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Managing the Health of New Born: A Study of Child Health and Immunization among Slum Dwellers of Mumbai

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Abstract:

Increasing the urbanization in developing countries has resulted in a faster growth of slum population. This has led to varying degrees of health burden on the slum children. The conditions of child health in slums with inadequate health facilities are worse in comparison to relatively better served slums. The present study is based on data collected by National Family Health Survey –II (1998-99) conducted in all 26 states of India. The analysis indicates that the distribution of polio vaccine is relatively high among first birth order children in Mumbai slum, urban Maharashtra and rural Maharashtra. The unit of analysis for this study is child. Accordingly the data has been tabulated and analyzed for rural-urban areas of Maharashtra and Mumbai slum. It is found that in view of the differential vulnerabilities across slums, an urban child health program should build contextually appropriate and community needs responsive approaches to improve children's health in the slums. It is found that in order to manage the child immunization in Mumbai Slum, it is important to improve the standard of living of the families, impart them a favorable population education, coupled with the value of education in the long term health impact and health effects of immunization with its economic impact on families.

1. Introduction

Immunization is a timely step for prevention of mortality and morbidity due to communicable diseases in 0-4 year age group (Bansod and Paswan, 2004). Vaccination or immunization term is used interchangeably. Both the terms mean process of giving vaccines or 'shots' to children or adults so that they develop immunity or resistance against some particular diseases. A vaccine is nothing but whole or part of the disease germ which has been processed or modified in such a way that it has lost its capacity to produce disease but it can still induce immunity or has fighting power when administered in the body. Hence, by vaccination one develops immunity without suffering from the disease (Bremberg, 2003).

One can look at the type of vaccines from different angles. Different vaccines work against different diseases, e.g. there are separate vaccines for Poliomyelitis, Measles, Diphtheria, Tetanus etc. Vaccines can be oral such as oral polio vaccine or oral typhoid vaccines or it can be injectable like DPT vaccine or Hepatitis B vaccine. Vaccine can be of single dose like the Measles vaccines or combination of more than one vaccine like the MMR vaccine (which acts against Measles, Mumps and Rubella) or the DPT vaccine (which acts against Diphtheria, Pertusis and Tetanus). Injectable vaccines can be given subcutaneously i.e. below the skin like the Measles vaccine or given intramuscularly i.e. in the muscle like DPT vaccine. Vaccines are usually given prophylactically i.e. before the exposure to the disease germ like most of the vaccines e.g. Polio vaccine, DPT vaccine. Some vaccines work when given even after the exposure to the disease germ like the Rabies vaccine which is given after the dog bite. Hence one can look at various vaccines from different angles. The vaccines recommended routinely to a baby differ from authority to authority (Folbre, et.al. 2005). We will mainly discuss the schedule recommended by Govt. of India and that recommended by Indian Academy of Pediatrics i.e. the professional body of Pediatricians of India.

2. Government of India Schedule

The minimum vaccines that an Indian child should receive are the vaccines recommended by Govt. of India under the Expanded Programme of Immunization (EPI). It includes three doses of tetanus toxoid to be given to the mother during pregnancy to protect both the mother and the new born from tetanus. After birth the baby receives vaccines against six killer preventable disease including BCG (against Tuberculosis) oral Polio vaccine (against poliomyelitis), DPT vaccine (against Diphtheria, Pertusis, Tetanus) and Measles vaccine (against Measles). These vaccinations are given according to a time schedule. Vaccination schedule has been recommended by Indian Academy of Pediatrics (IAP). IAP fully endorsed the EPI schedule as recommended by Govt. of India and agrees that EPI scheduled is the minimum a child should receive. But IAP also recommended some additional vaccines and some additional doses of EPI vaccines.

3. Additional Vaccines As Routine

IAP recommends two more vaccine as a must for all children. It recommends three doses of Hepatitis B vaccines, 0-1-6 months starting as early as possible after birth. 0-1-6 scheduled means first dose followed by second dose 1 month after first dose and third dose 6 months from first dose (5 month after the 2nd dose). To match with EPI scheduled it recommends first dose at birth along with zero dose of OPV and BCG. The second dose could be given at 6 weeks of age along with the OPV1 and DPT1 and the third dose could be postponed till 9 months of age along with Measles vaccine. This will entail giving simultaneous vaccines and cut down the number of visits the parents have to make. The second vaccine recommended as a must is MMR vaccine to be given at 15 -18 months of age. It could be given with first booster of OPV and DPT to reduce an additional visit.

The decision to give or not to give a vaccine when patient comes late depends on the natural history of the particular disease vis-a-vis the age of the child. BCG, OPV and DPT should be given till 5 years of age. If the child is older than 5 years only DT should be given. In a child older than six months prior Mantoux test is necessary before giving BCG. If Measles is delayed it can be given as Measles till 12 months or as MMR thereafter. If MMR is delayed it can be given at any age till adolescence, after that one can give mumps and rubella vaccine. Hepatitis B can be given till any age including adulthood, though the response is blunted after the age of 40 years. Vaccine if delayed can be given till 5 year of age. For a child above 12-15 months only one dose of Hi b (Hemoglobin) vaccine is enough. Typhoid vaccine can be given till adulthood. Similarly Hepatitis A and chickenpox vaccine can be given till any age provided patient has not suffered from the respective disease. For OPV and DPT if patient comes late for the 2nd and 3rd primary doses or the booster doses it is not necessary to restart the schedule. Instead just complete the remaining doses including 1st booster 1 year after the last primary dose and 2nd booster at 3-4 years after the 1st booster dose. What is more important to realize is that the child remains unprotected or only partially protected till he completes the desired schedule. Hence it is important to complete the scheduled as fast as possible to give early and complete protection and to prevent breakthrough infection. More and more vaccines are recommended and available for children. Many of them overlapping age of recommendation e.g. OPV, DPT, Hib and Hepatitis B; all 4 will be to require to be given at 6-8 weeks. Unless given on same day the scheduled of all these vaccines simultaneously.

4. Poliomyelitis

Polio is acute viral infection caused by an RNA virus affecting the nervous system. It primarily affects children under five year of age. About one percent of all infection leads to paralysis of limbs. The virus survives only for short time outside the human body. It spread through respiratory droplet and through faecal matters. The symptoms are high fever and pain in the limbs, followed by acute flaccid paralysis. Immunization by oral polio vaccine is wide spread.

5. Problem statement

In the pre-vaccination era, Poliomyelitis was found in all countries of the world (Young, 2002; Reichmann, 2004). The extensive use of Polio vaccines since 1954 has virtually eliminated the disease in developed countries. In 1988, World Health Assembly adopted a resolution for the global eradication of Poliomyelitis. Americas have been the only continent that has been certified as being polio-free in 1994 (WHO, 1999). The western Pacific Region reported zero incidences in 2000 and 2001 (WHO, 2002).

Acute flaccid paralysis (AFP) surveillance is conducted to identify all remaining infected areas, monitor progress towards eradication and target supplementary immunization appropriately. Utilizing a network of health facilities throughout each country, WHO recommends the immediate reporting and investigation of every cases of AFP in children aged less than 15 years, and collection of 2 samples for analysis in a WHO accredited laboratory. AFP surveillance is evaluated by two key indicators: the sensitivity of reporting (target being non polio AFP rate of at least 1 case per 100,000 children aged less than 15 years), and the completeness of specimen collection (target being 2 adequate stool specimen from at least 80 per cent of all AFP cases) (Hook et.al., 2004). AFP surveillance in critical countries of the region is being conducted through a network of surveillance medical officers, who received special training and are responsible for defined catchment area.

6. The Status of Immunization in India

The overall number of polio cases reported in the country decreased from 25711 in 1988 to 265 (all wild virus confirmed) in 2000, a reduction by 99.06 percent. While the disease is on its way out in rest of the country; Delhi, Bihar, Uttar Pradesh and West Bengal are still reporting number of cases of wild polio. The spread of virus is a great concern not only to the Govt. of India but for international agencies also. May be lack of good monitoring as well as diminishing emphasis on round the year immunization programme for children contributed to this sudden outbreak of polio cases (Times of India, 4th Sept. 2002). India plays an important role in the global eradication of poliomyelitis because of the presence of large number children under 5 years of age in the country.

7. Poliomyelitis eradication

Poliomyelitis is eradicable because man is the only host. A long term carrier state is not known to occur. The half life of excreted virus in the sewage is about 48 hours and spread can only occur during this period. Oral polio vaccine (Rao, Mishra and Retherford, 1998), which is easy to administer and relatively cheap, is ideally suited for poliomyelitis eradication strategies because the live vaccine virus, by multiplying in the intestine can interrupt the transmission of the wild polioviruses. As this vaccine contains live attenuated poliovirus, when administered orally it mimicks the natural the route of infection, and it can also be transmitted from a recently vaccinated child to close contact that have not been immunized. The simultaneous administered of OPV within a short period of time by mass immunization campaign (such as by Pulse Polio Programme) interrupts transmission

of wild poliovirus by displacing it from intestine, where the wild polio virus multiply. This effect is enhanced if the vaccination coverage is 100 percent of the population at risk i.e. children below 3 years of age.

The net result is abrupt interruption of transmission of wild poliovirus in the community, a result that cannot be otherwise achieved in areas of poor sanitation and high population density by year – round routine immunization alone.

8. Epidemiological trends

Poliomyelitis can occur sporadically, endemically or epidemically. During the past century or so, the epidemiological behavior of polio has considerably changed: (a) what was originally a sporadic disease, has evolved itself into an epidemic disease of varying degree of severity, (b) what was predominantly a disease of infants (infantile paralysis), and has shown a tendency to affect higher age group, and (c) epidemic poliomyelitis which was earlier confined to countries with temperate climate is now being increasingly reported from tropical countries, probably as a result of rising standard of living.

9. Agent factor

- **AGENTS:** The causative agent is the poliovirus which has three serotypes 1, 2 and 3. Most outbreak of paralytic polio is due to type -1 virus. Polio virus can survive for long periods in the external environment. In a cold environment, it can live in water for 4 months and in faeces for 6 months. It is therefore well-adapted for the faecal-oral route of transmission. However, the viruses may be rapidly inactivated by the pasteurization, and a variety of physical and chemical agents.
- **RESERVOIR OF INFECTION:** Man is the only known reservoir of infection. Most infections are sub clinical. It is the mild and sub clinical infections that play a dominant role in the spread of infection; they constitute the submerged portion of the iceberg. It is estimated that for every clinical case, there may be 1000 sub clinical cases in children and 75 in adults. There are no chronic carriers. No animal source has yet been demonstrated.
- **INFECTIOUS MATERNAL:** the virus is found in the faeces and oropharyngeal secretion of an infected person.
- **PERIOD OF COMMUNICABLE:** The cases are most infectious 7 to 10 days before and after onset of symptoms. In the faeces, the virus is excreted commonly for 2 to 3 weeks, sometimes as long as 3 to 4 months.

10. Host factors

- **AGE:** In India, polio is essentially a disease of infancy and childhood. About 50 per cent of cases are reported in infancy. The most vulnerable age is between 6 months and 3 years.
- **SEX:** Sex differences have been noted in the ratio of 3 males to one female.
- **RISK FACTOR:** Several provocative of risk factors have been found to precipitate an attack of paralytic polio in individuals already infected with polio viruses. They include fatigue, trauma, and intramuscular injections, operative procedures such as tonsillectomy undertaken especially during epidemics of polio and administration of immunizing agents particularly alum-containing DPT.
- **IMMUNITY:** The maternal antibodies gradually disappear during the first 6 months of life. Immunity following infection is fairly solid although reinfection can occur since infection with one type dose not protect completely against the other two types of viruses. Type 2 virus appears to be the most effective antigen. Neutralizing antibody is widely recognized as an important index of immunity to polio after infection.

11. Environmental Factor

Polio is more likely to occur during the rainy season. Approximately 60 percent of cases recorded in India occur June to September. The environmental sources of infection are contaminated water, food and flies. Polio virus survives for a long time in a cold environment. Overcrowding and poor sanitation provide opportunities for exposure to infection.

12. Pulse Polio Immunization

In India NIDs has become the largest public health campaigns ever conducted in a single country, with 147 million children immunized in 1999 compared to 79 million children in 1995 during a sign. The expanded program on immunization (EPI) was launched by World Health Organization (WHO) in 1974 and came to an existence in 1978 in India. The main objective of EPI was to reduce the child mortality by preventing six major dreadful diseases, such as Tuberculosis, Diphtheria, Whooping Cough, Tetanus, Poliomyelitis and Measles. In 1985-86, Government of India (GoI) started Universal Immunization Programme (UIP) in our country in a phased manner and the UIP is being implemented in the entire country to protect the children against six major diseases. The UIP also protected the pregnant women against tetanus in order to prevent the neo-natal tetanus infections. In spite of the Reproductive and Child Health (RCH) program being implemented by the Government of India (GoI) through National Health Policy in all over India, the full immunization coverage is at a lower level. Hence there is a felt need to examine the reason for lower coverage of full immunization in India. The presented study attempts to study the factor for lower coverage of full immunization in India.

The World Health Organization (WHO) launched the expanded programme on immunization (EPI) in 1974. The programme focused on tackling six major childhood diseases: Measles, tuberculosis, pertussis (whooping cough), diphtheria, tetanus and poliomyelitis, aimed at universal immunization of children against all the above mentioned diseases by 1990, the expanded programme on immunization (EPI) was initiated by the Govt. of India in 1978 with the objective of reducing morbidity, mortality and disabilities occurring due to these disease by making free vaccination services available to all the eligible children. Under the

EPI, a child is likely to receive one dose of BCG for protection against tuberculosis, three doses of DPT (diphtheria, pertussis and tetanus), three doses of OPV for poliomyelitis protection and dose of Measles vaccine by his/her first birthday.

The universal immunization programme (UIP) was introduced in India in 1985-86 with the objective to cover at least 85 percent of all infants against the six vaccine preventable diseases by the 1990 and to achieve self sufficiency in vaccine production and the manufacture of cold chain equipment for storage purpose (Government of India, 1992). Presently this scheme has been introduced in every district of the country and the target now is to achieve 100 percent immunization coverage. A national Socio-Demographic goal was set up in National Population Policy (NPP) 2000, to achieve universal immunization of children against all vaccine preventable disease by 2010.

In National family Health Survey-II (1998-99), children who receive BCG, Measles and three dose of DPT and polio (excluding polio 0) are considered to be fully vaccinated based on the information obtained from a card and for those the cards were not available, information was procured from their mothers. NFHS-II reveals that the percentage of eligible children, who received full immunization, varies across the states and regions from as low as of 8.8 percent in Jharkhand to 8.8 percent in Tamilnadu. The achievement of full immunization of children not only depends on the involvement of people (Casper and Smith, 2004) but also to a large extent rest on the driving force of governance.

In this aspect, it is disheartening to note that West Bengal's achievement in just in half way as compared to that of Tamilnadu. Albeit during the past 26 years, West Bengal with a stable Govt has achieved many a success in the fields of land reforms through Panchayats, distribution of vested land among land less scheduled castes, tribes and the poor and marginal farmers but from the demographic points of view, the state is still lagging behind in comparison to many southern states. As now it has failed to reach the replacement level of fertility, whereas most of the southern state have already reached at that level. Immunization coverage in west Bengal is far from complete coverage, although it has improved slightly from 34 percent in NFHS-I (1992-93) to 44 percent in NFHS-II (1998-99). Child health care has two important elements: (1) Paediatric care; and (2) Immunization. New born children are often registered in hospital, primary health centre, family welfare centre, and maternity homes with doctors, auxiliary nurses, lady health visitors are rendered by these institutions and medical/paramedical persons up to a certain period after birth and in some cases on receipt of information of a child birth, an auxiliary nurse or lady health visitor attends to the new born. Such services are designated as Pediatric care. Information was collected in the NSS data whether a child aged 0-4 years in a household was registered for Pediatric care and also at the intuitions or personal with whom they are registered to avail such services.

One of the most important public health services is immunization of children in the form of inoculation of vaccination to procure immunity from developing certain infections. The NSS collected information for the children between 0-15 years of age on immunization. Of all the measures of immunization, the vaccine of triple antigen which seeks to immunize the children from diphtheria, whooping cough and tetanus is the most important. The first injection is usually given when the child is 0-9 months old and booster dose is also injected when the child is generally aged 18-24 months. The age group 0-1 has been chosen for this purpose. On the basis of the above literature review, following objectives have been framed:

13. Objectives

- To analyze the socio-economic and demographic differential in the childhood immunization like Polio vaccine, DPT, BCG and measles in Mumbai Slum
- To suggest ways to improve the childhood immunization in Mumbai Slum

14. Data And Method

Maharashtra is one of the most urbanized states of India but there is a wide gap between rural and urban so far as provision of health services is concerned. At the same time Mumbai the capital of Maharashtra and also commercial capital of India is better off in certain terms. As mentioned earlier the same type of health facilities may not be available throughout the city especially in slums. Therefore, different regions of Maharashtra have been considered for the present study.

The present study is based on data collected by National Family Health Survey –II (1998-99) conducted in all 26 states of India. More than 90,000 women aged 15-49 were interviewed. The present study focuses on currently married women and children of Maharashtra; one of the populous states in India. In this study, children's and household files have been merged. The unit of analysis for this study is child and bi-variate analysis has been performed. The ultimate sample size for this study is 1761 children born in last three years before the survey. Accordingly the data has been tabulated and analyzed for rural-urban areas of Maharashtra and Mumbai slum.

15. Analysis and Findings

15.1. Percentage distribution of children who received Polio drop out by background characteristics in Maharashtra

The sex ratio of population of Maharashtra is 947 females per 1000 males for rural areas it is 985 and urban areas 898 which suggest that more men than women have migrated to urban areas. The sex ratio at birth for the seven year period preceding NFHS -2 is 935, NFHS-I which is at the lower boundary of the range normal biological sex ratio. According to NFHS-2 castes are divided into many categories but in this table castes are divided in to two categories, SC/ST/OBC and others which includes rest of the castes. The SC/ST/OBC children of Mumbai slum have received less polio vaccine comparison other two categories while polio vaccine distribution is almost same in urban and rural Maharashtra. In case of other castes children, larger proportion of rural Maharashtra children got all doses of vaccine than those from slum of Mumbai. In NFHS-2 through religion was divided in many categories in our analysis, religions is divide in to only two categories, Hindu and other such as Muslims, Christian, Sikh and Buddhist. It can be observed that from table larger proportion of Hindu children from rural Maharashtra and larger proportion

of other children from Mumbai slum got all the three doses of polio vaccine. It is interesting to note in other category all the children from Mumbai slum got dose of polio 1 and polio 2 but in case of polio 3 a shortfall of 14 percent was observed. Birth order is divided in four categories in NFHS-II but in this table birth order is clubbed in to three categories. This indicates that the distribution of polio vaccine is relatively high among first birth order children in Mumbai slum urban Maharashtra and rural Maharashtra, but in case of second birth order children polio vaccine is equally distributed in three categories, which is around 84 percent. In third and higher order birth proportion of children who received polio vaccine is higher than that from urban areas. Standard of living index is an indicator which affects the living style of a person. In NFHS-2 standard of living index is divided in three categories low, medium and high. All the children living in slum of Mumbai having low standard of living got their children vaccinated all the three doses of polio.

Characteristics		Mumbai Slum				Maha Urban				Maha Rural			
		Polio1	Polio2	Polio3	All Polio	Polio1	Polio2	Polio3	All Polio	Polio1	Polio2	Polio3	All Polio
Sex of Child	Male	100 (23)	95.4 (65)	78.5 (65)	78.5 (65)	100 (52)	100 (52)	86.8 (53)	88.5 (52)	95.7 (117)	94.0 (117)	82.9 (117)	82.9 (117)
	Female	100 (13)	98.7 (75)	85.3 (75)	85.3 (75)	100 (73)	97.3 (73)	82.2 (73)	83.3 (72)	96.1 (127)	92.1 (127)	86.6 (127)	86.6 (127)
Mother's Education	Illiterate	97.9 (47)	95.7 (47)	78.7 (47)	78.7 (47)	100 (30)	96.7 (30)	80.0 (30)	77.4 (31)	91.1 (112)	85.7 (112)	76.8 (112)	76.8 (112)
	Literate	98.9 (93)	97.8 (93)	83.9 (93)	83.9 (93)	100 (95)	98.9 (95)	86.3 (95)	86.3 (95)	100 (132)	99.2 (132)	91.7 (132)	91.7 (132)
Caste	SC/ST/OBC	100 (33)	97.0 (33)	75.8 (33)	75.8 (33)	100 (58)	98.3 (58)	84.5 (58)	83.1 (59)	94.5 (109)	90.3 (109)	82.6 (109)	82.6 (109)
	Others	98.1 (107)	97.2 (107)	84.1 (109)	84.1 (107)	100 (67)	98.5 (67)	85.1 (67)	85.1 (67)	97.0 (133)	94.7 (133)	86.5 (133)	86.5 (133)
Religion	Hindu	97.1 (68)	94.1 (68)	77.9 (68)	77.9 (68)	100 (76)	98.7 (76)	89.5 (76)	88.3 (77)	95.8 (212)	92.5 (212)	84.9 (212)	84.9 (212)
	Others	100 (72)	100 (72)	86.1 (72)	86.1 (72)	100 (49)	98.0 (49)	77.6 (49)	77.6 (49)	96.9 (32)	96.9 (32)	84.4 (32)	84.4 (32)
Birth Order	1	98.2 (57)	96.5 (57)	87.7 (57)	87.7 (57)	100 (49)	98.0 (49)	89.8 (49)	88.0 (49)	95.2 (83)	94.0 (83)	89.2 (83)	89.2 (83)
	2	97.6 (41)	97.6 (41)	85.4 (41)	85.4 (41)	100 (37)	96.9 (32)	84.4 (32)	84.4 (32)	96.4 (56)	94.6 (56)	83.9 (56)	83.9 (56)
	3 or above	100 (47)	97.6 (42)	71.4 (42)	71.4 (42)	100 (44)	100 (44)	79.5 (44)	79.5 (44)	96.2 (105)	91.4 (105)	81.9 (105)	81.9 (105)
Standard of Living Index	Low	100 (5)	100 (5)	100 (5)	100 (5)	100 (16)	100 (16)	62.5 (16)	58.8 (17)	93.0 (115)	90.4 (115)	79.1 (115)	79.1 (115)
	Medium	98.9 (91)	96.7 (91)	78.0 (91)	78.0 (91)	100 (74)	98.6 (74)	87.8 (74)	87.8 (74)	98.1 (103)	95.1 (103)	91.3 (103)	91.3 (103)
	High	97.0 (33)	97.0 (33)	90.9 (33)	90.9 (33)	100 (31)	100 (31)	93.5 (31)	93.5 (31)	100 (22)	100 (22)	90.9 (22)	90.9 (22)

Table 1: Percentage distribution of children who received Polio drop by background characteristics in Maharashtra

Note: Figures in parenthesis indicates frequency

Characteristics		Mumbai Slum				Maha Urban				Maha Rural			
		DPT1	DPT2	DPT3	ALL DPT	DPT1	DPT2	DPT3	ALL DPT	DPT1	DPT2	DPT3	ALL DPT
Sex of Child	Male	98.5 (65)	96.3 (65)	93.2 (65)	92.3 (65)	100 (51)	100 (51)	96.1 (51)	92.5 (53)	94.9 (117)	93.2 (117)	89.7 (117)	89.7 (117)
	Female	94.5 (75)	93.3 (75)	93.3 (75)	93.3 (75)	97.2 (72)	93.1 (72)	91.7 (72)	90.4 (73)	94.4 (126)	88.9 (126)	87.3 (126)	86.6 (127)
Mother's Education	Illiterate	91.5 (47)	91.5 (47)	87.2 (47)	87.2 (47)	96.4 (28)	92.9 (28)	85.7 (28)	77.4 (31)	88.3 (111)	82.0 (111)	79.3 (111)	78.6 (112)
	Literate	98.9 (93)	96.8 (93)	95.7 (93)	95.7 (93)	98.9 (95)	96.8 (95)	95.8 (95)	95.8 (95)	100 (132)	98.5 (132)	96.2 (132)	96.2 (132)
Caste	SC/ST/OBC	97.0 (33)	97.0 (33)	93.9 (33)	93.9 (33)	100 (58)	96.6 (58)	93.1 (54)	91.5 (59)	91.7 (109)	88.1 (109)	87.2 (109)	87.2 (109)
	Others	96.3 (107)	94.4 (107)	92.5 (107)	92.5 (107)	96.9 (65)	95.4 (65)	98.3 (65)	91.0 (67)	97.0 (132)	93.2 (132)	89.4 (132)	88.7 (132)

Religion	Hindu	95.6 (68)	94.1 (68)	92.6 (68)	92.6 (68)	98.7 (75)	96.0 (75)	94.7 (75)	92.2 (77)	94.3 (211)	90.0 (211)	87.7 (211)	87.3 (212)
	Others	97.2 (72)	95.8 (72)	93.1 (72)	93.1 (72)	97.9 (48)	95.8 (48)	91.7 (48)	89.8 (49)	96.9 (32)	96.9 (32)	93.8 (32)	93.8 (32)
Birth Order	1	98.2 (57)	96.5 (57)	94.7 (57)	94.7 (57)	100 (49)	100 (49)	98.0 (49)	96.0 (49)	95.2 (83)	92.8 (83)	91.6 (83)	91.6 (83)
	2	95.1 (41)	92.7 (41)	92.7 (41)	92.7 (41)	100 (32)	90.6 (32)	87.5 (32)	87.5 (32)	96.4 (56)	92.9 (56)	89.3 (56)	89. (56)
	3 or above	95.2 (42)	95.2 (42)	90.5 (42)	90.5 (42)	95.2 (42)	95.2 (42)	92.9 (42)	92.9 (42)	88.6 (104)	88.5 (104)	85.6 (104)	84.8 (104)
Standard of Living Index	Low	100 (5)	100 (5)	100 (5)	100 (5)	100 (15)	93.3 (15)	80.0 (15)	70.6 (17)	91.2 (114)	86.0 (114)	82.5 (114)	81.7 (115)
	Medium	95.6 (91)	93.4 (91)	91.2 (91)	91.2 (91)	97.3 (73)	95.9 (73)	95.9 (73)	94.6 (74)	97.1 (103)	95.1 (103)	93.2 (103)	93.2 (103)
	High	97.0 (33)	97.0 (33)	97.0 (33)	97.0 (33)	100 (31)	96.8 (31)	96.8 (31)	96.8 (31)	100 (22)	100 (22)	100 (22)	100 (22)

Table 2: Percentage distributions of children who received DPT by background characteristics in Maharashtra

Note: Figures in parenthesis indicates frequency

15.2. DPT

The sex ratio of population of Maharashtra is 947 females per 1000 males. For rural areas it is 985 and urban areas 898 which suggest that more men than women have migrated to urban areas. In NFHS-2 castes are divided into many categories but in our case castes are divided into two categories, SC/ST/OBC and others which includes all other castes. Table 2 indicates that the proportion of SC/ST/OBC children receiving various doses of DPT are higher compared to rural and urban areas of Maharashtra but in case of other castes larger proportion of children from Maharashtra urban got all doses of vaccine Drop out from DPT 2 to DPT 3 was more visible in case of children from rural Maharashtra.

In NFHS-2 though religion was divided in many categories in our analysis, religion has been divided into only two categories, Hindu and others (includes Muslims, Christian, Sikh and Buddhist). It can be observed the table that lesser proportion Hindu children from rural Maharashtra and larger proportion of others children from Mumbai slum and rural Maharashtra got all the three doses of DPT vaccine. It is interesting to note that in case of Maharashtra urban 98 to 99 percent got dose of DPT 1 and steep fall was observed when all the dose were considered. Birth order is divided in four categories in NFHS-II but in our case birth order is clubbed into three categories. Table 2 indicates that the immunization DPT vaccine is relative high among first birth order children of Mumbai slum urban and rural Maharashtra. But in case of second order birth, there are more shortfalls in case of rural Maharashtra. It is interesting to note that in case of third order birth the proportion of children having all DPT doses has reduced in Mumbai slum and rural Maharashtra but increased in urban Maharashtra.

Standard of living index affects the living style of a person. In NFHS-2, standard of living index is divided in three categories low, medium and high. All the children living in Mumbai slum having low standard of living and those living in rural Maharashtra with high standard of living got their children vaccinated all the three doses of DPT. It is worth mentioning that in case of higher SLI all children from Maharashtra rural and urban got first and second dose of DPT and there was a subsequent dropout in case of other doses. Dropout rate was less evident among children from household having medium SLI.

15.3. BCG and Measles

In NFHS-II children who have received BCG Measles and three doses each of DPT and polio (excluding polio 0) are considered to be fully vaccinated, based on information obtained from a card or reported by mothers "either source" 78 percent of children aged 12-23 months are fully vaccinated and only 2 percent have not received any vaccination at all. All the male children in Mumbai slum urban were vaccinated for the BCG where as 97 and 93 present children respectively from Mumbai slum and Maharashtra rural were immunized for BCG. More than 80 percent children were immunized for Measles. The proportion was higher in urban Maharashtra followed by rural Maharashtra and Mumbai slum. In case of girls around 97 percent from Mumbai slum and urban Maharashtra were vaccinated for BCG. Similarly around 83 percent girls from Mumbai and Maharashtra urban were vaccinated for Measles. It is interesting to note that the proportion of girls having BCG vaccination was comparatively lower but such a proportion was higher in case of Measles which is evident from this table.

It is believed that education of parents especially mothers makes them more knowledgeable about child health. The mother's education has been categorized as illiterate and literate. Almost an equal proportion of children of illiterate mothers in Mumbai slum and urban Maharashtra were vaccinated for BCG. Almost all the children of literate mothers in Mumbai slum and urban Maharashtra had their children vaccinated for BCG. The proportion of children of illiterate mothers who got BCG vaccination was far below. Three fourth children of illiterate mothers of

rural and urban Maharashtra were vaccinated for BCG while this was prevalent among only two third children of Mumbai slum. It is evident from this table that around 89 percent children of literate mothers got Measles vaccination compared to 94 percent children from rural Maharashtra. It has already been mentioned that in NFHS-2 castes are divided into many categories but in our analysis castes are divided in to two categories, SC/ST/OBC and others. Table indicates that around 85 percent SC/ST/OBC children have received Measles vaccines which are very much the same throughout the study area like that in other categories;

children receiving BCG vaccines are almost the same in Mumbai slum and urban Maharashtra but low in rural Maharashtra. In case of children of first birth order who had took BCG vaccine proportion are relatively high in urban Maharashtra who took Measles vaccine are almost same everywhere. But in second order birth all children got BCG vaccine this proportion was more than 95. Almost 9 of every 10 children from the study area were vaccinated for Measles. However, this proportion was higher in rural and urban Maharashtra followed Mumbai slum. In third order birth most of the children of rural Maharashtra and Mumbai slum got BCG vaccination while it was 87 percent in rural Maharashtra. Less than three fourth of slum children of third and higher order birth got, while this proportion was more than four-fifth in other areas. On considering standard of living index it is found that in Mumbai slum all the children from low SLI household were vaccinated for BCG while such an event took place among high SLI household of rural and urban Maharashtra. Irrespective of SLI most of the children of Mumbai slum were vaccinated for BCG while in case of Measles it has about 80 percent. It is evident from table that percentage of children getting various types of vaccination increases with the increase in SLI.

Characteristics		Mumbai Slum		R. Maha_Urban		R. Maha_Rural	
		BCG	Measles	BCG	Measles	BCG	Measles
Sex of Child	Male	96.9 (65)	81.5 (65)	100 (53)	88.5 (52)	93.2 (117)	86.2 (116)
	Female	97.3 (75)	82.7 (75)	97.3 (73)	83.3 (72)	88.2 (127)	86.5 (126)
Mother's Education	Illiterate	93.6 (47)	68.1 (47)	9.35 (31)	76.7 (30)	83.9 (112)	77.5 (111)
	Literate	98.9 (93)	89.2 (93)	100 (95)	88.3 (94)	96.2 (132)	93.9 (131)
Caste	SC/ST/OBC	93.3 (33)	84.8 (33)	96.6 (59)	86.2 (58)	91.0 (133)	85.2 (108)
	Others	98.1 (107)	81.3 (107)	100 (67)	84.8 (66)	89.9 (109)	87.1 (132)
Religion	Hindu	94.1 (68)	83.8 (68)	97.4 (77)	92.2 (77)	89.6 (212)	86.7 (210)
	Others	100 (72)	80.6 (72)	100 (49)	74.5 (47)	96.9 (32)	84.4 (32)
Birth Order	1	94.7 (57)	87.7 (57)	98.0 (50)	88.0 (50)	92.8 (83)	90.2 (82)
	2	100 (41)	82.9 (41)	96.9 (32)	86.7 (30)	94.6 (56)	87.3 (55)
	3 or above	97.6 (42)	73.8 (42)	100 (44)	81.8 (44)	86.7 (105)	82.9 (105)
Standard of Living Index	Low	100 (5)	80 (5)	88.2 (117)	62.5 (115)	85.2 (115)	82.5 (114)
	Medium	96.7 (91)	79.1 (91)	100 (74)	86.3 (73)	95.1 (103)	90.2 (102)
	High	97.0 (33)	84.8 (33)	100 (31)	100 (31)	100 (22)	90.9 (22)

Table 3: Percentage distribution of BCG and Measles in Maharashtra

Note: Figures in parenthesis indicates frequency

16. Discussion, Conclusion and Policy Implications

Immunization is a mass means of protecting the greatest number of peoples' life. By reducing the number of susceptibility in the community, it augments "hard immunity" making the infection more difficult to spread. It also reduces the risk for those individuals who have escaped vaccination or those who have not developed satisfactory protection. It is important to bear in mind that immunization are not all 100 percent effective, particularly when an individual is opposed to a large dose of pathogenic organism. Immunization is frequently postponed if children are ill or malnourished. This is not acceptable in the light of present knowledge. In fact, it is particularly important to immunize children with malnutrition. Child health care has two important elements: Pediatric care and immunization, new born children are often registered in hospitals; primary health centre etc, in some cases on receipt of information of a child birth, an auxiliary birth nurse (ANM) or lady health visitors (LHV) attends to new born. In case of Mumbai slum 85 percent female children received all polio doses and among the boys it was around 79 percent. In urban Maharashtra received polio vaccines is almost high. Like that in rest of Maharashtra urban and less percentage of received polio vaccines is high followed by rest of Maharashtra urban and less percentage of received polio vaccines is in Mumbai slum. Sex ratio of population receiving DPT vaccines is higher in Mumbai slum than rest of Maharashtra urban and lesser percentage of children received polio vaccine are in rest of Maharashtra rural. But, according to standard of living index, higher percentage of children received polio vaccines are in Mumbai slum followed by rural Maharashtra and lesser percentage are in urban Maharashtra.

Therefore, in order to manage the child immunization in Mumbai Slum, it is important to improve the standard of living of the families, impart them a favorable population education, coupled with the value of education in the long term health impact and health effects of immunization with its economic impact on families.

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