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Childhood Vaccination Coverage in India and Its Impact: Evidence From NFHS-5 Factsheet

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ABSTRACT

Background: In developing countries various childhood diseases lead the morbidity, mortality and irreversible losses which can be prevented by proper vaccination. This study was conducted to analyse the changing trends of childhood vaccination in India and its impact on childhood diseases and mortality, the trends in coverage of each vaccine along with identification of geographical areas of concern.

Materials and methods: NFHS data published by Government of India was analyzed to see the trends in vaccination coverage, female literacy, childhood diseases and under-five mortality, along with online database search for relevant literature.

Results: Total vaccination coverage in India has reached to 76.4% as per NFHS- 5 data. Orissa stands at the top with 90.5% coverage while Nagaland at the bottom with 57.9% coverage. Prevalence of childhood diseases and under-five mortality has reduced overtime accountable to increase in vaccination coverage as one of the major factors for same.

Conclusion: Despite improvement in total vaccination coverage, the goal of Intensified Mission Indra Dhanush of 90% coverage still remains unachieved. There is reduction in childhood disease and mortality rate, but the pandemic has adversely affected these advances. Therefore, immediate steps should be taken to gain the lost ground.

Keywords: Child vaccination, NFHS 5, National Family Health Survey 5, vaccination coverage, Immunization India, Childhood disease

INTRODUCTION

Most of the childhood diseases and child mortality that occur, are due to the diseases that can be prevented by vaccines.[1] Despite the fact that vaccination can lead to reduction in morbidity and mortality, the acceptance of vaccines is still not universal. There are various reasons for this lack of acceptance, the most common reason in developing countries is poor literacy, lower socio- economic status and population living in inaccessible areas while in developed countries, people choose consciously not to take vaccine.[2] Other factors that limit the vaccination coverage or lead to vaccine refusal, which includes: beliefs and attitudes of population that it may cause side-effects, or be ineffective[3,4]; lack of trust in government or healthcare delivery system[5,6] and other emotional factors leading to negligence towards utilization of vaccines.[7]

India's Vaccination programme is considered as one of the largest in the world. In 1978, Ministry of Health and Family Welfare (MoHFW), Government of India (GoI) launched 'Expanded Programme of Immunization', which was later modified as 'Universal Immunization Programme' in 1985. Despite this programme being operational for long time, only 65% of children were immunized in their first year.[8] Although there is continuous improvement in routine vaccination programme, it has shown a slow rise.[9] Child immunization was intensified by the Central Government in the year 2012- 2013, with the focus

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to cover inaccessible areas.[8] As a result of this, on December 2014, MOHFW launched Mission Indra Dhanush (MI), with an aim to vaccinate 90% of pregnant women against tetanus and to fully vaccinate children against vaccine-preventable diseases before two years of age.[10,11] The programme was implemented between 2015 and 2017, by vaccinating around 25 million children and 7 million pregnant women. This led to improved total vaccination coverage by around 7%, which included around 8% in rural areas and 3% in urban areas.[12] To reach the unreached areas and to speed-up the coverage of vaccination of pregnant mothers and children, Intensified Mission Indra Dhanush (IMI) 2.0 was implemented from December 2019 to March 2020.[13] Further in 2021, the programme was upgraded to IMI 3.0 to cover the children and mothers who missed their vaccination due to COVID-19 pandemic.[14] As the pandemic had disrupted essential services of immunization, Government has conducted IMI 4.0 in February 2022, to catch up with the immunization gaps.[15]

In high-income countries, there exists a concept of health literacy, which is defined as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make basic health decisions."[16] Understanding of health problems and health care systems is thought to be affected by poor health literacy,[17] although there is controversy between health literacy and general cognitive ability.[18] Various research studies demonstrate positive correlation between female literacy and child health. Though there is great diversity in standard of living, education and health-care delivery systems among various countries, still similar kind of link was detected.[19,20]

This study is a secondary data analysis of the recently released National Family Health Survey (NFHS) factsheet which aims to analyse trends of childhood vaccination coverage and to determine its impact on childhood disease and mortality.

METHODOLOGY

NFHS is a multi- phase, large-scale survey conducted in a representative sample of households throughout India. Each successive round of the NFHS has had two specific goals: to provide essential data on health and family welfare needed by the MOHFW and other agencies for policy and programme purposes, and to provide information on important emerging health and family welfare issues. The MOHFW, GoI, designated the International Institute for Population Sciences (IIPS), Mumbai, as the nodal agency, responsible for providing coordination and technical guidance for the survey.[21] NFHS factsheets give us information regarding the trends on key indicators.

The fieldwork for NFHS-5 survey was done in 2 phases. The first phase was conducted from 17th June 2019 to 30th January 2020 and the second phase from 2nd January 2020 to 30th April 2021 by 17 field agencies who gathered information from 6,39,699 households and 7,24,115 women. Computer-assisted personal interviewing (CAPI) was used to carry- out surveys in local languages on a mini- notebook. Scientific Sampling of households was done from the list of each cluster to be surveyed. Uniform sample-design, field procedures and questionnaires which were translated into 18 regional languages were used in the survey. All these surveys were cross- sectional in nature and were conducted in a selected sample of households throughout the country.

Change in the trends of female literacy and childhood vaccination is mentioned using the data of NFHS 1 (1992-1993), NFHS 2 (1998-1999), NFHS 3 (2005-2006) and NFHS 4 (2015-2016).

RESULTS

It was observed that total vaccine coverage improved in each phase of NFHS reporting since NFHS 1 (1991) to NFHS 5 (2021). As depicted in **Figure 1**, there was incremental improvement in vaccination coverage from NFHS 1 to NFHS 3. Post the launch of 'MI' in the year 2014, there was substantial increase; as compared to NFHS-3 (43.5%) there was an increment of 18.5% in the following NFHS-4 (62%) report. According to NFHS 5 factsheet, overall vaccination has improved to 76.4% in the year 2021.

The heat map (**Figure 2)** shows the childhood vaccination coverage at state level. The highest vaccination coverage was seen in Odisha with 90.5% and lowest vaccination coverage in Nagaland with 57.9%. Smaller states like Tripura, Meghalaya, Mizoram, Nagaland have lower vaccine coverage as compared to larger states like Rajasthan, Karnataka, Madhya Pradesh, Gujarat.

From **Figure 3**, it can be observed that there is not a similar pattern of increase, when each vaccine is compared individually. From NFHS 1 to NFHS 3, there is substantial increase in polio vaccination coverage with 24.8%, followed by measles vaccination coverage with 16.6%, followed by BCG vaccination with 15.9%, while DPT vaccination showed only a slight increase of about 3.6%.

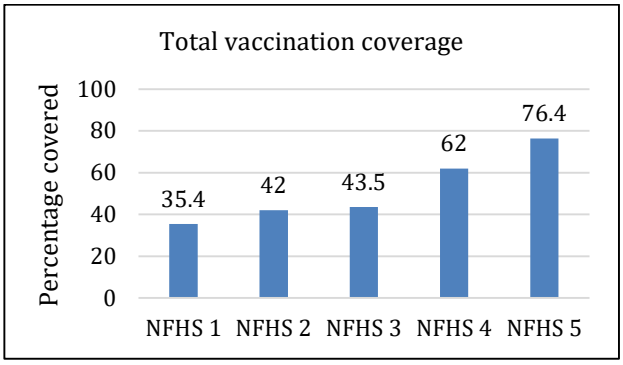

Figure 1: Trends in Total Vaccination Coverage across NFHS

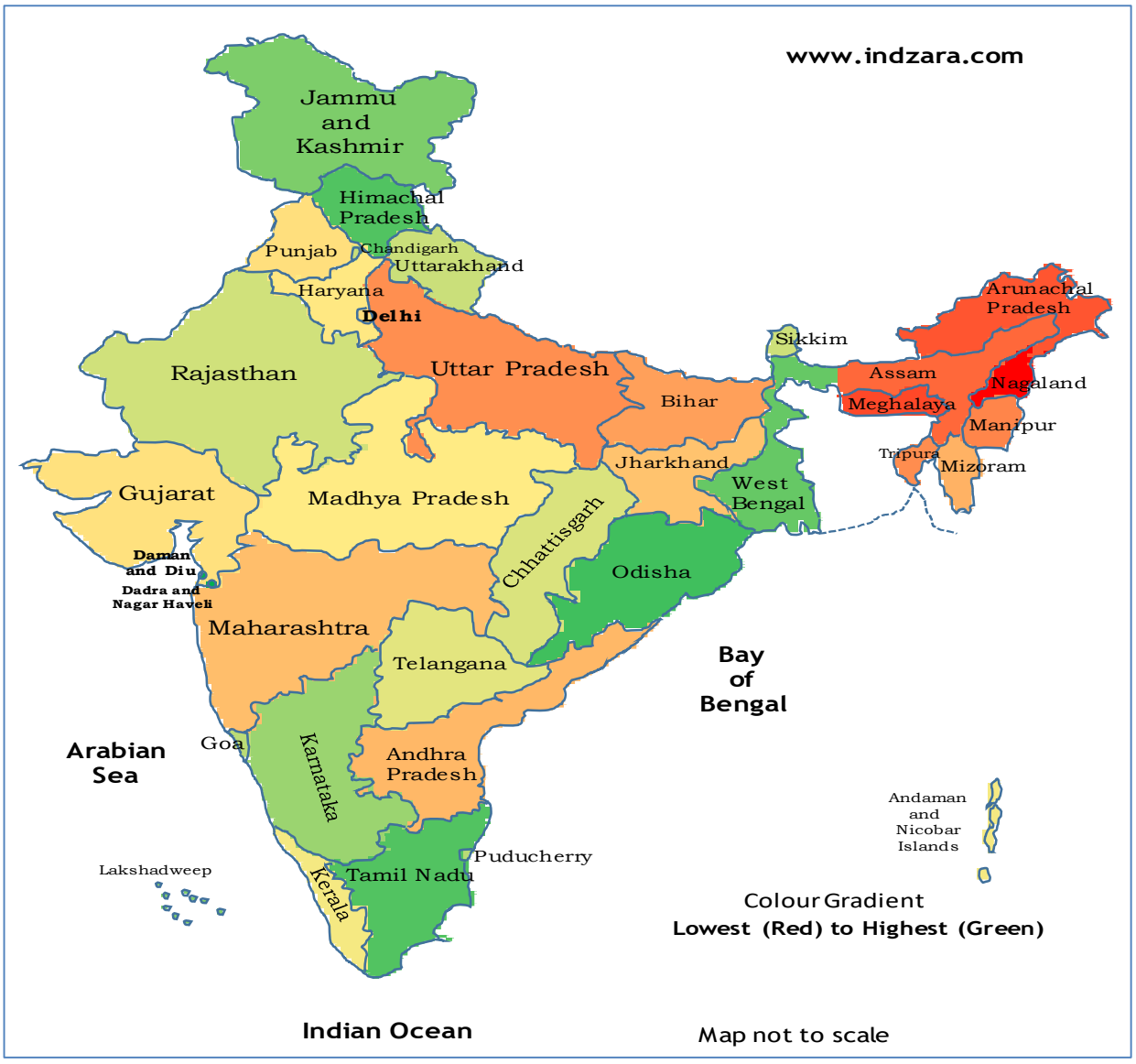

Figure 2: Heat Map of Pan India Vaccination Coverage

This map is generated from free online software and may differ from India's political and geographical map.

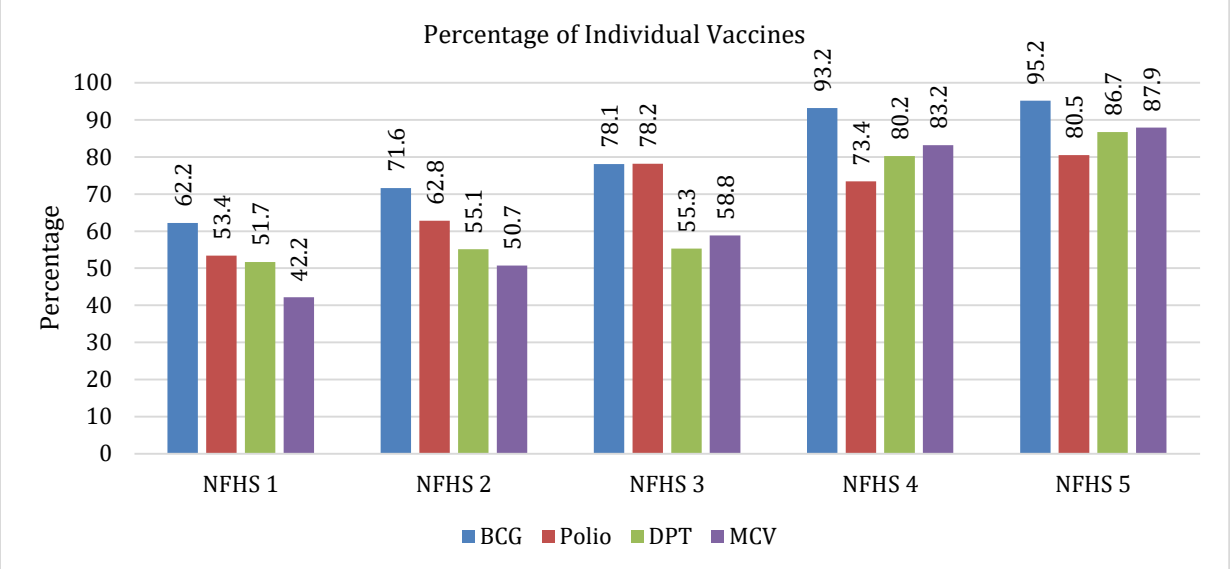

Figure 3: Change in trends of BCG, Polio, Diphtheria and Measles vaccine

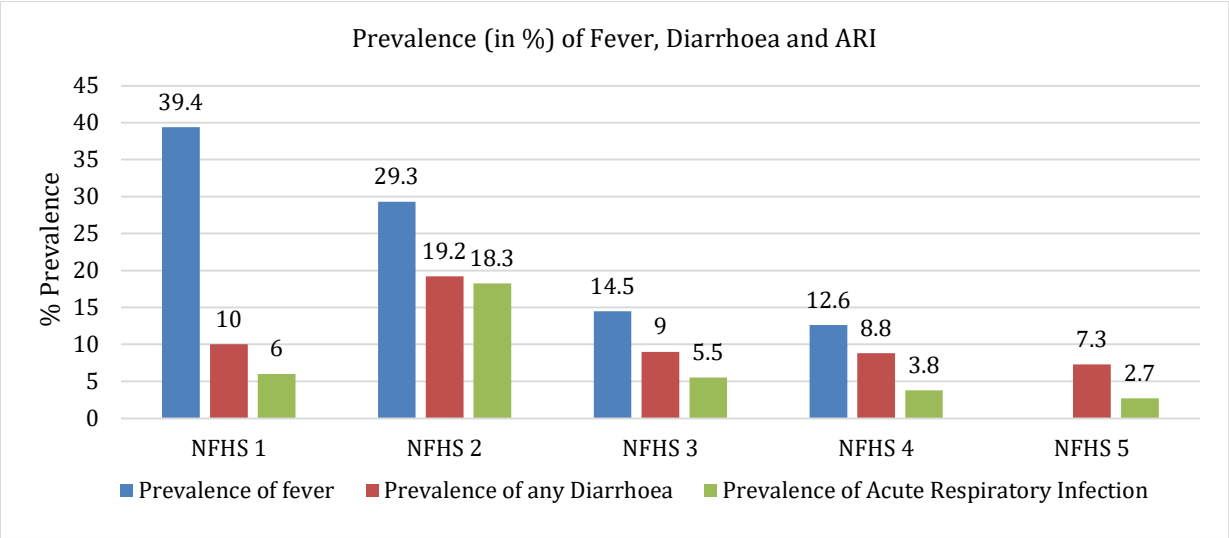

Figure 4: Trends of prevalence of Fever, Diarrhea and ARI in different rounds of NFHS

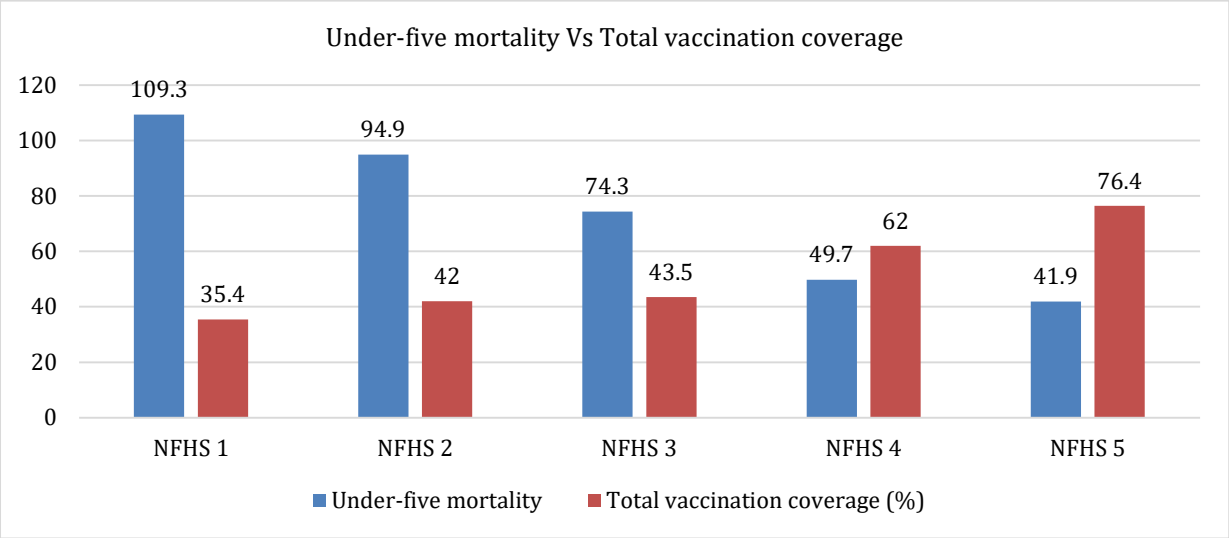

Figure 5: Comparison of Total Vaccination Coverage (%) versus Under-five mortality

In NFHS-4, which was conducted post the launch of MI, it showed that there was a sudden/ prominent increase in measles vaccination (24.4%), DPT (24.9%) and BCG (15.1%) while there was slight decrease in polio vaccination coverage.

Figure 4 depicts that there was a gradual decrease in prevalence of fever from NFHS-1 to NFHS-4. Prevalence of diarrhea and Acute Respiratory Infection (ARI) is shown to increase with 9.2% and 12.3% respectively in NFHS-2 compared to NFHS-1. Followed by this, in NFHS-3 it was seen that prevalence of ARI and diarrhea decreased and reached almost similar levels to that of observed in NFHS-1, and thereby slightly decreased in NFHS-4 and NFHS-5. (NFHS 5 doesn't provide data on fever prevalence)

In **figure 5,** it is clearly depicted that with an increase in total vaccination coverage over the years, there is constant decrease in under-five mortality of children. The greatest decrease of 24.6 was observed in under-five child mortality in NFHS-4 compared to NFHS-3, this was in concurrence to greatest increase of 18.5% in total vaccination coverage.

DISCUSSION

Our analysis highlights the key findings on child immunization, and female literacy all over India based on the secondary data study findings of the factsheet of NFHS 5. It was seen in NFHS 5 data that the child vaccination has reached to 76.4%. Though there was an improvement of 14.4% compared to NFHS 4, the goal of 90% immunization coverage remains unachieved. This can be partially due to COVID-19 pandemic which has been going on since the beginning of the year 2020.

Smaller states have poorer vaccination coverage compared to that of larger states can be due to difficult terrain area, lack of awareness and low population density. States like Nagaland, Assam, Arunachal Pradesh, Meghalaya are areas of concern to improve

vaccination coverage. Being in difficult terrain area, lack of awareness, increased hesitancy among the population are various reasons that needs to be addressed to intensify immunization in these areas. Lack of literacy and poor female literacy rate can be linked to deficit vaccination coverage in states like Uttar Pradesh and Bihar. States like Tamil Nadu, Odisha, Himachal Pradesh and West Bengal have comparatively better vaccination coverage due to increased awareness and strong state health policies and programmes.

Various childhood diseases can be prevented with proper utilization of vaccines. Fever is one of the common symptoms of various diseases. There is a substantial decrease in prevalence of fever from NFHS-1 (39.4%) to NFHS-3 (14.5%), this can be compared to the increase of vaccination coverage of BCG (62.2% to 78.1%), Measles (42.2% to 58.8%) and polio vaccination (53.4% to 78.2%).

NFHS-2 showed inexplicable increase in prevalence of diarrhea (19.2%) and ARI (18.3%) compared to that of NFHS-1, where it was 10% and 6% respectively. A study done by Mathew et al,[22] stated that this huge difference can be due to different time- periods at which the surveys were conducted. NFHS-3 showed the prevalence of diarrhea and ARI similar to that observed in NFHS-1. The change that is observed in ARI from NFHS-3 to NFHS-5 is about 2.8%, this can be partly due to DPT vaccination that prominently increased to 80.2% in NFHS-4. One of the most common symptoms of Rotavirus is watery diarrhea. In 2016, Rotavirus vaccine was launched in Universal Immunization Programme. NFHS-5 showed that Rotavirus vaccine coverage of 36.4%, is comparable to the prevalence of diarrhea that reduced to 7.3% in NFHS-5 compared to that of NFHS-3 (9%) and NHFS-4 (8.8%), where it was almost similar.

Comparison of total vaccination coverage with under-five child mortality showed that with increase in vaccination coverage there is decrease in under-five mortality. Post the launch of MI, there was substantial increase in total vaccination coverage form 43.5% (NFHS-3) to 62% (NFHS-4), concurrence to this under-five child mortality reduced below 50/1000 live births.

From past 30 years, it is seen that female literacy rate has improved by 32.2% (from 39.3% to 71.5%) which is also one of the major factors of increase in childhood vaccinations. Comparison of total vaccination with female literacy shows that there has been improvement individually in both the variables. Various studies shows that there lies a positive correlation between female literacy and total vaccination coverage.[19,20] Though there could be relation between these two variables, female literacy does not act as the prime factor. The growth in female literacy rate between NFHS 4 and NFHS 5 was very minimal of 3.1%, while the vaccination showed an improvement of 14.4%. This can be due to increase in awareness among mothers, provided at grass-root levels by Auxiliary Nurse Midwife and ASHA.

The benefit of the current study is that it is a secondary data analysis and the data is readily available from various concerned sources and articles available on internet, governmental and non-governmental online portals, commercial information sources and educational institutions. The process was less time consuming and less expensive as the data required was easily available. The primary limitation of our study is based on the accuracy of the data as not all the data resources offer latest reports and statistics.

CONCLUSION

The vaccination coverage needs to be intensified and hard-to-reach areas needs to be addressed. This will be possible by focusing on increasing the awareness about the vaccination coverage and addressing the reasons for hesitancy among the general population. Improvement in vaccination coverage and achieving the goals set by programmes will help us reduce the morbidity and mortality in the children caused by various vaccination-preventable diseases. With the additional burden caused by COVID-19 pandemic on our health system, it is essential to take immediate actions to cover up the immunization gaps.

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Ethical Issues: As it is secondary data analysis and the data is freely available in public domain, it is exempted from ethical issues.

Conflict of Interest: None

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