

Immunization Status in Children of Age Group 2-5 Years Admitted in Tertiary Care Hospital

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Conflict of interest: Nil

Abstract:

Background and Aim: The coverage of vaccination in India is far from complete despite the commitment for universal coverage. Reasons for lack of coverage vary from logistic ones to those dependent on human behavior. Present study was done with an aim to determine immunization status of children in age group 2 to 5 years admitted to Tertiary care hospital and to study the factors which influence the immunization status.

Material and Methods: A Cross-Sectional Observational Study was carried out in which children between 2 to 5 years' age admitted to paediatric department of a tertiary care hospital were included. Information on socio demographic factors and immunization history was collected. Immunization status of these children was analyzed and the cause for partial and non-immunization were studied. A total 380 children fulfilling the inclusion criteria were included in the study.

Results: Out of 380, 266 (70%) children were completely immunized and remaining 114 (30%) children were non/partially immunized. The immunization rate being highest (77.5%) in the 2 to 3 year's age group followed by 3 to 4 year's (70.7%) and 4 to 5 year's age group (60.8%). The numbers of completely immunized children were more in the urban area (71.9%) compared to rural area (62.3%). Birth order, place of delivery, presence of immunization card, socio-economic status, father and mother's education and employment status were statistically associated with immunization.

Conclusion: Lack of knowledge about immunization was the most common reason given by the caretakers for incomplete or no immunization. Other common reasons were 'child not well' at the scheduled date of immunization, fear of untoward effects, no information about place of vaccination, and child gone to native place at scheduled date of vaccination.

Keywords: Children, Cross-Sectional, Immunization, Vaccination.

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Introduction

The World Health Organization (WHO) has defined immunization as the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. These vaccines help to stimulate the body's own immune system to protect the person against subsequent infection or disease. Immunization therefore depicts the ability to develop immunity. Immunity being the state of having sufficient biological defences to avoid infection, disease, or other unwanted biological invasion. Immunity also depicts the capability of the body to resist harmful microbes from gaining access into it. [1]

Overall, worldwide immunization coverage in the developed world has improved considerably during the past decade. From the early 1980s to the early

1990s, the reported coverage increased from under 20% to approximately 80%, and millions of deaths were estimated to have been avoided as a result during this period. Despite these advances, however, diseases that are preventable through immunization still remain a major public health problem in many developing countries. [2] It is estimated that 1.5 million deaths occur among children less than five years of age worldwide, which are attributed to vaccine preventable diseases. Measles accounts for 8% of such deaths despite the fact that a safe and cost-effective vaccine is available. [3]

During the last few decades, the burden of the infectious diseases has been reduced through immunization. Also, immunization has shown major aspects of disease, disability and death

prevention. The most common vaccine preventable diseases are Rubella, measles, diphtheria, Tetanus, pertussis and Polio. [4] Vaccination is one of the public health programs that prevent disease in society. Immunization is the most common procedure used in vaccination. Vaccines are safe and effective; however, adverse reactions may develop. Children have a low level of immunity therefore are more prone to microbial infection. Children need to be immunized at a certain age, in order to ensure that they have a good ability to fight against infection. [5] Immunization has been one of the most significant and cost-effective public-health interventions to decrease childhood morbidity and mortality. Approximately three million children die each year of vaccine-preventable diseases. Recent estimates suggest that approximately 34 million children are not completely immunized, with almost 98% of them residing in developing countries. [6]

The World Health Organization (WHO) launched the Expanded Programme on Immunization (EPI) in 1974 with focus on the prevention of six vaccine- preventable diseases of the childhood by 2000. [7] This was implemented by the Government of India in 1978. [8] On 19 November 1985, the Universal Immunization Programme was introduced in India, aiming at covering at least 85% of all infants by 1990. Further, a national sociodemographic goal was set up in the National Population Policy 2000 to achieve universal immunization of children against all vaccine preventable diseases of the childhood by 2010. [9]

The Indian Academy of Pediatrics (IAP) Advisory Committee on Vaccines and Immunization Practices (ACVIP) has recently reviewed and updated the recommended immunization schedule for children aged 0 to 18 years based on recent evidence for the vaccines licensed in India. The process of preparing the new recommendations consisted of review of data and literature, consultative meetings twice, taking the opinion of various National Experts and arriving at a consensus and drafting the recommendations while taking into consideration the existing National immunization schedule and policies of the government. All decisions were taken unanimously. [10]

The coverage of vaccination in India is far from complete despite the commitment for universal coverage. According to the National Family Health Survey (NFHS) 4, only 62% of children, aged 12-23 months, were fully vaccinated – 63.9% in urban areas and 61.3% in rural areas (NFHS 4). Reasons for lack of coverage vary from logistic ones to those dependent on human behaviour. [11]

The disparity between government figures for immunization and UNICEF shows the need for

study, and necessity to study the social factors influencing the primary immunization and to know the reasons for partial and non-immunization. There are number of studies of Immunization in various areas. However, the tertiary care hospital-based studies are limited and such study is yet not performed in our institute. And so, there is a requirement of such study and if results will be found optimum it can be generalized to the entire area and state. Present study was done with an aim to determine immunization status of children in age group 2 to 5 years admitted to Tertiary care hospital and to study the factors which influence the immunization status.

Material and Methods

Present cross-sectional study was done in patients who were admitted in Nirmal Hospital between 2 to 5 years of age group from 1st September 2019 to 31st March 2021. Prior approval of thesis protocol from the institutional Ethics Committee was taken for the study. Patients were explained clearly about the nature and purpose of the study in the language they understand. Written informed consent was obtained before enrolling the patient for the study.

Inclusion Criteria:

- Children in age group 2 to 5 years who are admitted in Nirmal Hospital.
- Children whose guardians give consent to be included in study.

Exclusion Criteria:

- Children less than 2 years and more than 5years.
- Children whose guardian do not give consent to be included in study.

Once the study had been explained, caregivers gave their informed consent to participate into the study. The care giver, preferably mother was interviewed; if mother was not available, father was interviewed. Demographic and socioeconomic data were recorded using a questionnaire. The caregiver was asked about the immunizations received by their children. Immunization status was confirmed from the record of vaccination cards whenever available. In absence of immunization card, history obtained from parents was considered. The immunization status of the enrolled patients was assessed as per the National immunization program.

Children who had received BCG and three doses of DPT/oral polio vaccine (OPV) and measles vaccine as scheduled in the first year of life was classified as fully immunized. Those who had missed any dose of six primary vaccines were labelled as partially immunized, and those who had not received any vaccine, except OPV in pulse polio immunization, up to 12 months of age, were defined as non- immunized. [12] If the child was

partially immunized or non-immunized, the reasons for the same were recorded using open-ended questions. All places with a municipality, corporation, cantonment board or notified town area committee, etc. All other places which satisfied the following criteria: a minimum population of 5,000; at least 75 per cent of the male working population is engaged in non- agricultural pursuits; a density of population of at least 400 persons per sq. are considered in urban area. All area other than urban is rural. The basic unit for rural areas is the revenue village.[13] Immunization in catch-up age range and immunization in special situations are not included in this study.

Statistical Analysis: The recorded data was compiled and entered in a spreadsheet computer

program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

A total 380 children fulfilling the inclusion criteria were included in the study. Out of total 380 children, 266 (70%) children were completely immunized for age. The remaining 114 (30%) children were non/partially immunized.

Table 1: Immunization Status wise distribution

Immunization Status	Number	Percentage
Completely Immunized	266	70.0
Non/partially Immunized	114	30.0
Total	380	100.0

Table 2: Age and Immunization Status

Age in years	Completely immunized no. (%)	Non/partially immunized no. (%)	Total
2 to 3	121 (77.5%)	35 (22.5%)	156 (100%)
3 to 4	77 (70.7%)	32 (29.3%)	109 (100%)
4 to 5	70 (60.8%)	45 (39.2%)	115 (100%)

As can be easily appreciated by above table and chart, tendency is to have less and less immunization as the age of the child grows, the immunization rate being highest (77.5%) in the 2 to 3 year's age group and lower in the 3 to 4 year's age group (70.7%) and 4 to 5 year's age group (60.8%). The difference was found statistically significant. (p value = 0.0118) There were 255 boys and 125 girls in this population with a male to female ratio of 2:1. Completely immunized children were higher (70.58%) among boys

compared to girls (68.8%). There was no significant statistical difference among male and female immunization status. (p value = 0.7223) The place of delivery in (88.4%) children was institutional and only (11.6%) children were born at home. Majority of children born at hospitals (72.9%) were completely immunized as compared to (47.7%) children born at home. The difference was found statistically significant. (p value = 0.0001)

Table 3: Birth order and Immunization Status

Birth order	Completely Immunized no. (%)	Non/partially Immunized no. (%)	Total
1	101(78.3%)	28(21.7%)	129(100%)
2	105(69.1%)	47(30.9%)	152(100%)
3	40(65.6%)	21(34.4%)	61(100%)
≥ 4	20(52.6%)	18(47.4%)	38(100%)

Majority of families (73.9%) were having up to two children and only (26.1%) families were with more than two children. The tendency was to have less immunization as the birth order of the children increase. The immunization rate being highest (78.3%) in the first child and lowest in the birth order of four and more (52.6%). The difference was

found statistically significant. (p value = 0.0161) Immunization record was present with (57.3%) families. Around (90.4%) completely immunized children had immunization record and only (42.5%) non/partially immunized children were having immunization record. The difference was found statistically significant. (p value = 0.0001).

Table 4: Residence place and Immunization Status

Residence place	Completely immunized no. (%)	Non/partially immunized no. (%)	Total
Urban	218(71.9%)	85(28.1%)	303(100%)
Rural	48(62.3%)	29(37.7%)	77(100%)

Residence distribution showed that (79.7%) children were from urban areas and (20.3%) were from rural area. The numbers of completely immunized children were more in the urban area (71.9%) compared to rural area (62.3%). This shows children from urban area are better immunized but the difference was not statistically significant. (p value = 0.1326)

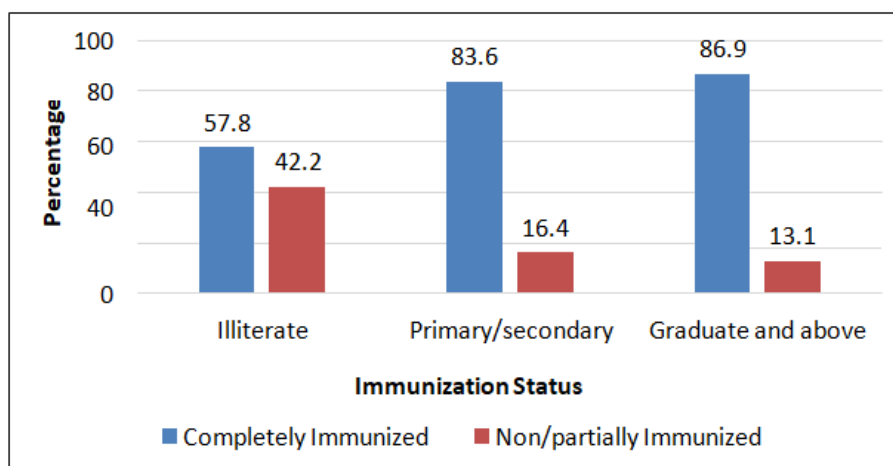


Chart 1: Mother's education and Immunization Status

A vast majority of mothers (54.2%) were illiterate, (33.6%) were studied till primary school and (12.1%) of them were either graduates or post graduates. There was direct co- relation of mother's education with immunization status. Only (57.8%) of Illiterate mothers had their children completely

immunized whereas mothers who had attended up to middle school had (83.6%) completely immunized children and mothers with higher education had (86.9%) completely immunized children. The difference was found statistically significant. (p value = 0.0001)

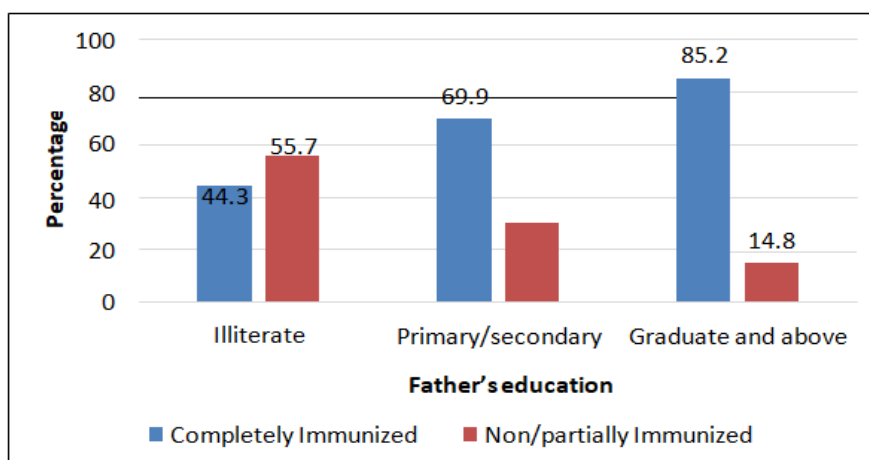


Chart 2: Father's education and Immunization Status

There was direct co-relation of father's education with immunization status. Only (44.3%) of Illiterate fathers had their children completely immunized whereas fathers who had attended up to middle school had (69.9%) completely immunized children and fathers with higher education had (85.2%) completely immunized children. Immunization rate was higher in children with highly educated father and the difference was statistically significant. (p value= 0.0001)

Table 5: Socio-Economic Status and Immunization Status

Socio-Economic Class	Completely immunized no. (%)	Non/partially immunized no. (%)	Total
I	41(89.1%)	5(10.9%)	46(100%)
II	65(90.3%)	7(9.7%)	72(100%)
III	94(63.5%)	54(36.5%)	148(100%)
IV	34(61.8%)	21(38.2%)	55(100%)
V	32(54.3%)	27(45.7%)	59(100%)

Majority of the families (38.9%) belonged to class III of socio-economic status according to BG Prasad classification. As per above table and chart, there was direct correlation of socio-economic status with immunization status. The immunization rate being highest in the class I (89.1%) and class II (90.3%) whereas lowest in the class III (63.5%), class IV (61.8%) and class V (54.3%). The difference was found statistically significant. (p value = 0.0001)

Table 6: Reasons for non/partial immunization

Reason	No. of patients	Percentage
Lack of knowledge	51	44.6
Child not well	20	17.3
Fear of untoward effects	19	16.4
Place and time of vaccination not known	13	11.4
Gone to native place	4	3.1
Others	7	7.2
Total	114	100.0

On considering the reasons given by the caretakers for incomplete or no immunization, lack of knowledge about immunization was the most common reason. Other common reasons included 'child not well' at the scheduled date of immunization, fear of untoward effects, no information about place of vaccination, and child gone to native place at scheduled date of vaccination. Miscellaneous causes put forth by the parent for incomplete immunization included loss of wages, mother not well and neither parent available.

Discussion

Immunization protects the children from the vaccine preventable diseases and those who are not fully immunized are at risk of developing recurrent infections and under-nutrition. This implies that partially and non-immunized children were at higher risk of malnutrition as they were not protected against the vaccine preventable diseases and contributing to the vicious cycle of malnutrition and infection. [14] Several factors play a role in the variations seen in immunization of children. These factors may be related to the individual characteristics like gender and birth-order or may be family related viz. area of residence, socio-economic status and education level of parents. Factors specific to the society like ease of access to and availability of health-care, health seeking behavior etc., also contribute to the inequalities.

The present study was performed to evaluate the immunization status of children attending a health care facility as well as to find out the reasons and factors associated with incomplete immunization. A total 380 children fulfilling the inclusion criteria were included in the study. Out of them, 266 (70%) children were completely immunized and remaining 114 (30%) children were non/partially immunized. Coverage comparable to National average (NFHS-4), which indicated (62.0%) children as completely immunized. [15] Similar

studies have shown variable results for children completely immunized or unimmunized. [16-18] In Pahwa HS et al [14], (60.25%) children were fully immunized, (29.5%) partially immunized and (10.25%) were unimmunized. Natsu SA et al [16] found about (70.3%) of the children were completely immunized while about (29.7%) were partially/unimmunized. The wide variation in different studies probably reflects the immunization coverage in different areas of the country.

In present study, the immunization rate being highest (77.5%) in the 2 to 3 year's age group and lower in the 3 to 4 year's age group (70.7%) and 4 to 5 year's age group (60.8%). So, the tendency is to have less and less immunization as the age of the child grows. In present study, completely immunized children were higher (70.58%) among boys compared to girls (68.8%). Which is comparable to study conducted by Pahwa HS et al [14], stated coverage levels of males (61.7%) were better than in females (58.6%), and also study conducted by Chavan VP et al [19], revealed (34%) of males are fully immunized compared to females where (29%) are immunized.

In present study, majority of children born at hospitals (72.9%) were completely immunized as compared to (47.7%) children born at home. In Pahwa HS et al [14], (75.0%) (198) of children born at hospitals were completely immunized in comparison to (31.60%) (43) Children born at home. Cutts et al, showed that delivery in a hospital had a positive impact on the immunization status of the child later in the life. [20] Mothers who deliver at home in general tend to be poor users of health services. More focus on ensuring that all deliveries take place at an institution may indirectly help in improving immunization coverage. Also, delivery at hospital ensures early start to the routine immunization and more information imparted to the parents regarding subsequent immunizations.

Our study shows that immunization rate being highest (78.3%) in the first child and lowest in the

birth order of four and more (52.6%). As the birth order of the child increases immunization declines. There is a strong association between use of family planning and use of immunization services or it may indicate that mothers at home are unable to bring their infant for the practical difficulties and expense of having other children at home. [21] It was found that mothers with 2-3 children are (20%) less likely and those with >4 children are (40%) less likely to have vaccinated children than those with 1 child. [22]

In present study, Immunization record was present with (57.3%) families. Around (90.4%) completely immunized children had immunization record and only (42.5%) non/partially immunized children were having immunization record. In Natsu SA et al [16], availability of immunization cards was seen in only (20.1%) of study population. Among them (76.2%) were completely immunized and (23.8%) non/partially immunized children. Other studies have shown a variable figure with some showing immunization card available in around (32.0%) subjects while others showing its availability in around (74.0%) subjects. [23,24]

Parental education, both maternal and paternal is an important indicator of the child's immunization. Education of the mother and father independently were significantly associated with complete immunization. Illiteracy has been shown to be associated with partial and unimmunized children in several studies. [22,23] In present study, only (57.9%) of Illiterate mothers had their children completely immunized whereas mothers who had attended up to middle school had (83.6%) completely immunized children and mothers with higher education had (86.9%) completely immunized children. In Pahwa HS et al [14], only (16.67%) of Illiterate mothers had their children completely immunized whereas mothers who had attended up to middle school had (60%) completely immunized children while almost all the children of mothers with higher education were completely immunized.

In present study, only (44.3%) of Illiterate fathers had their children completely immunized whereas fathers who had attended up to middle school had (69.9%) completely immunized children and fathers with higher education had (85.2%) completely immunized children. Chavan VP et al [19] shows children with father illiterate, primary, middle and high- School no children are fully immunized, father with Pre-university course (PUC) (6.1%), graduates (54.2%), postgraduates (70%) are fully immunized.

In Natsu SA et al [16], about (60.6%) of Illiterate fathers had their children completely immunized whereas fathers with higher education had (79.6%) completely immunized children. Significantly

higher level of knowledge is found amongst parents who were graduate or post-graduate and will understand the scientific information more easily than those parents who were illiterate or have primary education. This high level of knowledge may be attributable to quality of information provided to parents at health facilities.

In present study, only small numbers of children (21.8%) were non/partially immunized among the family with both the parents employed. The numbers of non/partially immunized children were more among the family with only father employed (33.5%) and both the parents unemployed (40%). Chavan VP et al [19] shows that children of professional father are (78.9%), businessman (23.8%), skilled worker (13.7%), farmer (0%), unskilled worker (4.3%) are fully immunized. Children of professional mother are (85.7%), skilled worker (54.5%), unskilled (5.8%), house wife (26.3%) are fully immunized. They show that occupation of parents has impact on immunization of children. Natsu SA et al [16] shows contrast result where both the parents employed, the chances of the child being incompletely immunized was significantly higher.

In present study, majority of the families (38.9%) belonged to class III of socio- economic status according to BG Prasad classification. The immunization rate being highest in the class I (89.1%) and class II (90.3%) whereas lowest in the class III (63.5%), class IV (61.8%) and class V (54.3%). Similar observations made by Dalal et al.

Natsu SA et al [16] shows that out of the children who were not completely immunized, the most common reason was absence of knowledge about immunization (46.7%) followed by 'child not being well' at scheduled time of vaccination (16.9%) and lack of information about place and time of vaccination (16.1%). Pahwa HS et al [14] shows that the main reason of partial or non-immunization was lack of knowledge of families about vaccination and unsatisfactory practices. Several other studies have given similar reasons for incomplete immunization. [20-24]

These findings demonstrate the need of continuous activities and efforts to spread knowledge about vaccination and its benefits. Use of mass media like television and utilization of services of prominent personalities in the field of arts and/or sports can be considered as was done in the case of pulse polio immunization campaign should also be considered. Minor illnesses are no contraindications for routine immunization. This fact needs to be reinforced repeatedly in the minds of health care workers as well as parents especially mothers during counselling at time of discharge after delivery. Similarly, the fear of untoward effects needs to be dispelled from the minds of the parents. Serious

adverse effects after immunization are extremely rare and the benefits of vaccination far outweigh the risk. Limitation of the study was as this was cross-sectional study, we had to rely on secondary data information, that was collected from immunization card or recall method.

Conclusion

Out of 380, 266 (70%) children were completely immunized and remaining 114 (30%) children were non/partially immunized. The immunization rate being highest (77.5%) in the 2 to 3 year's age group. Completely immunized children were higher (70.58%) among boys compared to girls (68.8%). Majority of children born at hospitals (72.9%) were completely immunized as compared to 47.7% in children born at home. The number of non/partially immunized children was more among the family with only father employed (33.5%) and both the parents unemployed (40%). The immunization rate being highest in the class I (89.1%) and class II (90.3%) whereas lowest in the class III (63.5%), class IV (61.8%) and class V (54.3%). Birth order, place of delivery, presence of immunization card, socio-economic status, father and mother's education and employment status were statistically associated with immunization. Lack of knowledge about immunization was the most common reason given by the caretakers for incomplete or no immunization. There is need to strengthen communication and information skills of health workers to improve service provision and health education among mothers/guardians. The surveillance also needs reinforcing so as to identify defaulters of immunization and reduce the drop-out rate.

References

1. Chris-Otubor, G.O, Dangiwa DA. Assessment of Knowledge, Attitudes and Practices of Mothers in Jos North Regarding Immunization. Department of Pharmacology, Faculty of Pharmaceutical Sciences, University Of Jos, Plateau State, Nigeria, 2319- 4219page. 2015;
2. Matsuda D. Beliefs about Immunization and Children's Health Among Childbearing Mothers in Nepal. Stanford University Program in Human Biology, 1-40page.
3. Doshi RH. Assessing trends in measles epidemiology, immunization coverage, vaccine efficacy, cost-effectiveness to identify practical strategies for measles elimination. University of California, 1-106page. 2014;
4. Alenazi AAS. Assessment of Knowledge and Attitude and Practice of Parents about Immunization in Jeddah City, 2017. Imam Abdulrahman bin Faisal University, King Khalid University, Batterjee medical college, Ibn sina National college., 2939- 2943page.
5. Allela OQBA. Knowledge and Attitude of Immunization among IIUM Pharmacy Students. College of Pharmacy, University of Duhok, Duhok, Kurdistan Region, Iraq- Journal of Basic and Clinical Pharmacy, 65-69page.
6. Frenkel LD NK. Immunization issues for the 21st century. Ann Allergy Asthma Immunol 2003; 90(Suppl 3):45-52.
7. WHO. Global control of vaccine-preventable diseases: how progress can be evaluated. Reviews of Infectious Diseases. 1999;49-54.
8. K. P. Principles of epidemiology and epidemiologic methods. Text book of preventive and social medicine. Jabalpur: Banarasidas Bhanot Publishers, 2005. 103 p.
9. India. Ministry of Health and Family Welfare. Department of Family Welfare. National population policy 2000. New Delhi: Ministry of Health and Family Welfare, Government of India, 2000. 37 p.
10. Delhi N. Indian Academy of Pediatrics (IAP) Advisory Committee on Vaccines and Immunization Practices (ACVIP) Recommended Immunization Schedule (2018-19) and Update on Immunization for Children Aged 0 Through 18 Years. 2018; 1066–74.
11. National Family Health Survey (NFHS-4). (December 2017). Available at: <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>.
12. WHO vaccine preventable diseases: monitoring system: 2001 global summary. Geneva: World Health Organization (WHO/ V&B/ 01.34); 2001.
13. https://censusindia.gov.in/2011-prov_results/paper2/data_files/kerala/13-concept-34.pdf.
14. Pahwa HS, Goyal D, Sareen D, Hs P, Contemp IJ, Mar P. Evaluation of immunization coverage and its determinants in children aged 12-24 months from rural and urban areas of. 2019; 6(2):837–41.
15. National Family Health Survey (NFHS-4). (December 2017). Available at: <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>.
16. Natu SA, Mhatre S, Shanbhag R, Captain M, Kulkarni K. Immunization status of children admitted to a tertiary hospital in India. 2020; 7(8):1686–91.
17. Muranjan M, Mehta C PA. An observational, health service-based survey for missed opportunities for immunization. Indian Pediatr. 2011; 48:633-6.
18. Gupta P, Prakash D, Srivastava JP. Determinants of Immunization Coverage in Lucknow District. 2015; 7(2):36–41.
19. Chavan VP, Maralihalli MB, Vp C, Contemp IJ, May P. Immunization status of children less than 5 years attending to tertiary care hospital out-patient department in an urban area , prospective-descriptive study. 2016; 3(2):639–44.

20. Cutts F, Diallo S, Zell E RP. Determinants of Vaccination in Urban population in Conakry, Guinea. *Int J Epidemiol.* 1991; 20(4):1099-106.
21. Ndiritu M, Karen D, Ismail A, Chipchasi S, Kamau T FG. Immunization coverage and risk factors for failure to immunization within the Expanded Programme on Immunization in Kenya after introduction of new Haemophilus influenzae type b and hepatitis b virus antigen. *BMC Public health.* 2006; 6:132.
22. Luman ET, Mason M, Shefer A SY. Maternal Characters associated with vaccination of young children. *Pediatrics.* 2003; 111:1215-8.
23. Kumar D, Aggarwal A, Gomber S. Immunization status of children admitted to a tertiary-care hospital of North India: Reasons for partial immunization or non-immunization. *J Heal Popul Nutr* 2010; 28(3):300-4.
24. Saxena P, Prakash D, Saxena V KS. Assessment of routine immunization in urban slum of Agra district. *Indian J Prev Soc Med.* 2008; 39:60-2.