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Factors Influencing Immunization Coverage among Children 12-23 Months of Age - A Community Based Study

[1]Dr.B.Venkatachalam,[2]Dr.A.Aparna,[3]Dr.B.Manjula,[4]Dr.R.Vinod Kumar, [5]Dr.M.L.Suryaprabha

[1] Professor of paediatrics,[2]Associate professor of paediatrics,[3]Postgraduate student,[4]Assistant professor of paediatrics,[5]Professor of community medicine
[1,2,3,4] Department of Paediatrics, Niloufer Hospital, [5] Department of Community Medicine, Osmania Medical College, Hyderabad ***Corresponding Author****:DrA.Aparna,email:aparna1903@yahoo.co.in*

Abstract:
Introduction: *Among 12-23 months children in India 61% are fully immunised and in the combined state of AndhraPradesh and Telangana it is 68%(coverage survey 2009).There are various reasons for partial and non immunization on the supply side as well as demand side .Parents still do not view immunization as a right and the demand for immunization services is lacking. Hence this study was done to evaluate the factors influencing immunization coverage in children between 12- 23 months of age in and around Hyderabad.*
Aims and Objectives*: To estimate the immunization coverage and study the factors influencing immunization coverage in children between 12-23 months of age in and around Hyderabad district.*
Study Design: *This is a cross sectional community (house hold) based study.*
Study setting*: The analysis of immunization coverage focuses on the 200 children of 12-23 months of age in the community in randomly selected four urban slums and four rural areas for a period of one year.*
Materials and methods: *Data was collected by interviewing mothers about vaccination status and personal history and verifying with the immunization card of children aged 12-23 months with a structured questionnaire(partially open). Data was analyzed using simple portions, percentages and chi-square test with EPI info statistical software.*
Results: *The fully immunized, partially immunized and non immunized among children of urban slums and rural areas were 79%, 19%, 2% and 88%, 11%, 1% respectively.*
Conclusions: *Full immunization is more among children in rural areas than in urban slums whereas partial immunization and non immunization is more among children in urban slums than in rural areas .Delay in vaccination is more for measles vaccine followed by 3 rd dose of DPT and OPV. Increasing the awareness about Immunization and its importance among the parents is crucial to reduce infant and child mortality.*
Keywords: *Full immunization, partially immunised, unimmunised, rural areas, urban slums, immunization coverage.*

I. Introduction

Immunization is a process of inducing immunity against a specific disease [1]. It is a proven tool for controlling and eliminating life-threatening infectious diseases and is estimated to avert 2 to 3 million deaths each year. It is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations. It has clearly defined target groups; it can be delivered effectively through outreach activities; and vaccination does not require any major lifestyle change.

World Health Organization (WHO) established the Expanded Programme on Immunization (EPI) based on the emerging success of smallpox in 1974. Through the 1980s, UNICEF worked with WHO to achieve Universal Childhood Immunization of the six EPI vaccines (BCG, OPV, diphtheria, tetanus, pertussis, and measles), with the aim of immunizing 80% of all children by 1990. Progress has continued since then, by 2010, a record 109 million children were vaccinated and global immunization rates were at 85%, their highest level ever [2]. Of the world's 19.3 million children not immunized with DPT3, 13.2 million (or 68%) live in 10 countries like Afghanistan, Democratic Republic of the Congo, Ethiopia, India, Indonesia, Iraq, Nigeria, Pakistan, South Africa and Uganda. Despite these successes, immunization is an unfinished agenda. An estimated 19.3 million children were not reached with three doses of DTP vaccine in 2010 compared to 19.7million in 2009. Parents still do not view immunization as a right, and demand for immunization services is lacking in many communities

Total number of children who died from diseases preventable by vaccines currently recommended by WHO is 1.5 million. The estimated deaths due to Hib is199000, Pertussis is 195000, Measles is 118000, Neonatal tetanus is 59000, Tetanus (non-neonatal) is 2000, Pneumococcal disease is 476000 and Rotavirus is 45300.

Immunization initiatives in India [3] had begun with BCG immunization against tuberculosis in 1962, which later became a part of the Expanded Program on Immunization (EPI) in 1978. In 1979 oral polio vaccine was included as a part of EPI. This program evolved to become the Universal Immunization Program (UIP) in 1985. Measles vaccine was added to the program the same year. UIP was rolled out in the form of National Technology Mission for Immunization in 1986 with the target of 90% coverage of pregnant women and 85% of infants by 1990.

In India, under the UIP, vaccines for six vaccine preventable diseases (tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, and measles) are available free of cost to all. Lots of effort and fund have been exhausted on the UIP but several survey results testified to a glaring gap between the goals aspired for and the targets touched.

Immunization program is one of the essential interventions for protection of children from life threatening diseases, which are avertable. In 2009 Immunization coverage in India [4] among 12-23 months of children is as follows:BCG-86.9%, OPV-70.4%, DTP3-71.5%, Measles-74.1%, HEP-B3-58.9%, Fully Immunised-61%

In Coverage survey of 2009[5], Immunization among 12-23 months children in Andhra Pradesh state is as follows:BCG-98.6%, OPV-75.9%, DTP3-89.9%, Measles-90.4%, HEPB3-70.8%, Fully Immunised-68%

There are various reasons for partial and Non–immunization which includes supply side and demand side issue.

II. Aims & Objectives

1. To estimate the immunization coverage and study the factors influencing immunization coverage among children from 12-23 months of age in and around Hyderabad district.
2. To determine the extent of delay of vaccinations and the reasons for delay during first 24 months of life
3. To impart health education to mothers of the children

III. Materials And Methodology

Sample size: It is taken according to DLHS-3(2007-2008) [6] where among children of 12-23 months, Full immunization was seen in 67% in Andhra Pradesh and with an allowable error of 10%, a sample size of 196 was calculated and adjusted to round figure of 200.

Study Design: A cross sectional community (house hold) based study

Study setting: The analysis of immunization coverage focuses on the 200 children of 12-23 months of age in the community.

Randomly selected 4 urban slums from Haraspenta (field practice area of Osmania Medical College) which include Nehrunagar, Shastrinagar, Sundarnagar and Krishnanagar.

Randomly selected 4 rural areas i.e two villages from Hayathnagar which include Saroornagar, Taramatipeta and two villages from Keesara which include Shivajinagar, Keesara.

Approval: The study has received approval from the Ethics scientific committee, Osmania Medical College Hyderabad on 23rd September 2011

Duration: The study was carried out for a period of one year (Sep 2011 to Aug 2012)

Participants: Parents of children aged 12-23 months of age.

Data collection: Interviewing mothers about vaccination status and personal history and verifying with the immunization card of children aged 12-23 months.

- Inclusion criteria: Children aged 12-23 months of age
- Exclusion criteria:
  Children less than 12 months and more than 24 months of age.

Tools: Structured questionnaire (partially open)
Immunization card

Data analysis: Simple proportion, percentage and chi square test are used to summarize the data and EPI info statistical software was used for analysis.

Background questions covered demographic, social, and economical status. The results were categorized into three groups of Completely, Partially and Unimmunized children.

- The child was considered as completely immunized if he/she had received one dose each of BCG and measles, and three doses each of DPT and polio (excluding Polio 0 dose) by his/her first birthday. Those who had missed any one vaccine out of the six primary vaccines were described as "partially immunized" and those children who had not received any vaccine up to the 12 months of age were defined as "unimmunized" [7].
- For BCG vaccine more than 6weeks is considered as delay, for first second and third doses of DPT and OPV more than 8 weeks is considered as delay, for measles from 11 th month is considered delay [8].

To ascertain this information, the respondents were asked to produce immunization card if they had any. In the case of non availability of the card, the information regarding the administration of vaccines was recorded on the basis of the respondent's memory.

The selected predictor variables are sex of the child (male, female), birth order of the child (1,2,3,4 and above), residence(rural, urban), mother's education (illiterate, literate) religion (Hindu, Muslim, Christian and other minorities), caste(general, scheduled caste, scheduled tribe, other backward class), mother's knowledge on immunization (yes/no),media exposure(yes/no), socio economic status(upper, middle lower),type of family(nuclear/joint), household head (male/female), vaccination status of children from a part of the OPD health check up by health professionals(yes/no), awareness of the diseases prevented by vaccination(TB, Polio, Measles, DPT, Hepatitis B) (yes/no)

IV. Observations

Urban sample size n=100; Rural sample size n=100

Table 1:Immunization coverage in urban area

Fully Immunised	Partially Immunised	Not immunised
79	19	2

Table 2:Immunization coverage in rural area

Fully Immunised	Partially Immunised	Not immunised
88	11	1

Full Immunization is seen more in rural areas while Partial immunization is more in Urban area However, there was no statistically significant difference in immunization coverage based on urban and rural area. (p >= 0.05; Chi square=2.94)

V. Variable Factor Analysis

variables	**Number (n=100)**	**Fully immunized**	**partially immunized**	**Not immunized**	**P value (<0.05 significant)**
Sex	Male(42)	35 (83%)	7 (17%)	0 (0%)	0.22
	Female(58)	53 (91%)	4 (7%)	1 (2%)	
Birth order wise	1st and 2nd(81)	74 (91%)	7 (9%)	0 (0%)	0.14
	>2nd(19)	14 (74%)	5(26%)	0 (0%)	
Religion wise	Hindu(95)	83 (87%)	11 (12%)	1 (1%)	NA
	Muslim(3)	3 (100%)	0 (0%)	0 (0%)	
	Christian(2)	2 (100%)	0 (0%)	0 (0%)	
	Others(0)	0 (0%)	0 (0%)	0 (0%)	
Caste wise	BC(52)	51 (98%)	1 (2%)	0 (0%)	NA
	SC(29)	23 (79%)	5 (17%)	1 (3%)	
	ST(9)	6 (67%)	3 (33%)	0 (0%)	
	OC(10)	8 (80%)	2 (20%)	0 (0%)	
Family wise	Nuclear (50)	43 (86%)	6 (12%)	1 (2%)	0.53
	Joint (50)	45 (90%)	5 (10%)	0 (0%)	
Household head wise	Male (78)	67 (86%)	10 (13%)	1 (1%)	0.22
	Female (22)	21 (95%)	1 (5%)	0 (0%)	
Mothers education wise	Literate (69)	64 (93%)	5 (7%)	0 (0%)	0.029
	Illiterate (31)	24 (77%)	6 (19%)	1 (3%)	
Knowledge about vaccines	Yes(60)	56 (93%)	4 (7%)	0 (0%)	0.04
	No (40)	32 (80%)	7 (18%)	1 (3%)	
Media exposure	Yes (77)	69 (90%)	8 (10%)	0 (0%)	0.36
	No (23)	19 (83%)	3 (13%)	1 (4%)	
OPD health check-up	Yes(19)	16 (84%)	3 (16%)	0 (0%)	0.57
	No (81)	72 (89%)	8 (10%)	1 (1%)	
Awareness about vaccine preventable diseases	Yes(13)	11 (85%)	2 (15%)	0 (0%)	0.68
	No(87)	77 (89%)	9 (10%)	1 (1%)	
Socioeconomic status	Upper(0)	0 (0%)	0 (0%)	0 (0%)	0.63
	Middle(22)	20 (91%)	2 (9%)	0 (0%)	
	Lower(78)	68 (87%)	9 (12%)	1 (1%)	

Table 3: Distribution of predictor variable in urban areas

Table 4: Distribution of predictor variable in rural areas

variables	Number (n=100)	Fully immunized	partially immunized	Not immunized	P value (<0.05 significant)
sex	Male(51)	41 (80%)	9 (18%)	1 (2%)	0.72
	Female(49)	38 (78%)	10 (20%)	1 (2%)	
Birth order wise	1st and 2nd(76)	64 (84%)	11 (14%)	1 (1%)	0.02
	>2nd(24)	15 (63%)	8 (33%)	1 (4%)	
Religion wise	Hindu(44)	38 (86%)	6 (14%)	0 (0%)	NA
	Muslim(53)	38 (72%)	13 (25%)	2 (4%)	
	Christian(3)	3 (100%)	0 (0%)	0 (0%)	
	Others(0)	0 (0%)	0 (0%)	0 (0%)	
Caste wise	BC(73)	52 (71%)	19 (26%)	2 (3%)	NA
	SC(24)	24 (100%)	0 (0%)	0 (0%)	
	ST(1)	1 (100%)	0 (0%)	0 (0%)	
	OC(2)	2 (100%)	0 (0%)	0 (0%)	
Family wise	Nuclear (42)	29 (69%)	11 (26%)	2 (5%)	0.03
	Joint (58)	50 (86%)	8 (14%)	0 (0%)	
Household head wise	Male (60)	46 (77%)	12 (20%)	2 (3%)	0.48
	Female (40)	33 (83%)	7 (18%)	0 (0%)	
Mothers education wise	Literate (79)	67 (85%)	11 (14%)	1 (1%)	0.005
	Illiterate (21)	12 (57%)	8 (38%)	1 (5%)	
Knowledge about vaccines	Yes(67)	57 (85%)	10 (15%)	0 (0%)	0.03
	No (33)	22 (67%)	9 (27%)	2 (6%)	
Media exposure	Yes (86)	71 (83%)	14 (16%)	1 (1%)	0.03
	No (14)	8 (57%)	5 (36%)	1 (7%)	
OPD health check-up	Yes(22)	22 (100%)	0 (0%)	0 (0%)	0.02
	No (78)	57 (73%)	19 (24%)	2 (3%)	
Awareness about vaccine preventable diseases	Yes(7)	7 (100%)	0 (0%)	0 (0%)	0.36
	No(93)	72 (77%)	19 (20%)	2 (2%)	
Socioeconomic status	Upper(1)	1 (100%)	0 (0%)	0 (0%)	0.07
	Middle(24)	22 (92%)	2 (8%)	0 (0%)	
	Lower(75)	56 (75%)	17 (23%)	2 (3%)	

Chart 1: Major reasons for Vaccination delay in urban setting

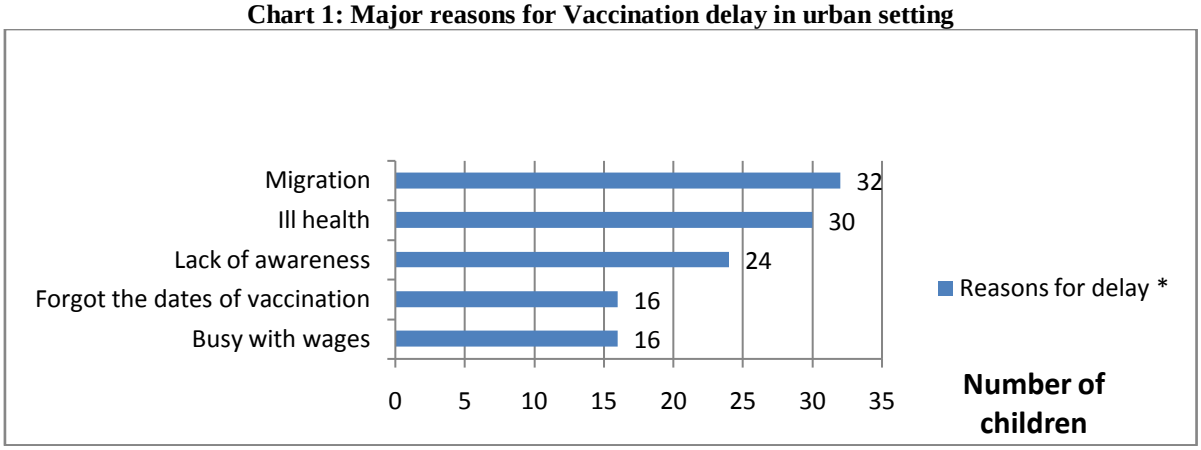

Chart 2: Major reasons for Vaccination delay in Rural setting:

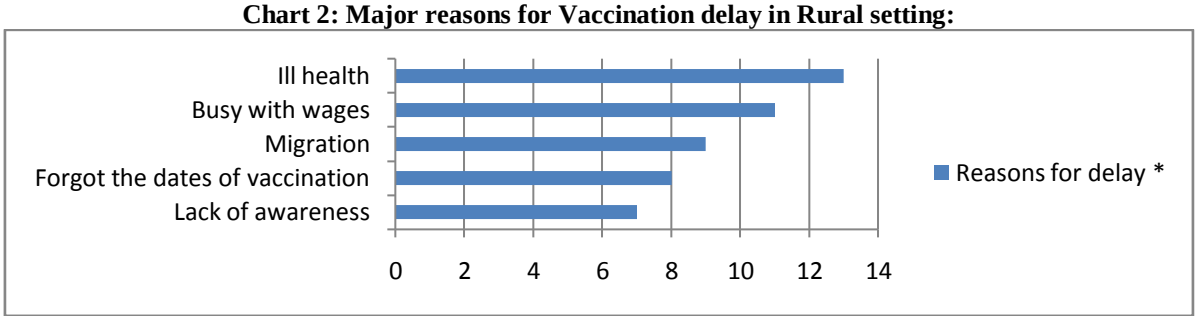

Chart 3: Partial immunization (Urban): Number of children with Reasons

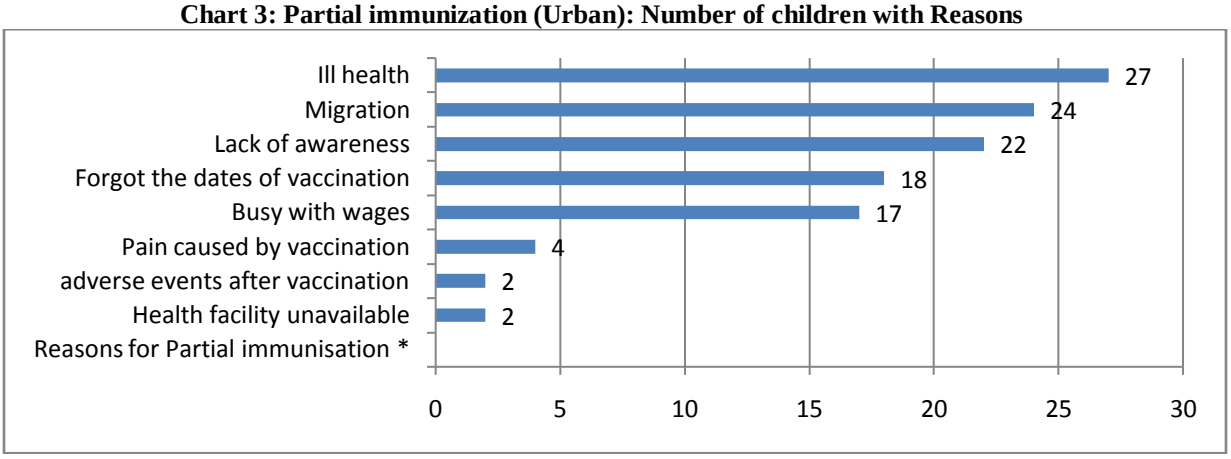

Chart 4: Partial Immunization (Rural): Number of children with Reasons

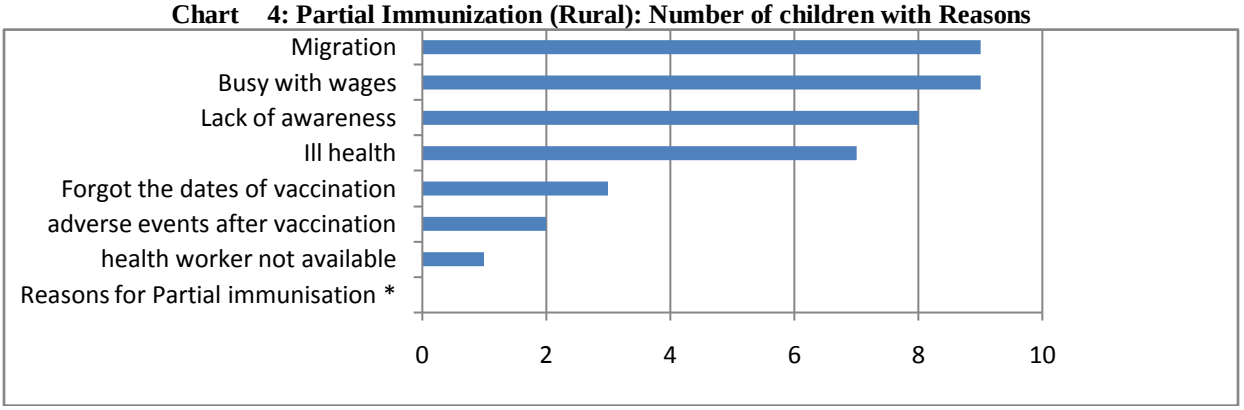

Table 5: Non immunization status and reasons

Reasons	Urban (total 2)	Rural (total 1)
Lack of awareness	2	1
Fear of side effects	2	Nil

VI. Discussion

The present study was conducted in the community as house hold study both in urban slums (Haraspenta) and rural areas(Hayathnagar and Keesara) in and around Hyderabad district , from 24thSeptember 2011to 31stAugust 2012

A Total of 200 children aged 12-23 months, immunization status was noted by viewing the immunization cards and interviewing their mother about personal data.

Full immunization in urban area 79% is found to be less than in rural area 88%. Partial immunization in urban area 19% is found to be more than in rural area 11%. Not immunized a single vaccine in urban area 2% is found to be more than in rural area 1%,

According to Nilanjan patra [9] urban children are much more likely to be fully vaccinated than rural ones. The chance of being fully immunized is 37 percent for rural children whereas it is 60 percent for urban children.

In our study full immunization according to gender in urban area is 80% in males and 78% in females whereas in rural areas it is 91% in females and 83% in males, which was statistically insignificant. This is similar to findings in previous studies by Daniel J Corsi **,** Diego G Bassani**,** Rajesh Kumar**,** ShallyAwasthi**,** RajuJotkar **,**NavkiranKaur and PrabhatJhai[10]. There were a higher proportion of boys (53%) than girls surveyed in NFHS-3. The complete vaccination rate was 45.3% for boys and 41.5% for girls. This gender imbalance existed irrespective of the method of determination of vaccination status.

Full immunization in urban area is more in Lower birth order (1^{st} and 2^{nd}) 84% compared to higher birth order (> 2^{nd}) with 63% which was statistically significant .In rural area, Lower birth order (1^{st} and 2^{nd}) 91% were fully immunised compared to Higher birth order (>2^{nd}) with 78% which was statistically insignificant similar to findings in previous studies by JørgenLauridsen and Jalandhar Pradhan[11],not being fully immunized is 35 percent higher for children of birth order 3 or more .

Full immunization based on religion in urban areas was 86% in Hindu children, 72% in Muslim children and 100% in Christian children whereas in rural areas it was 87% in Hindu children and 100% in both Muslim and Christian children as compared to Nilanjan Patra study which showed full immunization is 42 percent for children from Hindu household, 32 percent for children from Muslim household and 56 percent for children from Christian and other minority community household.

In urban area full immunization based on castes was 71% in backward caste (BC) and 100% in scheduled caste (SC) , scheduled tribe (ST) and other caste (OC) whereas in rural area, it was 98% in backward caste (BC), 79% in scheduled caste (SC) , 67% in scheduled tribe (ST) and 80% in other caste (OC).In 2005 AshieshaDatar, ArnabMukherji & Neeraj sood found that child born in an SC/ST household was 3% more likely to have no-cover for non polio vaccines when compared to a child born in a non-SC/ST family[12].According to Nilanjan Patra full immunization is 42 percent for children from general category household, 44 percent for children from SC household, 31 percent for children from ST household and 41 percent for children from OBC household.

In urban area, full immunization was seen in 86% children from joint family and 69% children in Nuclear family which was statistically significant, whereas in rural area it was 90% in joint family and 86% in Nuclear family which was statistically insignificant.

Full immunization in urban area children, was 83% in female household headship and 77% in male household headship which was statistically insignificant .In rural area children, it was 95% in female household headship were fully immunised compared to male household headship with 86% which was statistically insignificant. In the study by Nilanjan Patra fully immunized is 40 percent for children from households with female headship and 41 percent for children from households with male headship.

Full immunization in urban children whose mothers are literate was 85% and 57% in children whose mothers are illiterate, which was statistically significant. In rural area children, ,it was 93% with literate mothers and 77% in children with illiterate mothers which was statistically significant .Similar study done by JørgenLauridsen and Jalandhar Pradhan , being a child of an illiterate mother increases the risk of not being fully immunized with 85 percent, while the risks are 8 percent higher for children in rural areas. According to Nilanjan Patra, there is a strong positive relationship between mother's education and children's immunization coverage ,i.e, 3 times higher for the children of mothers with high school or above education than the children of illiterate mothers.

Full immunization in urban children whose parents had knowledge about vaccines was 85% compared to children whose parents had no knowledge about vaccines with 67% which was statistically significant**.** In Rural area, children whose parents had knowledge about vaccines was 93% compared to children whose parents had no knowledge about vaccines was 80% which was statistically significant.

In urban area full immunization of children whose parents had media exposure was 83% and children whose parents had no media exposure was 57% which was statistically significant, In rural area, children whose parents had media exposure was 90% and children whose parents had no media exposure was 83% which was statistically insignificant. In a similar study by Nilanjan patra, fully vaccinated are 38 percent for children whose mothers are not exposed to mass media and 43 percent for children whose mothers have some media exposure. This indicates that media exposure has significantly positive effect on immunization.

Full immunization in urban area children, whose vaccination status was a part of OPD health check up by health professional was 100% compared to children whose vaccination was not part of OPD health check up by health professional was 73% which was statistically significant.In rural area, children whose vaccination status was a not part of OPD health check up by health professional was 89% compared to children whose vaccination was part of OPD health check up by health professional with 84% which was statistically insignificant.

Full immunization in urban area children, whose parents were aware about vaccine preventable diseases was 100% compared to children whose parents were not aware of vaccine preventable diseases was 77% which was statistically insignificant. Full immunization in rural area children ,whose parents were aware about vaccine preventable diseases was 85% compared to children whose parents were not aware of vaccine preventable diseases was 89% which was statistically insignificant.

In urban area full immunization was 92% in middle socio economic status children and 75% in Lower socio economic status children which was statistically insignificant [13].In rural area, children of middle socio economic status were 91% fully immunised compared to 87% in children of Lower socio economic status which was statistically insignificant .In similar study by JorgenLauridsen and Jalandhar Pradhan- 47 % of the children belong to poor socio economic status. A majority of the children come from rural area (74 %). The relationship between wealth and immunization coverage is evident, as children from families with poor economic status have a 59 percent higher risk of not being fully immunized.

Reasons for delay in urban areas were travel from mothers place to mother- in laws place, missing of immunization cards in 80%, ill health of the child in 70%, lack of awareness of vaccines among parents in61% , forgot the date in 51% , busy with wages in 50% . Reasons for delay in rural areas were 70% due to ill health of the child, 20% due to lack of awareness of vaccination among parents,10% due to busy with wages.

Reasons for partial immunization in urban areas are busy with wages in 50% ,misplacement of immunization card at maternal place in 30%,lack of awareness in 40%,fear of side effects in 45%,family problems in 25% ill health of the child in 20%,frequent migration in 30% , wrong advise by mother-in-laws in 15%,health worker not informed the date in 9%. Adverse events after vaccination in 2%(swelling and pain over the thigh),low socio economic status in 2%,took in private hospital not knowing that it is provided free of cost in 2%. Reasons for partial immunization in rural areas are busy with wages in 70% , lack of awareness of vaccine among parents in 61.1%, fear of side effects in 20%, family problems in 10% , lack of immunization card in 10%.health worker not informed the date in 5%.

Reasons for not immunized a single vaccine is lack awareness of vaccine among parents in 100%.

VII. Summary And Conclusions

- Full Immunization is slightly more among children in rural areas than in urban areas.
- There is no effect of gender of child on full immunization in urban and rural areas.
- Children of higher birth order are less immunised compared to children of lower birth order.
- Children belonging to Muslim religion were less immunised compared to other religions.
- Children belonging to BC castes in urban area are less immunised followed by children of ST caste, in rural area children belonging to BC castes are well immunised when compared to SC/ST castes.
- Joint family are fully immunised than those of nuclear family both in urban and rural areas.
- Full immunizations is more in female headed families than male both in urban and rural areas.
- Full immunization is more in children whose mothers are literate than illiterate both in urban and rural areas.
- Full immunization is more in children whose mothers are aware of vaccination both in urban and rural areas.
- Full immunization is more in children whose mothers are exposed to the media both in urban and rural areas.
- Full immunization is more in children who were asked about vaccination status in OPD health checkups both in urban and rural areas.
- Full immunization is more in children whose mothers are aware of vaccine preventable diseases
- Full immunization is slightly more in children belonging to middle class status than lower socio economic status both in urban and rural areas
- Partial immunization is more in urban area than in rural area. Measles vaccine is mostly missed in the Immunization of children followed by 3rd dose of DPT and OPV
- Main reasons for partial Immunization include ill health of the child (Upper respiratory infection, Pneumonia, diarrhoea), forgot the dates of vaccination, lack of awareness and busy with wages.
- Non Immunised is more in urban area than rural. Reasons for Non immunization include lack of awareness of vaccination and illiteracy.
- Delay in vaccination is more for Measles vaccines followed by 3rddoseof DPT &OPV
- Main Reasons for vaccination delay include ill health of child, lack of awareness among parents, busy with wages, migration, forgetting the dates of vaccination and fear of side effects

VIII. Recommendations

1. Increasing the awareness about Immunization and its importance among the parents
2. Improving the literacy rate and creating awareness among parents about health services including family planning.
3. Regular and frequent Media coverage about National immunization programmes and government aided free immunization health centres.
4. Frequent reminders by ANMs to the parents about the dates for vaccination
5. Communication between the health centres through mobile health services need to be strengthened.
6. As a standard procedure in OPD, Immunization status of children needs to be enquired andVaccination should be provided throughout the day.

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