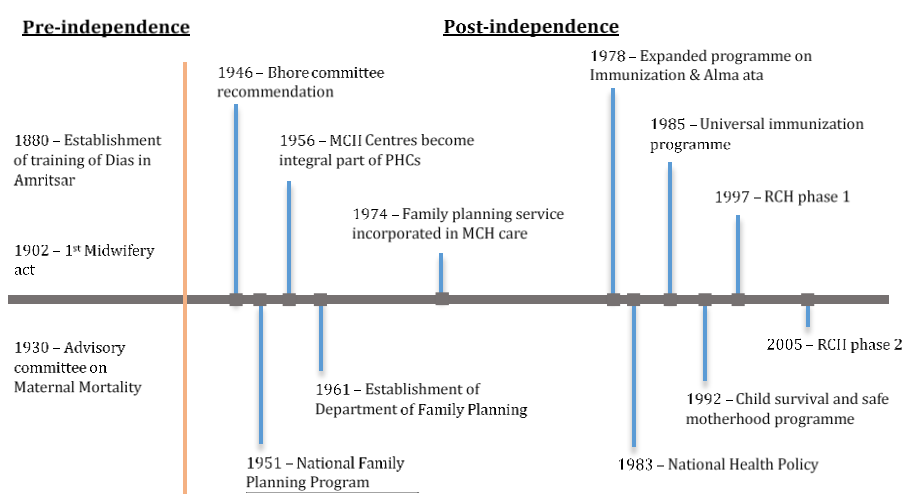


Fig. 1: Timeline of key MCH initiatives and establishments in India

CSSM was jointly funded by World Bank and UNICEF was started in 1992-93 for implementation up to 1997-98. The programme aimed to improve health status of children and mothers. It also strengthened and increased the coverage of immunization services to poor performing areas. CSSM was credited to be successful in improving health status of pregnant women, infants and children and subsequently reducing the IMR and MMR [3]. In 1997-98, a new programme was launched integrating CSSM programme to improve the health status of women and children by reducing early childhood and maternal mortality and morbidity and fulfil the unmet need for Family Welfare services. The programme was named as *Reproductive and Child health care (RCH) programme*.

RCH programme had two phases. During RCH phase-1, percentage of women receiving any ANC rose by 12 %, while use of government facilities declined. Infant mortality rate also reduced during this phase; from 71 in 1997 to 60 in 2003 [5], [6]. Reproductive and Child Health-II was a comprehensive programme under the National Rural Health Mission (NRHM). The main objective of the RCH – II was to bring about an improvement in mainly three critical health indicators i.e. total fertility rate (TFR), infant mortality rate (IMR) and maternal mortality rate (MMR). The programme was consistent with the outcomes envisioned in the Millennium Development Goals, National Population Policy 2000, the National Health Policy 2002, the Tenth Plan Document, and Vision 2020 India. The women in the reproductive age group and children up to 5 years of age were covered under this phase. RCH 2 was largely decentralized programme and held state accountable by involving in development of programme. Some of the key features of the RCH 2 are listed in table 1.

TABLE I: SALIENT FEATURES OF RCH PHASE 2

<ul style="list-style-type: none"> • Adoption of Sector wide approach which effectively extends the program reach beyond RCH to the entire Family Welfare sector.
<ul style="list-style-type: none"> • Building State ownership by involving states and UT's from the outset in development of the program.
<ul style="list-style-type: none"> • Decentralization through development of District and State level need based plans.
<ul style="list-style-type: none"> • Flexible programming with a view to moving away from prescriptive scheme based micro planning and instead allowing States to develop need based work plans with freedom to decide upon program inputs.
<ul style="list-style-type: none"> • Capacity building at the District, state and the Central level to ensure improved program implementation. In particular, the emphasis being on strengthening financial management systems and monitoring and evaluation capabilities at different levels.
<ul style="list-style-type: none"> • Adoption of the logical frame works as a program management tool to support and outcome driven approach.
<ul style="list-style-type: none"> • Performance based funding to ensure adherence to program objectives, reward good performance and support weak performers through enhance technical performance.
<ul style="list-style-type: none"> • Pool financing by the development partners to simplify and rationalized the process of assessing external assistance.
<ul style="list-style-type: none"> • Convergence, both inter sectoral as well as intra sectoral to optimize utilization of resource as well as infra structural facilities.

Realizing the equal importance of health just as economic and social development and to improve the quality of life, the Government of India launched the National Rural Health Mission (NRHM) in 2005 to bring out necessary correction in the basic health care delivery system. The mission aimed to improve the availability and accessibility of quality health care services, especially to those who are economically poor and residing in rural areas. NRHM envisioned to establish fully functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality. The National Rural Health Mission (2005-12) targeted rural population throughout the country with special focus on 18 states, which had weak public health indicators and/or weak infrastructure to provide effective healthcare.

Success of NRHM led to establishment of National Urban Health Mission (NUHM) as a sub-mission of National Health Mission (NHM) in 2013 which is to continue till 2020. While NRHM was set up for rural health care system development, NUHM targeted the Urban population. NUHM envisages to meet health care needs of urban poor, by increasing availability to essential primary health care services and reducing their out of pocket expenses for treatment.

Despite of health sector reform, technology-aided advancement in MCH care and treatment and presence of many MCH strategies and interventions, there is inadequacy of the availability and adoptability of maternal and child health care services leading to the higher Maternal mortality ratio (MMR) and Child mortality rate (CMR). Stringent monitoring, data driven planning and decentralized approach in the health care delivery may further help to improve the Maternal and child health in the country.

II. TREND AND STATE WISE DISPARITY IN MATERNAL AND EARLY CHILDHOOD MORTALITY

World Health Organization defines Mortality as the number of deaths by place, time and cause. Maternal mortality ratio (MMR) is the probability of dying due to birth related complication per 100,000 live births. While childhood mortality rate is calculated per 1000 live births. Early childhood mortality is usually represented in three different age groups 1) Infant mortality rate (IMR): death of children under 1 year of age, 2) Under 5 mortality rate (U5MR): death of children under 5 year of age and 3) Neonatal mortality rate (NMR): death of children within 28 days of birth. Early childhood and maternal mortality are widely accepted indicators of health of a country. A report on "Cause of Death Statistics 2010-13" [7], jointly prepared by the Registrar General of India and Centre for global health research reveals major causes of death by age group, gender, EAG groups, and geography. According to it, 9% of the women aged 15-29 years die from maternal conditions and as much as 45.9% of the infant mortality (age below 1 year) was due to prematurity, low birth weight, birth asphyxia and birth trauma together, and 6.7% deaths occurs due to diarrheal disease [7].

III A. Trend in Maternal Mortality

In 1990 India’s MMR (556) was higher than even average global MMR (385) and accounted for 27% of the global maternal deaths [8], [9]. Inclusion of maternal care in the National development programme and many other national and regional schemes have significantly reduced maternal mortality since then. While globally there was decline in maternal deaths by 47 % during the period of 1990-2010, India has registered decline of almost 70%, contributing only 16 % of the total maternal deaths globally. As per the WHO data [8] and SRS data [10], the MMR has decreased from 556 in 1990 to 130 in 2016, with an average annual reduction rate of 2.7% and an overall reduction rate of 70.5%.

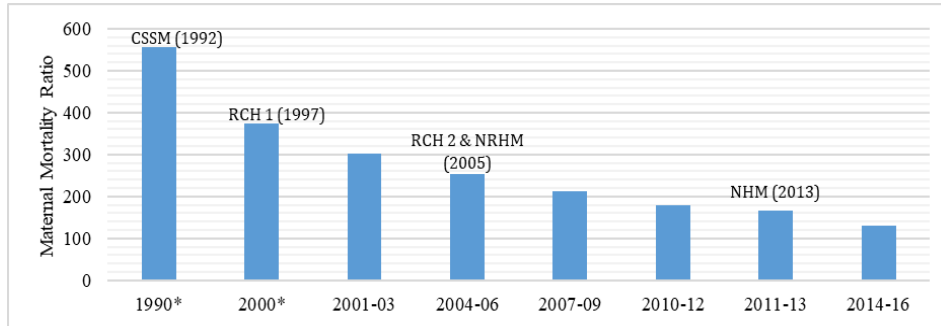


Fig. 2: Maternal Mortality trend in India

Source: Sample registration system (SRS) and *Global health observatory, WHO

The highest rate of decline in MMR was registered during the period of 2004-06 to 2007-09, which incidentally coincide with the period, immediately after the launch of NRHM (2005) along with other initiative taken under the scheme contributed significantly in increasing the institutional deliveries. Janani Suraksha Yojana (JSY, 2005) was one of the successful initiate undertaken to reduce maternal mortality during this period. Recent MMR estimate indicates that, still 130 women die per 100,000 live births related to pregnancy in India [10].

III B. State wise disparity in Maternal mortality

Maternal mortality rate varies across the states. Northern states predominately have high MMR compared with the southern states of India. Northern states (Uttarakhand, Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, Jharkhand; Central states: Madhya Pradesh & Chhattisgarh) and eastern states (Odisha and Assam) were the states with high MMR while most of the southern states (Maharashtra, Andhra Pradesh, Tamil nadu and Kerala) had low MMR. South India’s average literacy rate (80%) is higher than Indian national average (74%), and the disparity in northern and southern states may be reasoned with the differentiation in literacy rates [11], [12].

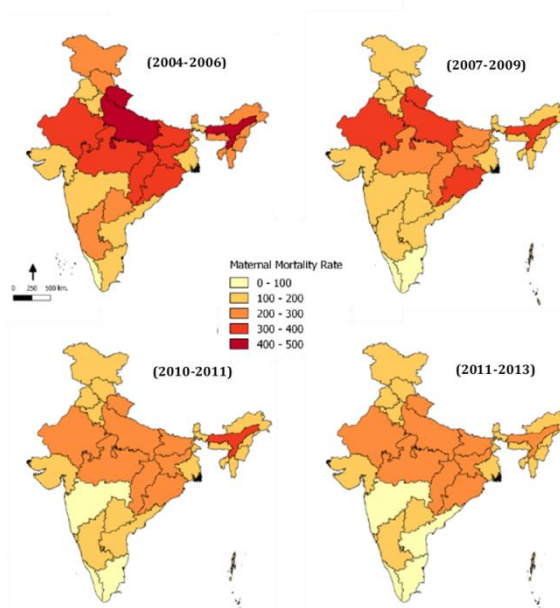


Fig. 3. State-wise maternal mortality trend Data source: SRS

Further socio-economic status of the region is also a vital determinant for MMR [13]. Empowered Action Group (EAG) states, are defined as socio-economically poorly developed states. Eight EAG states of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand and Uttar Pradesh had MMR consistently above 200. On the other hand, most of the non-EAG (Non Empowered Action groups) states have registered MMR below 200 during the period reference period (fig. 3). The state of Assam, Uttar Pradesh, Uttarakhand, Odisha and Rajasthan continues to be the top 5 states with the high MMR throughout period (2004-13). The states of Kerala, Maharashtra, Tamil nadu and Andhra Pradesh has successfully brought down MMR below 100; i.e., 61, 68, 79, and 92 respectively. Maharashtra, Andhra Pradesh, Haryana, Tamil nadu, Punjab, Gujarat and Assam has demonstrated significant decrease in the MMR. The MMR of these states dropped by 14.6%, 11.7%, 10.2%, 9.9%, 7.3%, 6.3% and 5.8% respectively during the period of 2010-12 to 2011-13 [10].

III C. Trend in Early Childhood mortality

Fig. 4 graphically presents Under 5 mortality rate, Infant mortality rate and Neonatal mortality rate with respect to successive NFHS rounds of survey. It is evident that neonatal mortality rate had declined from 49 deaths per 1,000 live births to 30 deaths per 1,000 live births. The infant mortality rate declined from 79 deaths per 1,000 live births to 41 deaths per 1,000 live births. During the same period, under-five mortality rate declined from 109 deaths per 1,000 live births to 50 deaths per 1,000 live births. Under 5 mortality rate, infant mortality rate and neonatal mortality rate decreased by 52%, 48% and 38% respectively over a period of 23 years (1992-2015). Decline in the under-five mortality rate was higher than the decline in the infant mortality rate and neonatal mortality rate during this period [14].

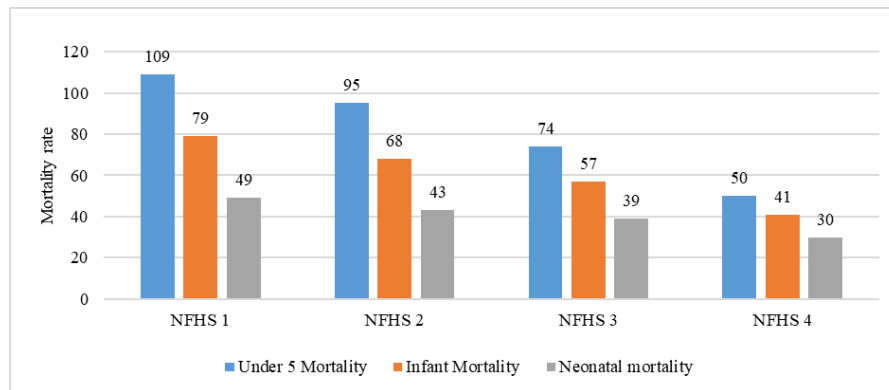


Fig. 4. Trend in early childhood mortality

With reference to the information given in SRS bulletins, there was decline in Infant mortality rate. RCH and NRHM were two major flagship programmes, which had significant impact on reduction of the IMR. During the period of 1997-2004, RCH phase 1, IMR has decreased with an average annual reduction rate of 2.6% and overall reduction rate of 18.3%. The simultaneous launch of RCH phase 2 and National Rural Health Mission (2005) was very successful in bringing down IMR. In a decade (2005-2016) IMR had reduced with an average annual rate of 3.7% and overall reduction by 41.3%. [15].

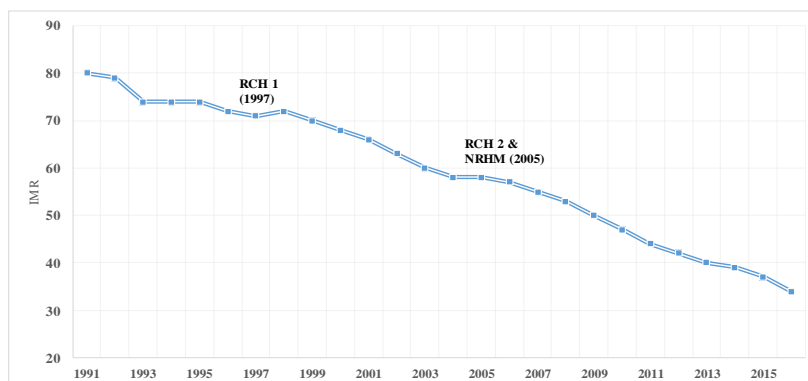


Fig. 5. Trend in Infant mortality (RCH – Reproductive and Child Health programme; NRHM – National Rural Health Mission)

III D. State wise disparity in Infant mortality

Number of factors are responsible for disparity in IMR and U5MR across states/regions and economic status, education, public health facilities and infrastructures, and environmental services like water, sanitation and waste management are the major determinant for these variations [16], [17]. It was also researched that exclusive breastfeeding up to 6 months can prevent up to 13% of the estimated under five deaths and appropriate complementary feeding can prevent almost 6% of under-five mortality [18]. In India, IMR and U5MR remains higher in rural as compared to Urban areas and higher IMR of rural India was stated to attributable to the underlying disadvantage of low household wealth and poor maternal education [19]. Comparing the NFHS 4 data of IMR and U5MR of urban and rural India, indicates that there is significant difference in IMR and U5MR of Urban and Rural India ($t_{IMR(54)}=-3.73$, $p_{IMR}<0.05$; $t_{U5MR(54)}=-3.95$, $p_{U5MR}<0.05$), and rural India has higher rates of Infant and under 5 deaths. The studies [20]–[22] also reported that malnutrition, respiratory infection and diarrhoeal diseases are still major problem among under five children.

Fig 6. Shows the state wise 5-year average IMR for the period of 2000-2016 using [15]. Majority of the Central states have high IMR including few other states of Assam and Andhra Pradesh. During the period of 2000-05, the IMR was highest in the states of Madhya Pradesh and Odisha. A study [23], indicates that in rural Madhya Pradesh although the exclusive breastfeeding rate is satisfactory but there are many inappropriate feeding practices during early childhood. High infant mortality rates in Odisha may be related to the poor availability of children's medicines in public sector and relative high

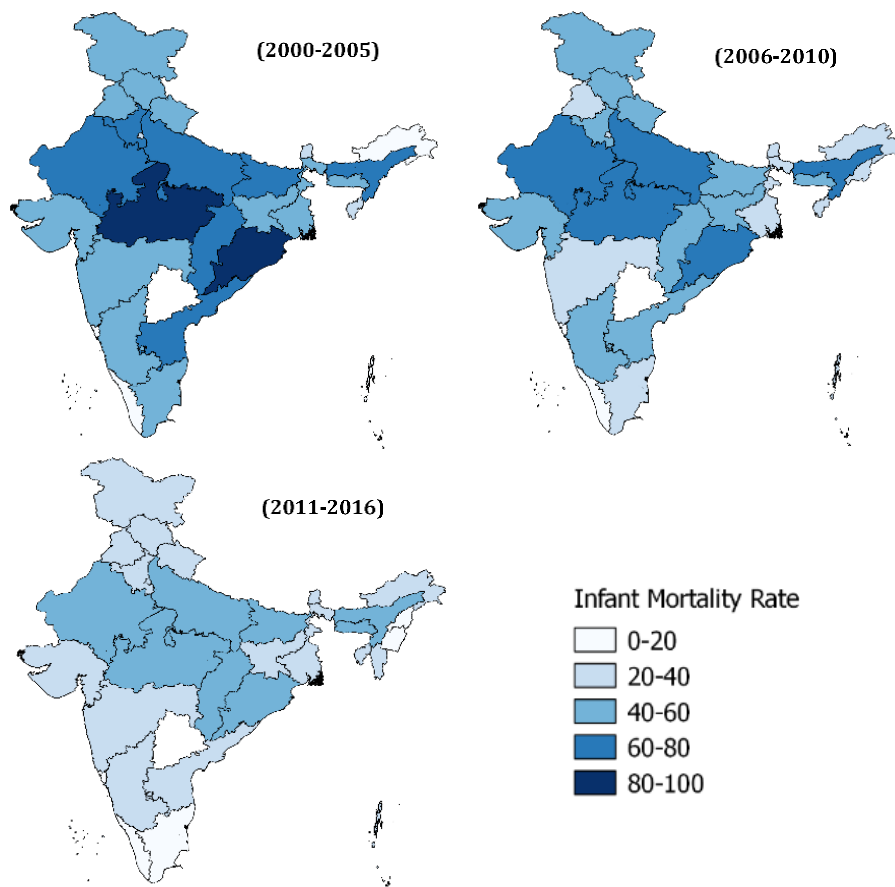


Fig. 6. State-wise trends in Infant mortality rate Data

Source: Sample registration system

Comparing IMR trend between EAG and Non-EAG states indicates that, there was consistently considerable difference and EAG states have high IMR compared to Non-EAG states. Analyzing the IMR differences across Gender using SRS data from 1991-2013, indicates that there is no significant difference in the infant mortality rates between male and female ($t(44)=-0.68$, $p>0.05$) though on an average infant mortality rate is lower in Male (61.17) compared to female (63.57) [15].

III. HEALTH CARE UTILIZATION AND MORBIDITY

IV A. Indicators of Maternal care utilization and morbidity

To understand the trends and variation in the maternal health status, it is essential to review the factor responsible for maternal health and health care utilization. NFHS 2nd, 3rd and 4th round data was used to compare and analyze the change in these factors [14].

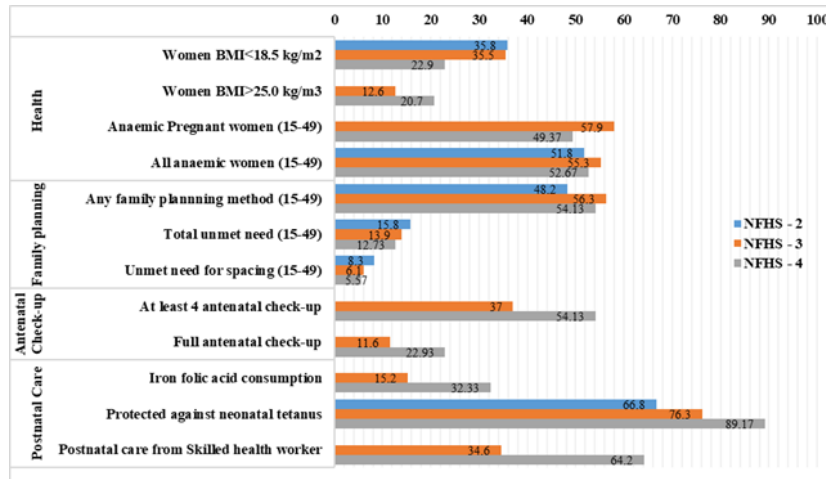


Fig. 7. Key indicators of Maternal care utilization and morbidity

Source: NFHS 4

From the figure 7, it is evident that there was marked improvement in the maternal health care utilization. Anaemia is the major health problem in India. Though, percentage of all women and pregnant women aged between 15-49 suffering with the anaemia has gone down gradually, it is still higher than estimated anaemia prevalence in developing countries i.e, 42% [25]. Indian government was successful in reducing the unmet need (total and for spacing) over a period of time but adoption of any family planning method remained relatively untouched.

Temporal variation indicates that total unmet need and unmet need for spacing was declined by around 3% for family planning. Proper antenatal and postnatal care is essential for the health of the mother and child and there was substantial increase in level of awareness for antenatal and postnatal care among mothers. Percentage of mothers who had at least 4 antenatal check-up and full antenatal check-up has increased by 17.13 % and 11.3% respectively from 2005-06 to 2015-16 [14].

IV B. Indicators of Child care and morbidity

Newborns are vulnerable and require utmost care and attention. Certain vaccinations should be mandatorily provided to child to protect them from infections and to develop immunity and increase in life expectancy.

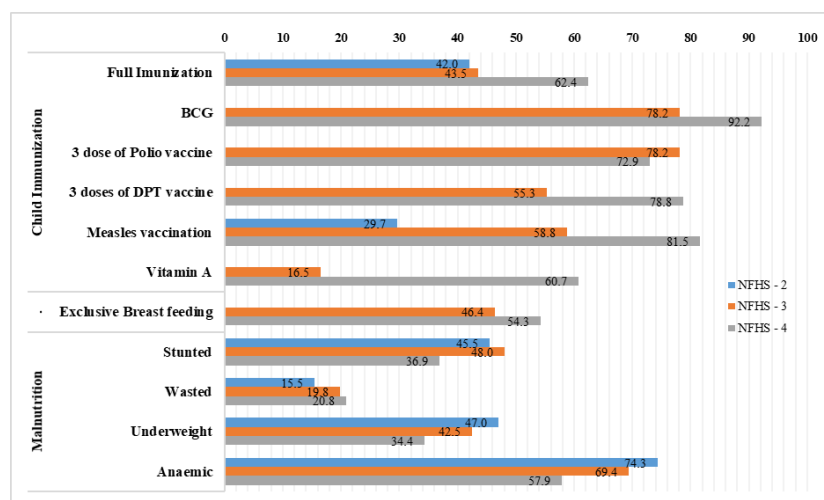


Fig. 8. Key indicators of Child care and morbidity

Source: NFHS 4

As per the NFHS 4 data [14], 62.4% of the children received full immunization which includes vaccination for BCG, Polio, DPT and Measles. It is surprising to notice that, though a little (5.27%), there was decline in percentage of children who have received the polio vaccination w.r.t NFHS 3. Excluding polio vaccination, the proportion of children who have vaccinated for other vaccines such as BCG, DPT and measles was increased by 14%, 23.5% and 22.7% respectively in the last decade (2005-06 – 2015-16). Nutritional status has also improved over time. There was sizable increase in the proportion of children under age of 6 months who were exclusively breastfed and proportion of the children having stunted growth and underweight was also dropped by 11.1% and 8.1% respectively from 2005-06 to 2015-16. Despite multifold efforts of government and other non-government organization, it failed to bring down the proportion of wasted children, which increased by 5.33% from 1998-2016 [14].

iv. WHO frame work: building blocks of Health system

Health system comprises of all the organizations, institutions, resources and people which works in harmony to improve health. To monitor and analyze the health system, WHO [26] defines 5 key building blocks which sum-up to operate health system as one, namely, 1) Health infrastructure, 2) Health workforce, 3) Health information system, 4) Essential medicines and 5) Health financing. Analyzing these units of health system at micro level provides the vital information and enable decision-makers to advice sound monitoring strategy, accurately track health progress and performance, evaluate impact and ensure accountability at country level.

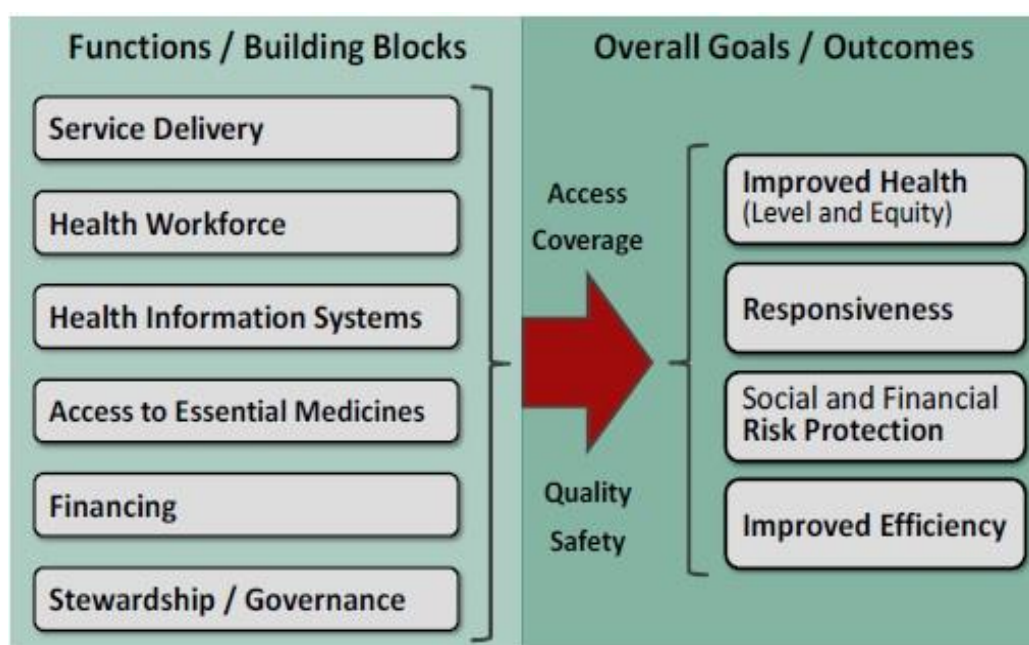


Fig. 9. Building block of health system

Source: World Health Organization, 2010

V A. Health Infrastructure

China is the most populous country so far, but as per the projections by UN population division, [27] by 2024 India will surpass china and become most populous country. For the this rapidly growing population, provision of sufficient resources is mandatory. Unfortunately, health infrastructure and health scenario is poor in India and requires focused attention [28].

Health infrastructure is an integral part of healthcare delivery services. Availability of adequate number of skilled human resource, equipped with the essential structural facility at different levels of health care set-up, is necessary for providing health care services for the population. Health infrastructure is basically divided into two categories; 1) Educational infrastructure, 2) Service infrastructure. Number of medical colleges, student enrolled and graduated/post-graduated with specific degree (MBBS, BDS, MDS, AYUSH institute, Nursing, Paramedical course) is considered as the Educational infrastructure. While, number of hospitals, hospital beds, PHCs, CHCs, blood banks, eye banks come under the Service infrastructure.

Medical Education infrastructure has increased substantially during the last decade. As per the data registered in National Health Profile report 2017 [29], India has 462 medical colleges, 309 dental colleges for BDC & 242 dental colleges for MDS. There is simultaneous increase in number of medical colleges and admissions suggesting gradual increase of health workforce. India has more than 3000 established institutions producing more than 1.25 million general midwives annually. In terms of hospital capacity, there are 14,379 hospitals having 6,34,879 beds. Out of which 11,054 hospitals are in rural area with 2,09,010 beds and 3,325 hospitals in urban area with 4,25,869 beds [29].

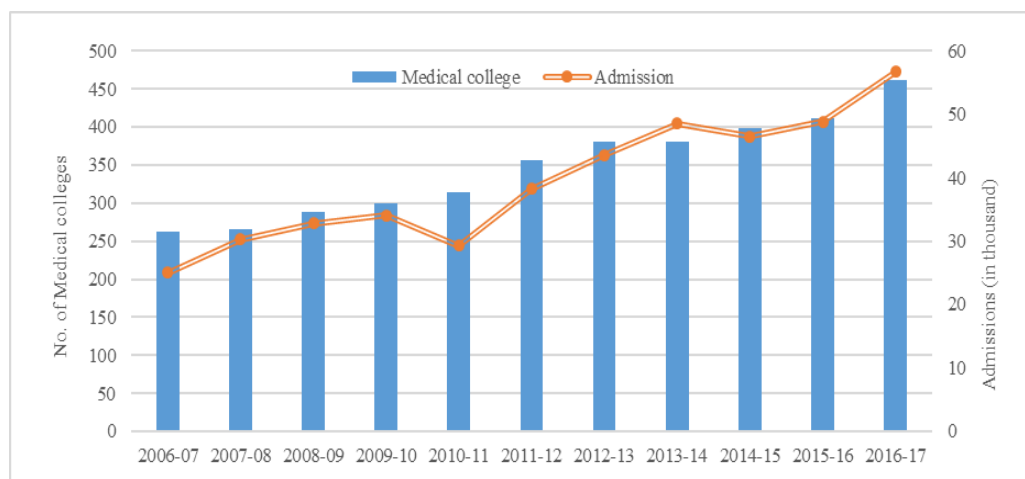


Fig. 10. Number of Medical colleges and Admissions in India (2006-2016)

Source: National Health Profile, 2017

PHC is the first contact point between village community and the Medical Officer manned by a Medical officer, which acts as a referral Unit for 6 Sub-Centers. Majority of the Indian population is in rural and to cater their health needs, there are 15,3665 sub-centers, 25,308 PHCs and 5,396 CHCs operational in the country as on 31st March 2015 [4].

Table 2 shows the availability of the basic health care services and facilities in India. Sub-center is the first peripheral contact point between Primary Health Care system and the community. Data indicates that basic facilities like water and sanitation is available in only 74% and 76% of the sub-centers respectively. Furthermore, electricity which is necessary to undertake basic operations, is absent in about 60% of the sub-centers.

TABLE 2: BASIC INFRASTRUCTURE NEEDED AT HEALTH FACILITY AND AVAILABLE SERVICE

Indicator	%
<i>Regular electricity in Sub-center (%)</i>	41.69
<i>Water in Sub-center (%)</i>	73.69
<i>Toilet in Sub-center (%)</i>	76.23
<i>Labor Room in Sub-center (%)</i>	37.98
<i>PHCs functioning on 24 X 7 hours basis (%)</i>	60.90
<i>PHCs with at least 4 beds (%)</i>	75.88
<i>PHCs having new born care services on 24 X 7 hours basis (%)</i>	87.62
<i>PHCs having referral services for pregnancies/delivery on 24 X 7 hours basis (%)</i>	48.78
<i>CHCs having 24 X 7 hours normal delivery services (%)</i>	95.58
<i>CHCs having functional Operation Theatre (%)</i>	50.54
<i>CHCs designated as FRUs offering caesarean section (%)</i>	30.36
<i>CHCs having new born care services on 24 X 7 hours basis (%)</i>	77.47

Source: District level Household Survey 4

CHC is established and maintained by the State Governments and as per standards, it is supposed to be manned by four Medical specialists i.e. Surgeon, Physician, Gynecologist and Pediatrician supported by 21 paramedical and other staff. It is surprising to notice that only around 50% of the CHCs are equipped with functional operation theatre, and only around 30% of them are offering caesarean section. However, 24 x 7 normal service delivery services and newborn care service are present in 95.58% and 77.47% of the CHCs respectively.

As per the DLHS 4 data [30], though there are only 60% of the PHC functioning on 24x7 basis, 24x7 newborn care services are provided in almost 90% of the PHCs. Less than 50% of the PHCs provide referral services for pregnancies/deliver on 24 x 7 basis. Out of the total 75.88%, PHCs are equipped with at least 4 beds.

V B. Health Workforce

Health workforce is described as the “Heart of the health system” [31]. In India, more than 50% of the health care professionals serves in unorganized sector, thus there is dearth of resource which may provide the reliable information about the health workforce statistics [32]. As per the estimates by Rao et al. 2016 [33], almost 77.4% of the health workers live in urban areas. Consequently, health worker’s density in urban area is almost four times higher than the rural areas. Despite adequate infrastructure and health workers in the urban areas, due to population growth, their access to facilities remain somewhat restricted [32].

TABLE 3: HUMAN RESOURCE AVAILABILITY FOR HEALTH

<i>Indicator</i>	<i>%</i>
<i>Sub-Health Centre with ANM (%)</i>	83.51
<i>Sub-Health Centre with male health worker (%)</i>	38.89
<i>Sub-Health Centre with additional ANM (%)</i>	40.71
<i>PHC having Medical Officer (%)</i>	81.69
<i>PHC having Pharmacist (%)</i>	66.22
<i>PHCs having Lady Medical Officer (%)</i>	33.68
<i>PHCs with AYUSH doctor (%)</i>	42.31
<i>CHCs having Obstetrician/Gynecologist (%)</i>	23.09

Auxiliary nurse midwife (ANM) is the grass-root worker in health organization and pregnancy related health care is usually provided by them. More than 80 % of the Sub-centers have ANM and almost 40% of them have additional ANM. Despite the fact the PHCs are manned by the MO, data indicates that only 81.69% of the PHCs have them. Proportion of the PHCs having pharmacist, lady medical officer and AYUSH doctors are very less, 66%, 34% and 42% respectively. Evidently, there is deficiency of CHCs well-quipped with obstetrician/Gynaecologists. Major reason for the paucity of health workforce in rural area is that most of the specialist avoid practicing in rural areas or government health facilities. Despite considerable improvement in health personnel in position (ANM 27 per cent, nurses 119 per cent, doctors 16 per cent, specialists 36 per cent, pharmacists 38 per cent), gap between staff in position and staff required at the end of the twelfth five-year plan was 52 per cent for ANM and nurses, 76 per cent for doctors, 88 per cent for specialists and 58 per cent for pharmacists [34]. There is urgent need to strengthen the health delivery system and address the shortage of skilled health worker in rural areas. The same may be achieved by undertaking measures like providing incentives to work in rural areas and compulsory posting.

V C. Health Information System

According to World Health Organisation (WHO)[35], Health Information System underpins decision-making and has four key functions: (i) data generation, (ii) compilation, (iii) analysis and synthesis, and (iv) communication and use. Information driven decisions/action plans is the key to the successful implementation and achieving desirable outcomes. Health data in India comes from multiple sources generated by central and state government agencies (Table 4).

TABLE 4: DATA SOURCE OF HEALTH INFORMATION SYSTEM

MHA (Ministry of Home affairs)	MoHFW (Ministry of Health and Family welfare)	MoSPI (Ministry of Statistics and Programme Implementation)
Population census	National Family Health Survey (NFHS)	Consumer expenditure survey
Sample registration system	HMIS, National Health Mission	Health Specific Survey, NSSO
Civil registration system	Annual Health Survey (AHS)	
	Coverage Evaluation Survey (CES)	
	Concurrent monitoring	
	Rural Health Survey	
	National Health Profile	
	National Health Accounts	
	Integrated disease surveillance programme	

Source: Tripathi et al., 2018 [36]

Absence of a unified body at national level for data management and dissemination related issues, makes it more challenging for ensuring data quality. And as a result Different data sources provide different population demographic information which arises dilemma among decision maker. For eg; SRS 2016 [37] reports gender ratio as 898 while NFHS 4 [14] enumerate the same as 923. Lack of any standardized protocol with decentralized data management and dissemination approach leads to disparity in reported no. of data elements, quality and accuracy. A review [38] of Human Resources Information System (HRIS) showed some systems have only 10 data elements (Haryana) whereas some systems have more than 200 fields (Bihar and Jharkhand). Apart from data quality issues, delay in data dissemination also an issues with Health Information system in India for eg., NFHS 4 survey was conducted in 2015-16, and synthesis and compilation surfaced in December 2017.

Most of the government surveys cover public health sectors despite the fact that private sector controls 80 per cent of doctors, 26 per cent of nurses, 49 per cent of beds and 78 per cent of ambulatory services [39]. Based on this fact, even accurate and quality data of these surveys' estimates may not be of much use. Shortage of qualified personnel specially the nurses, ANMs, data entry operator who are responsible for data inputs is the primary reason for poor data quality [36].

Planning and decisions based on poor quality of the data compromises the effectiveness of the actions and outcomes. Indian health information system need to standardize the process of data collection, compilation, interpretation and dissemination. Availability of sufficient and skilled staff can be beneficial in improving the quality of data and streamlining the whole process.

V D. Essential Medicines

Essential medicines concept was launched in 1977 by WHO which became one of the eight pillars of "Primary Health Care" strategy. It is defined as "those drugs that satisfy the healthcare needs of majority of the population; they should therefore be available at all times in adequate amounts and in appropriate dosage forms, at a price the community can afford [40]. The aim of the concept was to improve the availability of the affordable drugs to economically poor communities especially in developing nations.

Very large number of various drugs are available in market out of which as many as 70% are substitutable, which varies only by the production units and packaging [41]. Thus, it is essential to establish a system to facilitate in selection of fewer drugs out of the vast pool of drugs. In India, first National Essential Medicine List (NEML) was prepared in 1996, which unfortunately was not taken into account either to procure drugs or to set Standard Treatment Guidelines (STGs) [42]. NEML 2011 contained 348 medicines which was revised in 2015, adding up 106 more medicines and removing 70 medicines from the list.

List of the essential medicines was prepared with reference to the level of health care facility; Primary, Secondary and Tertiary. 209 medicines are listed for all level of health care facilities, 115 medicines listed for secondary and tertiary care units while 79 medicines were formulated exclusively for the tertiary level health care facility only. National Pharmaceutical Pricing Policy (NPPA) was introduced in 2013 to include more drugs under National Leprosy Eradication Programme (NLEP) providing generic medicines at low cost to increase the availability of essential drugs at affordable

price especially for poor community within the country. It follows the strategy of International Non-proprietary Name (INN) or generic name to reduce the medicine cost and health care expenditure in the country. While government is maximizing efforts to reduce the medicine cost, pharmaceutical companies required to fine-tune balance between the production cost, profitability and affordability of the drugs in order to synchronize. Such government actions are bringing positive results in several drug makers, such as GlaxoSmithKline and Johnson and Johnson, which are intensifying their initiatives, oriented at ensuring the availability and affordability of their drugs in less affluent markets whereas on the other hand it is criticized by some industries operating in the Indian market against these new government policies citing erosion in both top and bottom line results [41].

The overall budget of the medicines varies across the states. Punjab invest as little as 2% while in Kerala its 17%. Many states which are poor in economy and health sector development incurred the lowest expenditure on medicines such as Assam, Bihar, Uttar Pradesh and Odisha spent about 5% or less of their total health budget on medicines [41]. Kotwani A, 2010 [43], carried out a survey in six states in 2004-05, which revealed that median availability of the 27 essential medicines were there only in 0-30% public health care facilities.

Despite India being one of the global leader in manufacturing the generic drugs, the availability and affordability is still unmet due to the larger proportion of economically marginalized group in the country. In the developing country like India, to increase the reach and affordability of the essential drugs, implementation of NEML to procure drugs, strengthening the delivery system, indigenous manufacturing capacity and price regulations should be emphasized along with the government's efforts.

V E. Health Financing

Health is one of the vital indicator, which reflects the quality of life of the country. Though preservation and promotion of health is one of the fundamental right, India is lagging behind in achieving adequate health status. About 7% of Indians are pushed into poverty each year due to unaffordable health care [44], and only 27% of the population is covered by health insurance. Out of all insured individuals, 77% have coverage through government-subsidized schemes or implementation plans for protecting informal workers (i.e., self-employed individuals or those who work for them, such as street vendors or farm workers) and some other vulnerable groups.

TABLE 5: KEY HEALTH FINANCING INDICATORS FOR INDIA ACROSS NHA ROUNDS

<i>Indicator</i>	NHA 2014-15	NHA 2013-14	NHA 2004-05
<i>Total Health Expenditure (THE) as per cent of GDP</i>	3.9	4	4.2
<i>Total Health Expenditure (THE) Per capita (Rs.)</i>	3826	3638	1201
<i>Current Health Expenditures (CHE) as per cent of THE</i>	93.4	93	98.9
<i>Government Health Expenditure (GHE) per cent of THE</i>	29	28.6	22.5
<i>Out of Pocket Expenditures (OOPE) as per cent of THE</i>	62.6	64.2	69.4
<i>Social Security Expenditure on health as per cent of THE</i>	5.7	6	4.2
<i>Private Health Insurance Expenditures as per cent of THE</i>	3.7	3.4	1.6
<i>External/ Donor Funding for health as per cent of THE</i>	0.7	0.3	2.3

Note: It is important to note that only selected indicators that are comparable across the three rounds of NHA are presented here. NHA estimates 2004-05 are based on System of Health Accounts 1.0 (SHA 1.0) framework which differs in the definitions, classification codes and boundaries of health expenditures in comparison with NHA estimates 2013-14 and 2014-15 that are based on SHA 2011 framework.

To minimize the financial barriers associated with the health, Rashtriya Swasthya Bima Yojana was launched in 2007, which provided insurance of \$500 per family annually at marginal annual premium of 50 cents. The cost coverage under the scheme was for hospitalized care only. Despite the scheme improved access of the poor to secondary care, it was inadequate to provide financial protection for outpatient care and cover additional costs of inpatient [44]. In India, state wise use of maternal service by rural poor women is different, thus it requires state level contextual analysis and leveraging existing resources to develop policies and programs that enhance the quality, use, and equity of maternal health services [45].

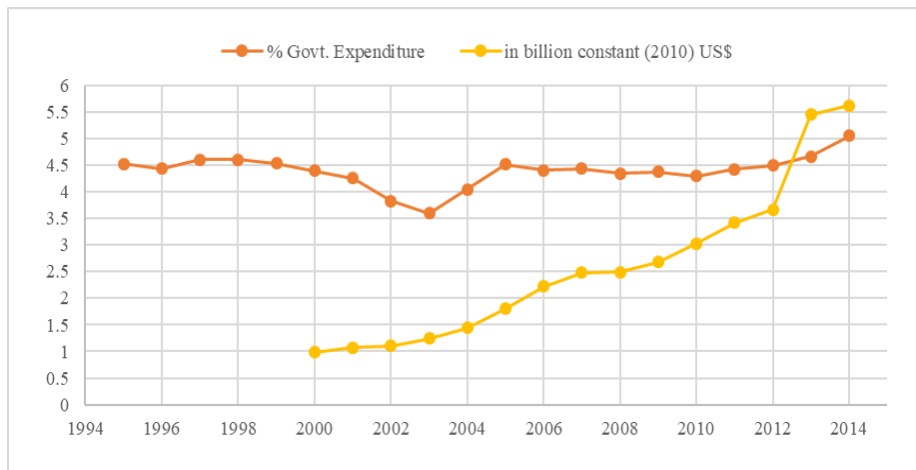


Fig. 11. Health expenditure (% of govt. total expenditure) trend, India

Source: World Health Organization Global Health Expenditure database

Analyzing the decadal trend of the Health expenditure with reference to National Health Accounts -2017 (NHA) [46], indicates that there was decline in the total health expenditure from 4.2 % of GDP in 2004-05 to 3.9% in 2014-15 and thus the financial implications have been increased upon citizens. Evidently, per capita health expenditure was also increased from 1201 INR in 2004-05 to 3826 INR 2014-15. The out of pocket expenditure has decreased from almost 70% to 63%, and under the National Health Policy, 2017 it is aimed to reduce further by 13% by the year 2020 (50% OOPE) [47].

Percentage of government expenditure is defined as Public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds. Health expenditure in billion constants is the actual amount invested in that particular year.

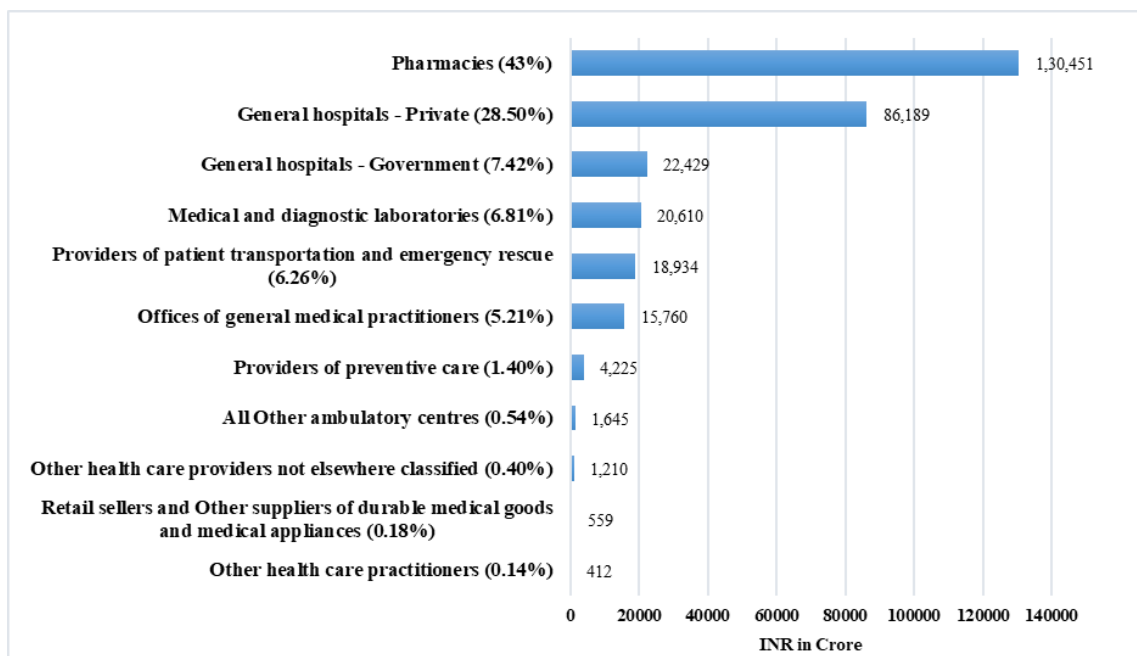


Fig. 12. Out of pocket expenditure (OOPE) on health care by Households for 2014-15 (INR In Crore)

Source: National Health Profile 2017

Health expenditure information reported by the WHO indicates that India ranks 149th globally, for the year 2014 [47]. India falls in 4th quartile with the 5.5 % expenditure to the total government spending. In the past 19 years (1995-2014), India has invested least % of total government expenditure in year 2003 and highest in year 2014.

As per the data published by National Health Accounts (NHA) in 2014-15 [46], total more than 3 lakh crore rupees have been spent by households, as out of pocket expenditure (OOPE) on health. Out of the total, as much as 43 % of these went into buying medicines and 28 % was spent for Private health facilities. It's apparent from the data that India consider private hospital more reliable and trustworthy than Government hospital, having spent only 7.42% of the total OOPE. OOPE is the money which is not covered by any health insurance or government schemes and constitute 62.6% of the total expenditure on health in India. Further, 7% spent on medical and diagnostic laboratories and 6% on transportation and emergency rescue services. It is surprising that, only 1.4 % spent on preventive care services.

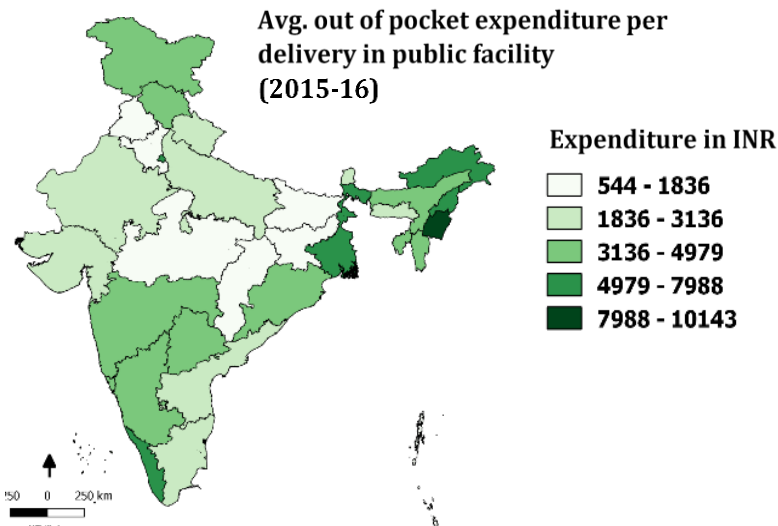


Fig. 13. State wise out of pocket expenditure per delivery in public health facility

Source: NFHS 4

Out of pocket expenditure on per delivery in public health facility was compared across the states to check the difference between the Urban and Rural areas. There is no statistically significant difference between the Urban and Rural areas for out of pocket expenditure on health. However, average amount of out of pocket expenditure is higher in Urban (3908) as compared to Rural (3196) areas.

IV. CONCLUSION

At present out of the total infant deaths, 46.2 % of the deaths occur only due to prematurity, low birth weight and other birth related complications. In India, 164 mother die per 100,000 live births and 50 under 5 children die per 1000 live births. National and state level subsidize schemes and policies will not be sufficient to improve the maternal child health of India. It is a mammoth task to increase the reach, affordability and availability of adequate health care services and facilities to marginalized community. Numerous efforts have been made to increase the nutritional status among children by introducing schemes like Integrated Child development Scheme, Mid-day meal program, public distribution system etc. In addition to that, Rashtriya Swasthya Bima Yojana (RSBY), was launched to decrease the health expenditure and provides financial protection up to \$500 per family for a nominal premium of 50 Cent was also partially successful. RSBY was limited to the in-hospital care and pre-hospital outpatient care and post-discharge follow up care was not insured. During the period of RSBY, to take advantage of assure insurance payments, the number of hospitalization cases increased and influenced inappropriate procedures resorted to by hospitals leading to the rise in out-of-pocket spending—mostly due to rise in spending by hospitalized patients. According to the study carried out by Salazar et al., 2016 [48], the availability of the hospital in close proximity is not enough for mother to avail maternal care services. Mother, irrespective of degree of complication or illness, will bypass obstetric facilities that are not adequately functional and prefer to travel to functional facilities.

In India, problem is not in the training of the skilled practitioners/doctors or the number of existent health universities, the issue is the presence of skilled health human resource where it needed. While the urban India is flooded with the health professionals, there is acute deficiency of the same in remote rural areas.

National Health Protection Scheme (NHPS) is the world's largest government funded health care programme launched on 8th March, 2018. It aims to cover 10 crore poor families (50 crore beneficiaries) with the financial coverage of 5 lakh per family per year for secondary and tertiary care hospitalizations. The NHPS doesn't demand any premium and registers families identified as the economically vulnerable based on the government survey data [49]. Thus government term it as "health assurance" as oppose to "health insurance" which requires premium.

Developing robust system of monitoring of the Maternal and child health care indicators like number of deaths, nutritional status, institutional deliveries, out of pocket expenditure, adoption of subsidy is advisable. Despite many such health information repository is available, the interval of monitoring and data quality is questioned by many. A city like London, has better health system 300 year ago, known as "Bills of Mortality", a report documenting the number of deaths by cause, age and gender which was updated weekly and was open to public. No such system is present in any state of the India, even by today. Majority of the repository are collected from public health facilities only, and despite higher percentage of OOPE on private health care facilities, that data remains unattended. In country like India, there is a need for systematic research and impact evaluation of various public health schemes for efficient and planned use of limited resources [50].

While multifocal efforts and investments have been vested upon health system to improve the health care services, facilities and specifically adoptability by the marginalized community, the overall goal of the universal health coverage cannot be achieved in the absence of stringent monitoring system, which enable decision makers to precisely evaluate the performance, progress, impact and accountability at country level.

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