Assessment of vaccine coverage among children in the Union Territory of Northern India

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Abstract

Introduction: Immunization is a key to child survival. Missing Routine Immunization (RI) can be life-threatening for infants. More than half of the world's most vulnerable children still miss out on the essential vaccines they need to survive and live healthy lives. Globally, 1.5 million deaths could be avoided if children were vaccinated. A substantial proportion of mortality in children in India is vaccine preventable.

Objectives: The current study aims to assess the immunization coverage of children during the period 2015-20 in the Union Territory of Chandigarh using the HMIS data and secondary data of NFHS-5. Also, the study intends to study the pattern, trends, and duration of immunization in Chandigarh.

Results: The children in the age group of 12-23 months who were fully immunized (based on information from either vaccination card or mother's recall) has increased from 79.5 percent (NFHS-4 2015-16) to 89.0 percent (NFHS-5, 2019-21). The proportion of cchildren aged 12-23 months receiving BCG has also increased from 95.9% to 96.8% in NFHS-4 and NFHS-5, respectively. An increase in the number of session held to number of session planned was found. It was 95.9% in the year 2015-16 to 98.8% in the year 2019-20. There is active participation of the ANM and staff.

Conclusion and Recommendations: The vaccination coverage of children (0-5 years) has increased considerably in the past 5 years. It is recommended to strengthen the

planning and implementation of the immunization sessions at the facility and the community level

Background

Immunization is a key to child survival. Missing Routine Immunization (RI) can be life-threatening for infants. Immunization is one of the most effective and cost-effective ways to protect children's lives and futures. More than half of the world's most vulnerable children still miss out on the essential vaccines they need to survive and live healthy lives. Globally, 1.5 million deaths could be avoided if children were vaccinated. (WHO, 2019)

In the last two decades India has made significant progress in improving health indicators, particularly those related to child health. The country was certified polio-free in 2014 and eliminated maternal and neonatal tetanus in 2015. However, the country continues to account for a disproportionate burden of the global morbidity and mortality in children less than five years of age. Despite having 17% of the global under-five population, 27% of deaths among this age group were in India in 2018 (UNICEF,2019; United Nations; 2019)

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A substantial proportion of mortality in children in India is vaccine preventable.[1]Over nine million immunization sessions are held across India every year towards full immunization coverage. India's Universal Immunization Programme (UIP) is among the largest routine childhood immunization programs in the world. Details of age-wise immunization schedule is given in Table 1. The programme introduced new vaccines, including the Pneumococcal Conjugate Vaccine (PCV) and Rotavirus Vaccine (RVV). It is also rolling out a country-wide Measles-Rubella Campaign aiming to reach every child wherever they live. A recent survey in the 190 districts where *Mission Indradhanush* was recently implemented indicates that after the programme's campaign the proportion of children with full immunization coverage increased by 18.5 per cent from pre-Mission Indradhanush estimates. The learnings from Mission Indradhanush are being used to

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reach all missed children across the Country to attain and sustain 90 per cent Full Immunization Coverage in India.

Table 1: Vaccination as per the National Immunization Schedule of Government of India

Age	Vaccines given
Birth	Bacillus Calmette Guerin (BCG), Oral Polio Vaccine (OPV)-0 dose, Hepatitis B birth dose
6 Weeks	OPV-1, Pentavalent-1, Rotavirus Vaccine (RVV)-1 # , Fractional dose of Inactivated Polio Vaccine (fIPV)-1, Pneumococcal Conjugate Vaccine (PCV)-1*
10 Weeks	OPV-2, Pentavalent-2, RVV-2#
14 Weeks	OPV-3, Pentavalent-3, fIPV-2, RVV-3, PCV-2*
9-12 Months	Measles & Rubella (MR)-1, JE-1**, PCV-Booster*
16-24 Months	MR-2, JE-2**, Diphtheria, Pertussis & Tetanus (DPT)-Booster-1, OPV –Booster
5-6 Years	DPT-Booster-2
10 Years Tetanus & adult Diphtheria (Td)	Tetanus & adult Diphtheria (Td)
16 Years	Tetanus & adult Diphtheria (Td)
Pregnant Mother	Td-1, Td-2 or Td-Booster***

* PCV in selected states/districts in phases
** JE in endemic districts only
*** One dose if previously vaccinated within 3 years
#RVV in some selected states

Despite the scale of the UIP, India has yet to achieve the universal coverage of routine childhood vaccines. In 2016, the most recent year for which national estimates are available, only 62% of 12- to 23-month-old Indian children received full immunization (BCG, measles, and three doses each of polio and DPT). In addition to low coverage, failure to vaccinate children at recommended ages has remained a major challenge. The vaccination coverage varies

considerably from state to state, with the lowest rates in the large central states. The highest numbers of partially immunized and non-immunized children are found in the large states such as Bihar, Madhya Pradesh, Uttar Pradesh and Rajasthan.

Differences in uptake are geographical, regional, rural-urban, poor-rich and gender-related. On an average, girls receive fewer vaccinations than boys and higher birth order infants have lower vaccination coverage. Some of the newer challenges in achieving full immunization coverage include limited capacities of staff, particularly in poor-performing states and at the field level, and gaps in key areas such as predicting demand, logistics and cold chain management, which result in high wastage rates. India also lacks a robust system to track vaccine-preventable diseases.

In this context, we aim to assess the immunization coverage of children during the period 2015-20 in the Union Territory of Chandigarh using the HMIS data and secondary data of NFHS-5. Also, the study intends to study the pattern, trends, and duration of immunization in Chandigarh.

Operational definition:

Fully Immunized: A child is said to be fully immunized if the child receives all due vaccine as per national immunization schedule within 1st year of age of the child. Children aged between 9 and 11 months are said to be fully immunized if they receive one dose of BCG; three doses of DPT/ Pentavalent; Pneumococcal Conjugate Vaccine (PCV) (where applicable in some selected states); three doses of Oral Polio Vaccines (OPV); two doses of Rotavirus (in some selected states) and one dose of Measles/ MR vaccine between 9-11 months of their birth. As per the NFHS 5 data 80.9 % of the children are fully immunized.

Methodology

Study Area:

The study captures the data of the Union Territory of Chandigarh, which was constituted on 1st November, 1966. As per Census 2011, Chandigarh has a population of 1,054,686 which is more than twice that of the number for which it was originally planned. The total number of children in the age group 0-6 years in Chandigarh UT is 117,953 (63,187 males and 54,766 females). However, the proportion of child population in age group 0-6

years in Chandigarh UT has declined from 12.83 percent in 2001 to 11.18 percent in 2011 registering a fall of 1.65 percentage points during 2001-2011. In terms of literacy rate, 90.54 males and 81.38 females are literates. There has been significant improvement in the child sex ratio in the age group 0-6 years in Chandigarh. The child sex ratio has increased from 845 in 2001to 867 in 2011, an increase of 22 points during this decade.

Data sources:

Data from the Health Management Information System (HMIS) and National Family Health Survey (NFHS-5) was taken as reference to assess the immunization coverage.

1. Health Management Information System (HMIS)- A digital initiative under National Health Mission (NHM) facilitates the flow of physical and financial performance from the District level to the State and the Centre. It collects facility based information covering all the Health Sub centres (HSCs), Primary Health Centres (PHCs), Community Health Centres (CHCs), Sub Divisional Hospitals (SDHs), District Hospitals (DHs), Tertiary Hospitals as well as private health facilities on periodic basis. There are around 50 data items related to Immunization services provided at various health facilities and around 11 data items related to child hood diseases.

2. National Family Health Survey-Round 5 (NFHS-5):

Ethical considerations:

RESULTS

The study presents the vaccination status of children in Chandigarh. As per NFHS 5 (2020-21), the national average for full immunization is 76.4 per cent and for Chandigarh it is 80.9. DPT-3 coverage is 86.7 per cent and it is 87.9% for measles first dose.

Table 2 gives the reflection of the immunization coverage among the children in the age-group of 12-23 months, as found from the NFHS-5 data. The children in the age group of 12-23 months who were fully immunized (based on information from either vaccination card or mother's recall) has increased from 79.5 percent (NFHS-4 2015-16) to 89.0 percent (NFHS-5, 2019-21). The proportion of children aged 12-23 months receiving BCG has also increased from 95.9% to 96.8% in NFHS-4 and NFHS-5,

respectively. Also, children receiving 3 doses of polio vaccine has gone up from 79.5 per cent as per NFHS-4 to 80.9 per cent (NFHS-5). Children receiving 3 doses of rotavirus vaccine has also increased (84.9 % in NFHS-4 to 85.7% in NFHS-5).

Similarly, Children aged 9-35 months receiving vitamin A dose in the last 6 months showed a increasing trend of over 15% with 56.1 and 72.6% in NFHS-4 and NFHS-5, respectively. NFHS-4 recorded better performance with regard to utilisation of public health services as compared to NFHS 5 (Table 1).

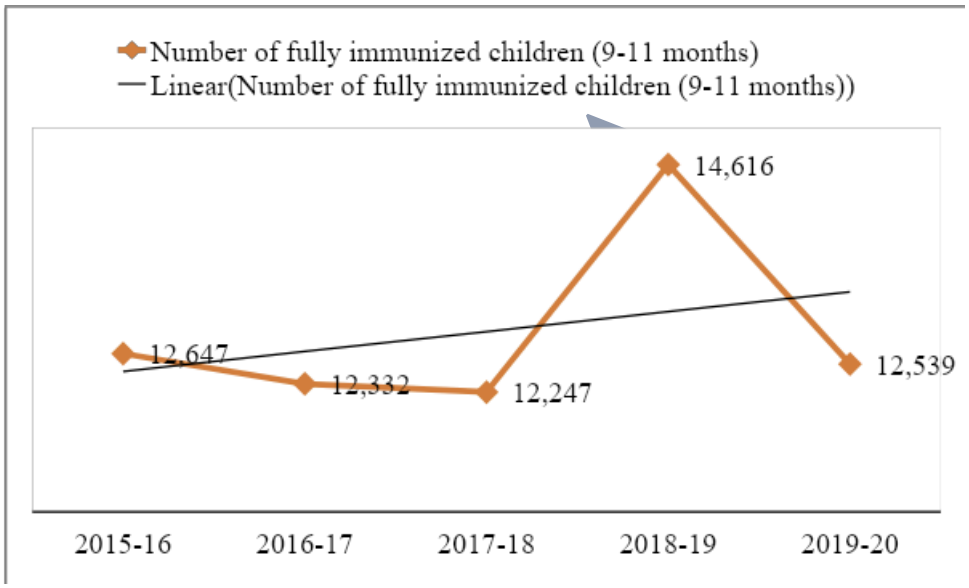
Table No 2: Comparative analysis of immunization coverage among children in NFHS-4 and NFHS-5

Indicators	NFHS 4	NFHS 5
Children age 12-23 months fully vaccinated based on information from either vaccination card or mother's recall	79.5	80.9
Children age 12-23 months fully vaccinated based on information from vaccination card only	93.2	82.8
Children age 12-23 months who have received BCG (%)	95.9	96.8
Children age 12-23 months who have received 3 doses of polio vaccine13 (%)	79.5	80.9
Children age 12-23 months who have received 3 doses of penta or DPT vaccine (%)	95.9	87.9
Children age 12-23 months who have received the first dose of measles-containing vaccine (MCV) (%)	95.9	87.9
Children age 24-35 months who have received a second dose of measles-containing vaccine (MCV) (%)	15	15.1
Children age 12-23 months who have received 3 doses of rotavirus vaccine	84.9	85.7
Children age 12-23 months who have received 3 doses of penta or hepatitis B vaccine (%)	82.7	84.9
Children age 9-35 months who received a vitamin A dose in the last 6 months (%)	56.1	72.6
Children age 12-23 months who received most of their vaccinations in a public health facility (%)	93.1	92.9
Children age 12-23 months who received most of their vaccinations in a private health facility (%)	6.9	7.1

Findings : Health Management Information Findings

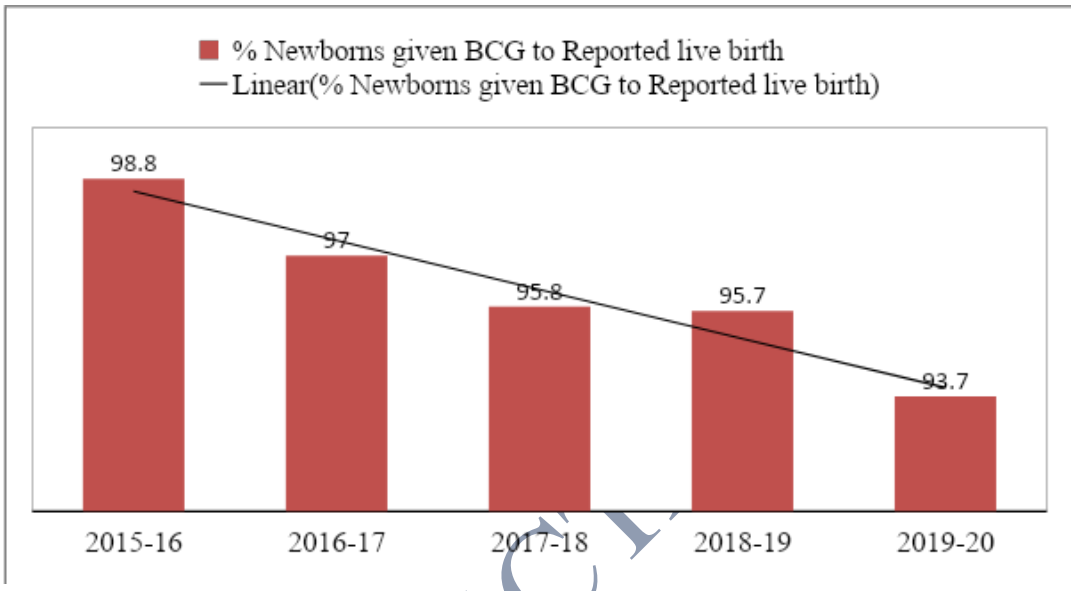
As per the HMIS data (2015-16 to 2019-20) shown in Figure 2, a linear trend shows the increase in the fully immunized children over the period of five years (2015-16 to 2019-20) in Chandigarh. Against the national average of 92.8% of children (9-11 months) who are fully immunized, it is 77.6% among the children in Chandigarh against estimated live births during 2019-20.

Figure No 2 Number of fully immunized children (9-11 months)



In 2015-16, 60.9% of infant received the measles vaccine where as in the year 2018-19 it was 66% which again come to 59.5% in 2019-20. (Figure No 10). there is decreasing trend in terms of % of newborn given BCG to reported live birth. It was 98.8 percent in 2015-16 percent which decrease 93.7 percent in 2019-20. The low coverage of BCG during the year 2019-20 was due the COVID-19 pandemic which not only effects the routine health services but also immunisation services (Figure No 3). Figure 4 shows the upward trend for pentavalent 2 from 2015-16 to 2019-20 though in the year 2016-17 and 2017-18 less number of children were given Pentavalent 2.

Figure No 3: Newborn given BCG to Reported live Birth



UT Chandigarh HMIS data showing the liner trend for infants given pentavalent from 2015 -16 to 2019-20. (Figure No 4).

Figure No 4 : Number of infants given Pentavalent 1, 2 and 3

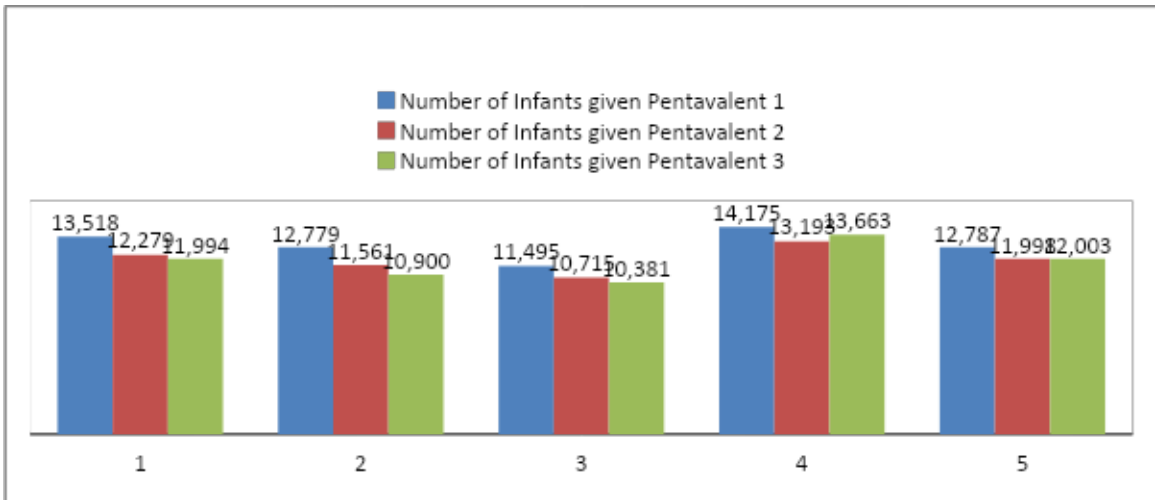
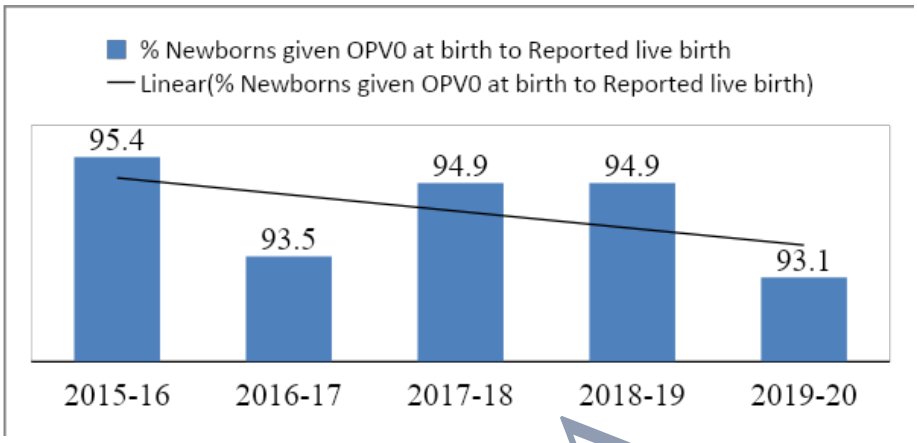


Figure No 7 : Number of infants given OPV 0



As reported in HMIS in 2019-20, the national percentage of OPV-0 and Hepatitis-B Birth Dose given against reported live birth are 87.3% and 72% respectively. HMIS trend from 2017-18 to 2019-20 showing that the Hepatitis-B Birth Dose 7.4 % in 2017 which goes upto 87.8 in 2018-19 and come down in 85.6 % in 2019-20 in UT Chandigarh. (Figure No 8).

Figure No 8 : Newborns given Hep-B0 (Birth Dose)at birth to Reported live birth

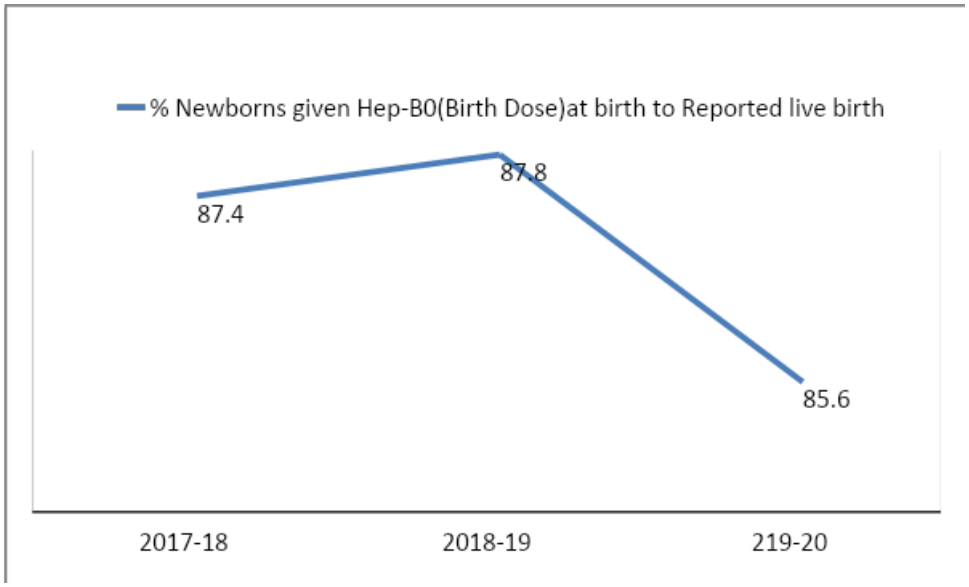
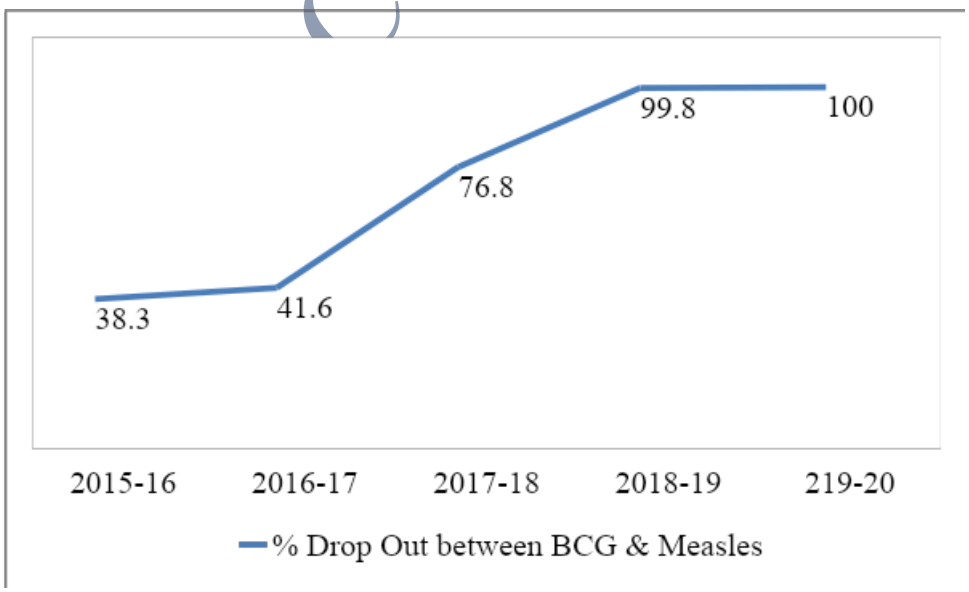
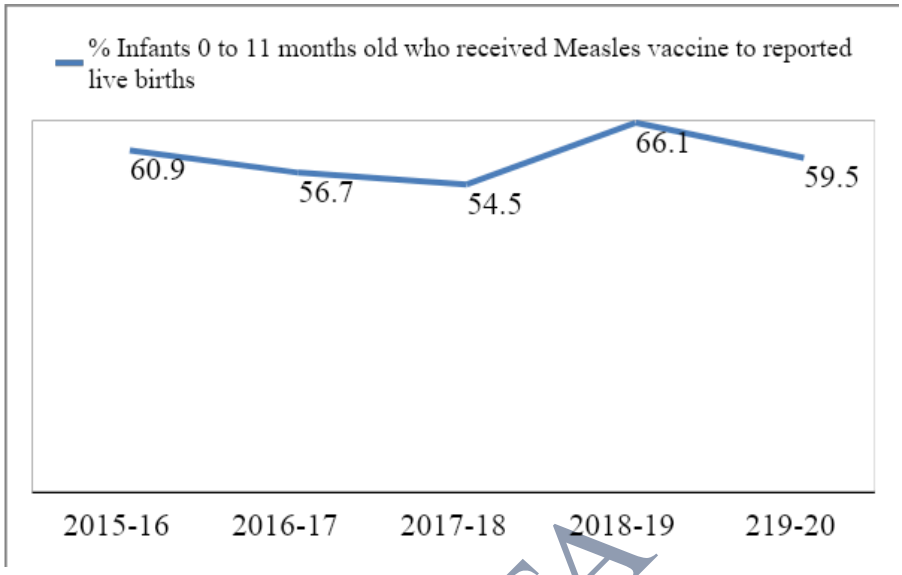


Figure No 9: Drop Out between BCG & Measles



In Fig. No 9 dropout between BCG and Measles trend was shown. In the year 2015-16 it was 38.3 % dropout between BCG and Measles where as in 2010 it was 100%.

Figure No 10 : Infants 0 to 11 months old who received Measles vaccine to reported live births

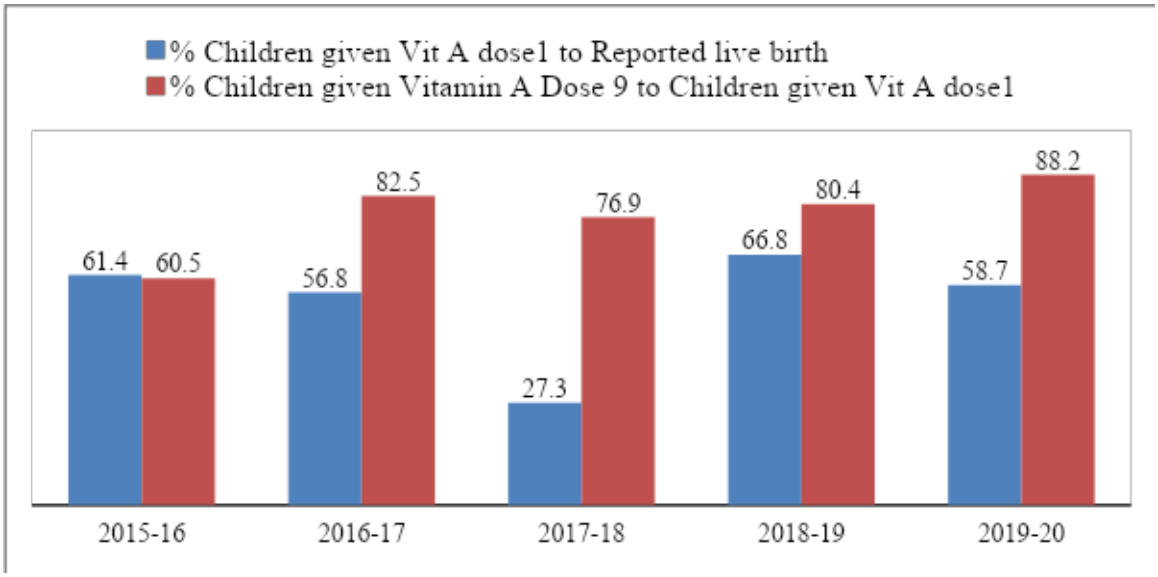


The first dose of Measles-Rubella vaccine needs to be administered, according to the National Immunization Schedule, after the completion of 9 months until 12 months of age while during 16-24 months the second dose shall be given. HMIS captures children given Measles 1st dose and children given MR 1 st dose (9-12 months), measles and MR 2nd dose (16-24 months).

Vitamin A

There is increase in the number of children who are getting both the doses of Vit A and Vit A 9 .

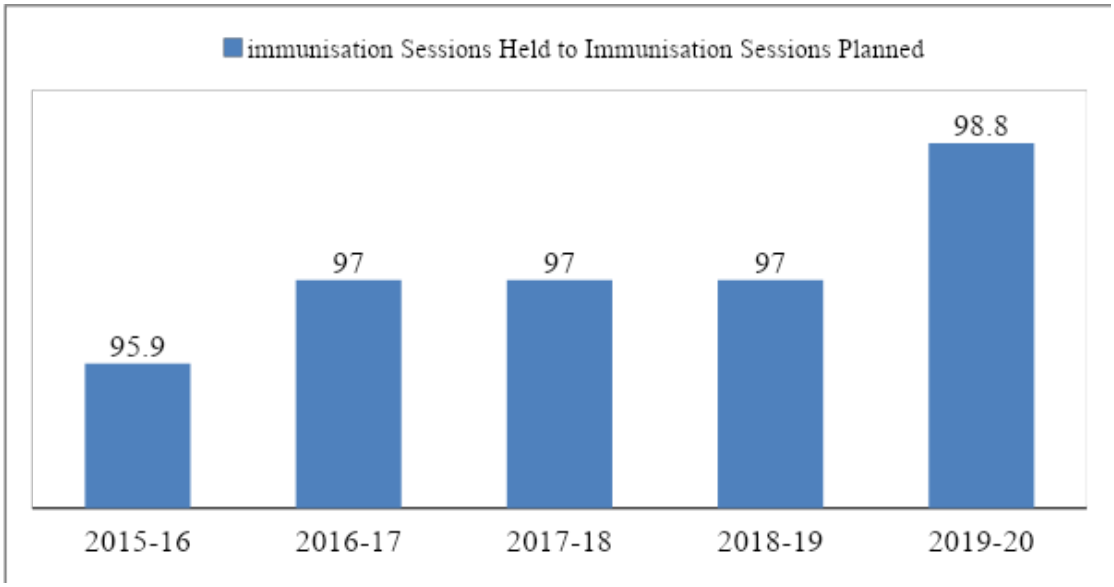
Figure No 11: Vitamin a and Vitamin 9 from 2015 to 2019



Immunisation session

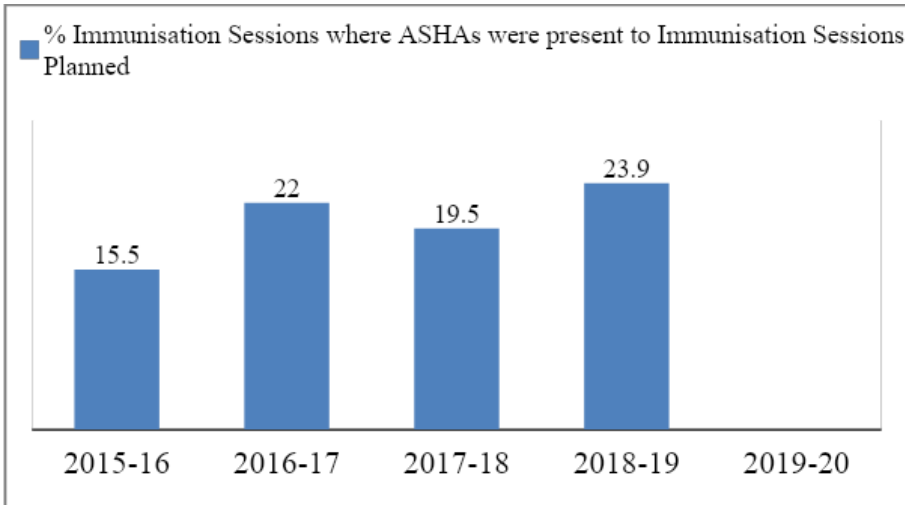
As per the HMIS data from 2015-16 to 2019-20 it was observed that there is increase in number of session held to number of session planned. It was 95.9% in the year 2015-16 to 98.8% in the year 2019-20. There is active participation of the ANM and staff. (Figure No 13).

Figure No 13: % Immunisation sessions held to immunisation session planned



The involvement of ASHA worker in planning of immunisation session planned. In the year 2015-16 only in 15.0 % session were planned by ASHA worker as compared to 23.9 % in the year 2018-19. Due to COVID 19 restrictions, the sessions were not conducted in the year 2019-20. (Figure No 14).

Figure No 14 : Immunization Sessions where ASHAs were present to Immunization Sessions Planned



Discussion

Health Management Information System (HMIS), a digital initiative under National Health Mission (NHM) facilitates the flow of physical and financial performance from the District level to the State and the Centre. It collects facility based information covering all the Health Sub centres (HSCs), Primary Health Centres (PHCs), Community Health Centres (CHCs), Sub Divisional Hospitals (SDHs), District Hospitals (DHs), Tertiary Hospitals as well as private health facilities on periodic basis.

It was seen that children in the age group of 12-23 months who were fully immunized increased from 79.5 per cent (NFHS-4 2015-16) to 89.0 per cent (NFHS-5, 2019-21). Different studies done in urban areas across the country have reported a wide range of variation in immunization coverage rate (20–85%). (Sharma et al, 2009; Kadri et al, 2010; Nath et al, 2007). Increase was also observed among the children age 12-23 months who have received BCG from NFHS 4 to NFHS 5 and same was true in case of children receiving 3 doses of Hepatitis B vaccine. It was 95.9 per cent in NFHS 4 which increase 96.8 percent in NFHS 5. Continuous efforts such as conducting regular immunization sessions, involvement of ASHAs and ANMs in mobilizing the community, etc. may be associated in lowering the percentage of children not immunized at all in the succeeding NFHS rounds. Previous literature reported that under or over-vaccination was associated with immunization system factors and access to services, such as training of health workers to reduce missed opportunities, communication of benefits of vaccination, lack of adequate vaccine supply, and inconsistent scheduling of vaccination supply. (Srivastava, N 2015) .

Number of live births to total deliveries has shown the upwards trend from 98.6 to 99.4 % from the year 2015-16 to 2019-20. India's Accredited Social Health Activist (ASHA) program was established by the National Rural Health Mission in 2010 with an aim to improve health outcomes—particularly among women and children—and to reduce geographic and socioeconomic disparities. The role of ASHAs in creating awareness on health and its social determinants and mobilize the community towards local health planning and increased utilization and accountability of the existing health services could not be undermined. For Universal Immunization Programme (UIP), ASHA workers work

for getting all pregnant women and children under five years of age immunized with vaccine doses as per the national immunization schedule, in a timely manner. Research on the role of ASHAs in promoting vaccination has shown mixed results although two-thirds of women in one study in Uttar Pradesh cited their ASHA as an important figure in assisting with having their child immunized. ((Fathima, 2015: Ahmad J et al, 2010) .

It is recommended to strengthen the planning and implementation of the immunization sessions at the facility and the community level. Each health centre should have a session plan showing where and when immunizations will be given. This session plan should be developed with and communicated to the community as part of micro planning. Immunization sessions may be held daily, weekly, every two weeks, monthly or quarterly at fixed or outreach sites. The frequency of the sessions depends on the size of the community being served and the workload for staff.

References

Ahmad J, Khan ME, Hazra A. Increasing complete immunization in Rural Uttar Pradesh. *Indian J Fam Welf* 2010; 56:65–72

Bhatnagar, P., S. Gupta, R. Kumar, *et al*. 2016. Estimation of child vaccination coverage at state and national levels in India. *Bull. World Health Organ.* **94**: 728– 734.

Fathima FN, Raju M, Varadharajan KS et al. Assessment of 'Accredited Social Health Activists'—a national community health volunteer scheme in Karnataka state, India. *J Health Popul Nutr* 2015;33(1):137–45.)

International Institute for Population Sciences.Accessed December 18, 2020.

Kadri AM, Singh A, Jain S, Mahajan RG, Trivedi A. Study on immunization coverage in urban slums of Ahemadabad city. *Health Popul Perspect Issues.* 2010;33:50–4. [Google Scholar]

Liu L, Chu Y, Oza S, Hogan D, Perin J, Bassani DG, et al. National, regional, and state-level all-cause and cause-specific under-5 mortality in India in 2000-15: a systematic analysis with implications for the sustainable development goals. Lancet Glob Health. 2019;7(6):e721–e3

MHTF Blog.2017. The Role of ASHAs in Improving Maternal and Newborn Health: A Closer Look at India's Community Health Worker Program. Available from ***https://www.mhtf.org/2017/08/07/the-role-of-ashas-in-improving-maternal-and-newborn-health-a-closer-look-at-indias-community-health-worker-program***

Nath B, Singh J, Awasthi S, Bhushan V, Kumar V, Singh SK. A study on determinants of immunization coverage among 12-23 months old children in urban slums of Lucknow district, India. *Indian J Med Sci.* 2007;61:598–606. [PubMed] [Google Scholar]

Sharma R, Desai VK, Kavishvar A. Assessment of immunization status in the slums of Surat by 15 clusters multi indicators cluster survey technique. *Indian J Community Med.* 2009;34:152–5. [PMC free article] [PubMed] [Google Scholar]

UNICEF. Levels & trends in child mortality, estimates developed by the UN inter-agency group for child mortality estimation, 2019

United Nations Department of Economic and Social Affairs Population Division. World population prospects: the 2019 revision. New York: United Nations; 2019.

World Health Organization. 2019. India: WHO and UNICEF estimates of immunization coverage: 2019 revision. Accessed April 12, 2021.

Nijika Shrivastwa, Brenda W. Gillespie, Giselle E. Kolenic, James M. Lepkowski, and Matthew L. Boulton. "Predictors of Vaccination in India for Children Aged 12–36 Months" American Journal of Preventive Medicine, vol. 49, . 6, 2015. doi:10.1016/j.amepre.2015.05.008