

Original Article

A study of measles vaccination coverage by lot quality assurance sampling technique and factors related to non-vaccination in Bellary District

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Abstract

Background: Measles is a leading cause of childhood morbidity and mortality accounting for nearly half the global burden of vaccine preventable deaths. In 2007, there were 197000 measles deaths globally nearly 540 deaths every day or 22 deaths per hour. According to NFHS-3 2005 – 06 total measles vaccination coverage in Karnataka was 72%. **Objectives:** 1) To find out measles vaccination coverage in Bellary District. 2) To know the reasons for non-vaccination. **Material and Methods:** A Cross sectional study was conducted from May 2010 to April 2011 at areas covered by PHC/PHU of Bellary district by using Lot Quality Assurance Sampling (LQAS) method. Total sample size was 1007(53X19). Bellary district has 47 primary health centers (PHC) and 6 primary health units (PHU), all of which were studied in which each PHC/PHU is considered as a lot. The data was collected from parents of children aged 12-23 months using a pretested semi structured questionnaire. **Results:** Out of 53 PHC's/PHU's we accepted 41 (77.35%) and vaccination coverage in these lots was considered as more than 85% and overall coverage in Bellary district was 69.41% and 53.62% had received Vitamin A supplementation. The reasons for non vaccination were lack of awareness, ignorance, ill health of the child, fear of side effects & lack of health services. **Conclusion:** Measles vaccination coverage was 69.41% and the reasons for non vaccination were lack of awareness, ignorance, ill health of the child, fear of side effects and lack of health services.

Keywords: Measles coverage, LQAS, Reasons for Non-vaccination.

Introduction:

A vaccine-preventable disease is an infectious disease for which an effective preventive vaccine exists. In 2002, the World Health Organization estimated that 1.4 million of deaths among children under the age of five were from vaccine-preventable diseases. With 100% immunization, and 100% efficacy of the vaccines, one out of seven deaths among young children could have been prevented. Four vaccine-preventable diseases were responsible for 98% of vaccine-preventable deaths: measles, H.influenzae serotype B, pertussis and neonatal tetanus¹. In the absence of vaccination, the measles virus would infect almost 100 percent of the population, In the absence of vaccination 125 million cases and 1.8 million to 2.0 million deaths per year could be expected².

Measles is a leading cause of childhood morbidity and mortality accounting for nearly half the global burden of

vaccine preventable deaths. In 2007, there were 197000 measles deaths globally nearly 540 deaths every day or 22 deaths per hour³. In India more than 50% of measles cases are currently reported in children less than 5 years of age indicating insufficient routine measles immunization. As no study has been done on measles vaccination coverage by using LQAS (Lot Quality assurance Sampling) method in Bellary district an effort is made to study the same.

Objectives:

1. To find out measles vaccination coverage in Bellary District by using LQAS technique
2. To know the reasons for non-vaccination for measles vaccine.

Material and Methods:

A Cross sectional study was conducted by using LQAS (Lot Quality assurance Sampling) technique from May 2010 to April 2011 and Data was collected from parents of children 12-23 months of age from areas covered by

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all that is 53 PHC/PHU (Primary Health centre/Primary Health Unit) of Bellary district.

Lot quality assurance sampling (LQAS) and Why 19 children

Lot quality assurance sampling (LQAS) is a simple, low-cost random sampling methodology developed in the 1920s to control the quality of output in industrial production processes. LQAS involves taking a small random sample (a 'lot') and then testing a sample of this lot for quality or the desired characteristic. It is often stated that 19 'lots' is generally a good number, although the justification for this is unclear. One possibility is that a sample size of 19 provides an acceptable level of error for making management decisions. Given this, Samples less than 19, however see a rapid deterioration in the precision of the measure and samples larger than 19 would have practically the same statistical precision as 19. Thus, they would not result in better information, but would cost more to measure.

Sample size

According to LQAS technique in each lot 19 children should be selected, so total sample size required for the study was 1007 (53X19). With a 5% level of significance and precision value of two, if more than two children were unvaccinated, the lot was rejected and coverage in the health center was considered to be low (i.e., <85%). If the number of unvaccinated children was two or fewer, the lot was accepted, and coverage in the health center was considered to be good (i.e. > 85%). All data were pooled in a stratified sample to estimate overall coverage in Bellary district.

Sampling Technique

Bellary district has 7 talukas, in that 47 primary health centers (PHC) and 6 primary health units (PHU), all of which were studied and each PHC/PHU is considered as a lot. One village from that particular PHC/PHU was selected randomly. The streets in the village were numbered and then one street will be selected by currency note method. The next street was selected by taking the second digit number of the same currency note and so on till the required sample is achieved. In that street houses are selected by systematic random sampling. If the required sample is not achieved in that village, the second village was selected randomly in the same PHC/PHU.

Proof of Immunization.

The child was considered as immunized or not, based on the immunization card. For those without an

immunization card, information from the parents stating that child has been immunized was considered based on age at vaccination, site of vaccination and route of vaccination. If the parents could not remember regarding the vaccination or in the presence of any other confounding factors, the child was considered as not immunized for measles.

Method of data collection.

Data was collected using a pretested semi structured questionnaire. Before collection of the data written consent was taken from the parents of study subjects after explaining the importance of the study in detail. Data was analysed using Epi-info software version 3.4.3. Chi square test was applied to find the association between vaccination and socio demographic profile.

Results:

Out of 1007 children, 52.9% were males and 47.1% were females. Majority were belong to age group between 12-14 months (32.97%). The mean age for males was 17.2 \pm 3.9 months and for females also 17.2 \pm 3.9 months. 38.33% were from second birth order followed by first (37.34%). Majority i.e. 84.71% informants were mothers and 85.30% were Hindus. (Table 1)

Among fathers education status 52.77% were illiterate followed by 28% who studied below SSLC, among mothers education status 60.97% were illiterates followed by 29.79% who studied below SSLC. Among fathers occupation 86.79% were doing unskilled work. Among mothers 89.67% were homemakers. Modified BG Prasad classification was adopted for socioeconomic classification, out of 1007 majority 69.81% were belong to upper lower class followed by lower middle class (25.22%). Majority were belonging to joint family (64.35%). More than half that is 58.99% mothers delivered at hospital and 41.01% delivered at home. 75.47% parents had immunisation card. (Table 1)

The overall measles vaccination coverage was 69.41%, 53.62% had received Vitamin A at the time of measles vaccination. The main reason for non vaccination was lack of awareness (40.90%) followed by ignorance (31.16%), ill health of the child (16.88%), fear of side effects (9.09%) and least was lack of health services (1.94%). (Table1).

Table 1: Socio-demographic profile and vaccination status and reasons for non vaccination

Variables	Frequency	%
Age (In Months)	(1007)	(100)
12 to 14	332	32.97
15 to 17	208	20.66
18 to 20	169	16.78
21 to 23	298	29.59
Sex		
Male	533	52.93
Female	474	47.07
Birth order		
First	376	37.34
Second	386	38.33
Third	183	18.17
Above third	62	6.16
Informant		
Mother	853	84.71
Father	154	15.29
Religion		
Hindu	859	85.30
Muslim	144	14.30
Christian	4	0.40
Education(Father)		
Graduate	31	3.08
SSLC/PUC	163	16.19
Below SSLC	282	28.00
Illiterate	531	52.73
Education(Mother)		
Graduate	-	-
SSLC/PUC	93	9.24
Below SSLC	300	29.79
Illiterate	614	60.97
Occupation(father)		
Professional	29	2.88
Skilled	68	6.75
Semiskilled	36	3.57
Unskilled	874	86.79
Home maker	-	-

Table 1: Cont'd

Variables	Frequency	%
Occupation(Mother)	(1007)	(100)
Professional	-	-
Skilled	-	-
Semiskilled	4	0.40
Unskilled	100	9.93
Home maker	903	89.67
Socio Economic Status		
Upper middle	18	1.79
Lower middle	254	25.22
Upper lower	703	69.81
Lower	32	3.18
Type of family		
Joint	648	64.35
Nuclear	359	35.65
Place of delivery		
Hospital	594	58.99
Home	413	41.01
Vaccination Card		
Present	760	75.47
Absent	247	24.53
Vaccination Status		
Vaccinated	699	69.41
Unvaccinated	308	30.59
Vitamin A prophylaxis		
Taken	540	53.62
Not taken	467	46.38
Reasons for Non vaccination		
Ignorance	96	31.16
Ill health of child	52	16.88
Lack of awareness	126	40.90
Lack of health services	6	1.94
Fear of side effects	28	9.09

Vaccination coverage was better in female child compared to male child and it was statistically not significant. First birth order children were vaccinated better (78.45%) followed by third birth order (69.94%), second birth order (61.65%) and least was above third birth order (61.29%) and it was statistically significant. Christians were better vaccinated (100%) followed by Hindus (70.89%) compared to Muslims (59.72%) and it was statistically significant. (Table 2)

Children of a father who had completed SSLC/PUC were better vaccinated (79.14%), followed by below SSLC (78.01%), Graduates (67.74%) compared to illiterates (61.95%) and it was statistically significant. Children of a father who was doing skilled jobs (88.23%) were better vaccinated followed by semiskilled (77.77%), profession (72.41%) compared to unskilled jobs and it was statistically significant. Children of a mother who had completed SSLC/PUC were better vaccinated (82.79%) followed by below SSLC (76.66%) compared to illiterates(63.84%) and it was statistically significant. Children belonging to working mother (78.84%) were vaccinated better compared to home maker (68.32%) and it was statistically significant. (Table 2)

Children belonging to upper middle class family(100%) were better vaccinated followed by lower middle class (85.03%), upper lower class (63.30%) compared to lower class (62.50%) and it was statistically significant. Children's mother who had delivery at hospital (80.47%) were vaccinated better compared to home delivery (53.51%) and it was statistically significant. Children belong to nuclear family (69.91%) were vaccinated better compared joint family (69.13%) and it was statistically not significant. Children belonging to family who had vaccination card were better vaccinated (78.42%) compared the family who doesn't had vaccination card (41.70%) and it was statistically significant. (Table 2)

Discussion:

In the present study we adopted LQAS technique and We accepted 41 (77.35%) of the 53 PHC's/PHU's and vaccination coverage in these lots was considered as more than 85% and 12 (22.64%) PHC's/PHU's were rejected and vaccination coverage in these lots was considered as less than 85%.

Similar study was done in Tamilnadu to estimate measles vaccination coverage using the LQAS method in 2002—2003. They found that for two (33.3%) of the six health subcenters, more than two children were

Table 2: Association between Sociodemographic profile and Vaccination status

Variables	Vaccinated	Not accinated	p-value
Sex	699(69.41)	308(30.58)	
Male	369(69.23)	164 (30.76)	0.89
Female	330 (69.62)	144 (30.37)	
Birth Order			
One	295(78.45)	81(21.54)	
Two	238(61.65)	148(38.34)	
Three	128(69.94)	55(30.05)	
More than three	38(61.29)	24(38.70)	0.00
Religion			
Hindu	609(70.89)	250(29.10)	
Muslim	86(59.72)	58(40.27)	
Christian	4(100.00)	0(0.00)	0.01
Father Education			
Graduate	21(67.74)	10(32.25)	
SSLC/PUC	129(79.14)	34(20.85)	
Below SSLC	220(78.01)	62(21.98)	
Illiterate	329(61.95)	202(38.04)	0.00
Mother Education			
SSLC/PUC	77(82.79)	16(17.20)	
Below SSLC	230(76.66)	70(23.33)	
Illiterate	392(63.84)	222(36.15)	0.00
Father Occupation			
Professional	21(72.41)	8(27.58)	
Skilled	60(88.23)	8(11.76)	
Semiskilled	28(77.77)	8(22.22)	
Unskilled	590(67.50)	284(32.49)	0.00
Mother Occupation			
Working	82(78.84)	22(21.15)	
Home maker	617(68.32)	286(31.67)	0.02
Socio-economic status			
Upper middle	18(100.00)	0(0.00)	
Lower middle	216(85.03)	38(14.96)	
Upper lower	445(63.30)	258(36.69)	
Lower	20(62.50)	12(37.50)	0.00
Place of Delivery			
Home	221(53.51)	192(46.48)	
Hospital	478(80.47)	116(19.52)	0.00
Type of Family			
Joint	448(69.13)	200(30.86)	
Nuclear	251(69.91)	108(30.08)	0.79
Vaccination card			
Present	596(78.42)	164(21.57)	
Absent	103(41.70)	144(58.29)	0.00

unvaccinated (i.e., coverage was <95%). Combining results from all six health subcenters generated a coverage estimate of 97.7% on the basis of 428 (97.7%) of 438 children identified as vaccinated. They concluded that LQAS techniques proved useful in identifying small health areas with lower vaccination coverage, which helps to target interventions⁴. In Madras city a study was done by using Lot Quality Assurance sampling for monitoring immunization coverage. The coverage was classified as unacceptable (i.e below 80%) in 19 divisions for Polio and DPT vaccines, in 26 divisions for measles vaccine and in 4 divisions for BCG vaccine. This study demonstrated the utility of the LQAS technique in identifying 'unsatisfactory' pockets in Madras City, when the overall coverage was satisfactory⁵.

In the current study all data were pooled in a stratified sample to estimate overall coverage in Bellary district and it was 69.41% and 53.62% children had received Vitamin A supplementation at the time of measles vaccination. This result was almost similar to the study conducted by a National Family Health Survey-3 (NFHS-3) in the year 2005-06 all over India by Ministry of Health and Family Welfare Govt. of India⁶. It showed that the total measles vaccination coverage all over Karnataka was 72%, for urban population 79.5% and for rural 67.5%. One dose of Vitamin A supplementation coverage was 22.8% for urban population 24.7% and for rural 21.7%. And also the total measles vaccination coverage all over India was 58.8%, for urban population 71.8% and for rural 54.2%. One dose of Vitamin A supplementation coverage was 24.9% for urban population 26.8% and for rural 24.2%. If we compared to our study the national coverage is less this could be explained by different geographical area and the time at which study was conducted.

A District Level Household and facility Survey – 3 (DLHS-3) conducted in the year 2007-08 by Ministry of Health and Family Welfare, Govt. of India showed that the measles vaccination coverage in Bellary district was 82.3% and it was higher in rural area (85%) and one dose of Vitamin A was 59.2% and for rural area (64.3%)⁸. And comparing this report with ours we see that we got lesser measles vaccination coverage. This could be because of different methodology adopted. There are many studies conducted in all parts of the world with different methodologies among them few studies have same results as of current study results. To quote few, a study was conducted in Karnataka by

Madhav SM, et al., shows that measles vaccine coverage was 69.5%⁷ which was very near to our study results.

Some more studies which had similar vaccination coverage were by Yadav J et al., conducted a study in India showed that the measles vaccine coverage was 65.2%⁸. Dasgupta S et al., conducted a study at Birbhum and Purba Medinipur districts of West Bengal, India showed that Measles vaccine coverage was 55.94% at Birbhum and 62.5% at Purba Medinipur⁹. In Bangladesh a study was conducted by Khan MN et al., in Dhaka District showed 67% for measles vaccination coverage¹⁰.

Coming to socio demographic profiles, our study reveals that female babies, children of first birth order, parents doing skilled jobs, belong to nuclear family, having better economic status, education status, hospital delivery babies and children belong to family which had immunization card were better vaccinated and it was statistically significant except sex of the baby and type of family. The first birth order baby were vaccinated better may be because of more love and care, similarly children belong to better socioeconomic status family were vaccinated better it could be because of better health seeking behaviour. Children belong to nuclear family were vaccinated better the probable reason for this may be in nuclear family there will be more attention. Babies who are born in hospital were vaccinated better the probable reason may be the mother who has hospital delivery will get better health knowledge. The same was proved by many studies.

A National Family Health Survey-3 (NFHS-3) showed that male babies, first birth order babies, children who's mother educated 10 or more years complete and family belong to highest wealth index were vaccinated better compared to other groups same thing was proved by our study also except gender of the baby⁷. Mutua MK et al., showed that household assets and expenditure, ethnicity, place of delivery, mother's level of education, age and parity were all predictors of full vaccination among children living in the slums¹¹.

In Dhaka a study conducted by Basaleem HO et al., showed that children with an immunization card and children with older aged mothers were more likely to have complete immunization¹². Kumar D et al., conducted a study in north India showed that the immunization status varied significantly with sex, education of parents, urban/rural background, route and place of delivery. On logistic regression, place of delivery,

maternal education and religion were significant¹³. Yadav J et al., shows that males, christians, better education of the parents and short distance of the health facility were vaccinated better⁸. In Dhaka a study done by Chowdhury F et al., showed that female children, illiterate mother significantly associated with non-immunization against measles vaccination¹⁴. In Nepal a study was conducted by Jha N et al., showed that there is positive relationship between immunization coverage and educational level of the respondents¹⁵. Dhadwal D et al., showed that complete immunization was positively associated with maternal education¹⁶. Current study shows that main reasons for non vaccination were lack of awareness followed by ignorance, ill health of the child, fear of side effects and least was lack of health services. There are many studies conducted proved the same thing. To quote few a study conducted by Ategbo S et al., showed that the principal reasons for non-immunization were lack of financial resources, in particular, for booster up vaccines and those recommended by the EPI, lack of information, forgetfulness, neglect, sick child, vaccine not available, wrong information, travel, mother sick and lack of time¹⁷. Yadav J et al., conducted in MadhyPradesh shows that the lack of information, lack of motivation and obstacles were main reason for non vaccination⁸. Namuigi P et al., conducted a study in Papua New Guinea showed that, limited access to health centres, especially to maternal and child health (MCH) clinics; too long a waiting time at the clinic; concern that too many injections were being given to their children; the side-effects of the vaccine; being sent away and asked to come back the next day for immunization; and a bad reception from health workers. Funerals or election-related events in the area also affected the attendance at the clinic were common reasons for non vaccination¹⁸. Manjunath U et al., showed that, obstacles, misconceptions/beliefs among the mothers of partially immunized children and lack of information among not at all immunized group were the main reasons of non-immunization¹⁹. In New Delhi a study was conducted by Mathew JL et al., showed that, the major reasons for non-immunization of the children were: migration to a native village, domestic problems, the immunization centre was located too far from their home and the child was unwell when the vaccination was due. The lack of awareness and fear of side effects constituted a small minority of reasons for non-immunization²⁰.

Conclusion:

In our study we accepted 41 (77.35%) PHC's/PHU's of the 53 PHC's/PHU's and vaccination coverage in these lots were considered as more than 85% and 12 (22.65%) PHC's/PHU's were rejected and vaccination coverage in these lots was considered as less than 85%. The overall measles vaccination coverage in Bellary district was 69.41%.and 53.62% had received Vitamin A supplementation.

Current study found that vaccination coverage was better in female child, First birth order baby, Christians, educated parents, working mother, family belong to upper middle class, mother who had hospital delivery, belong to nuclear family, parents who had vaccination card. All were statistically significant except sex of the child and type of family. The main reasons for non vaccination were lack of awareness followed by ignorance, ill health of the child, fear of side effects and least was lack of health services.

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