ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 03 | March - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A DESCRIPTIVE STUDY ON CLASSIFICATION OF ADVERSE EVENTS FOLLOWING IMMUNIZATION AMONG INFANTS ATTENDING MATERNAL AND CHILD HEALTH HOSPITAL, BANGALORE

Community Medicine

Dr. Nandini R C Assistant Professor, Department of Community Medicine, Dr B R Ambedkar Medical College, Bangalore, Karnataka, India.

Dr Prakruthi A R* Assistant Professor, Department of Community Medicine, Bowring and Lady Curzon Medical College, Bangalore, Karnataka, India. *Corresponding Author

Dr D H Ashwath Narayana Medical Superintendent, Kempegowda Institute of Medical Sciences, Bangalore, Karnataka, India.

ABSTRACT

Background: Vaccination is a vital component of the public health programs and among most cost effective medical intervention. Vaccines are usually safe and effective. However, like any other pharmaceutical products, adverse events may occur occasionally following vaccination.[1] Hence, the present study was conducted with objective to assess proportion of AEFI and classify them based on severity as minor, severe and serious and based on site as local and systemic reactions. **Material and Methods:** A one year, prospective, vaccine safety study was undertaken in maternal and child health hospital, Bangalore among mothers who delivered during the study period. A total of 110 infants were enrolled in the study and were followed for 1 year. Telephone survey of all mothers was conducted and all AEFI were recorded. **Results:** Out of 110 infants, 96 (87.3%) of study subjects had one or more AEFI for primary immunization. Minor reactions like pain, swelling and redness were 42% which are local reactions and fever accounted for 54.3% of all reported AEFI which is systemic reaction. **Conclusion:** The adverse events reported were mild and non-serious. Majority of the infants had only minor reactions which completely resolved with or without treatment. All were solicited reactions. Hence the vaccines given under UIP were safe among infants.

KEYWORDS

AEFI, primary immunization, vaccine preventable diseases and adverse event following immunization.

INTRODUCTION:

Universal Immunization Program (UIP) targets almost 27 million newborns and 30 million pregnant women each year, protecting them from vaccine preventable diseases (VPDs). Immunization is one of the most cost effective public health interventions and largely responsible for reduction of under-5 mortality rate. Immunization aims to protect the individual and the public from vaccine preventable diseases (VPDs). Vaccines are usually safe and effective. However, like any other pharmaceutical products, adverse events may occur occasionally following vaccination. .[1]

Past experience in AEFI surveillance has shown under reporting and lack of information regarding sequence of events in case of serious AEFI and this can hamper the immunization program. Hence, the operational guideline for surveillance and response to AEFI was revised in 2015 to use standardized definition & terminology in the country in sync with Global AEFI guidelines. This will help to improve the quality of immunization services & ensure immunization safety of all recipients.[1]

An adverse event following immunization (AEFI) is defined as "any untoward medical occurrence which follows immunization and which does not necessarily have a causal relationship with the usage of the vaccine". The adverse event may be any unfavourable or unintended sign, abnormal laboratory finding, symptom or disease (2015). [1]"Immunization" as used in the definition means the usage of a vaccine for the purpose of immunizing individuals. "Usage" includes all processes that occur after a vaccine product has left the manufacturing/ packaging site, i.e. handling, prescribing and administration of the vaccine.[2] AEFI are classified based on vaccine reactions by severity and frequency into common minor and severe / serious reactions. And classified as local and systemic reactions based on site involved.[1] The aim of AEFI surveillance is to monitor vaccine and immunization program safety and to detect population-specific, rare, late-onset or unexpected adverse events that may not be detected in pre-licensure vaccine trials.[3]

Recent evaluations have indicated that the major reasons for inability to reach with all vaccines to children in the entire country are lack of awareness among parents about the benefits of vaccination and fear of adverse events following immunization (AEFI).[1] Immunization managers must be ready to respond promptly to AEFI in order to prevent a loss of public trust in vaccines and consequent reduced immunization and increased diseases.[4] This lower tolerance for risks from vaccines translates into a greater need to detect and investigate any adverse event following immunization (AEFI) than is generally expected for other pharmaceutical products. Hence, the present study was conducted to assess the proportion and classify AEFI among infants receiving primary immunization.

METHODS:

A descriptive study was conducted at maternal and child health hospital, Bangalore involving infants and their mothers who delivered at the centre .The sample size was arrived by using the formula $n=4pq/d^2$ where prevalence "p" was taken as 55% (Measles vaccination at MCH hospital which is the least among all the vaccinations). With precision of 5%, using the above mentioned statistical formula which considers 95% confidence limits; the sample size was estimated to be 110. A total of 110 infants were involved in the study by purposive sampling and followed up for 1 year.

At the beginning, Institutional Ethics Committee clearance was taken. Revised Operational guidelines on AEFI surveillance (2015) was followed during the entire study. The data was collected by an interview method, using a pre-tested semi-structured questionnaire from study subjects regarding socio-personal profile and details of vaccines administered at birth viz. BCG, OPV0, Hepatitis B; pentavalent vaccine (PVV) + Inactivated Polio Vaccine (IPV) and OPV during 6 weeks and 14 weeks, pentavalent vaccine (PVV) and OPV at 10 weeks, and measles rubella (MR) vaccine at 9 months was obtained from mother or through Immunization card. All mothers who delivered during the study period and gave consent to participate in the study were enrolled for the study after fulfilling inclusion criteria. All infants not available for 1 year follow up and those contraindicated for vaccination were excluded from the study. They were interviewed on the day of immunization of their new born babies with birth dose of vaccine i.e. BCG + OPV0 + Hep B vaccine at maternal and child health hospital, Bangalore. During each immunization session, mothers were enquired about AEFI if any for the previous dose of vaccine and treatment provided to their infants. Seven days following each vaccination, a telephone call was made to mother enquiring if the child has AEFI and treatment taken (if any).

RESULTS:

A total of 110 infants were enrolled in the study and were followed for 1 year. Among 110 infants, 55 (50%) were males and 55 (50%) were females.

AEFI based on proportion of subjects affected

The primary results of the study showed that 96 (87.3%) of study subjects had one or more AEFI for primary immunization. Among the infants who received BCG, Hepatitis B and OPV0 dose of vaccine 63

(57.3%) had reported AEFI. Similarly, among 110 infants who were immunized for pentavalent first dose (PVV1), first dose of Inactivated Polio Vaccine (IPV1) and OPV2 36 (32.7%) infants had AEFI. Similarly, for second dose of pentavalent (PVV2) and OPV2 44 (40%) infants had AEFI. Among 110 infants who received third dose of pentavalent (PVV3), Inactivated polio vaccine second dose (IPV2) and OPV3 51(46.4%) infants had AEFI. Among 104 infants (6 loss to follow up due to migration) who received Measles Rubella (MR) 20 (19.2%) infants had AEFI.

AEFI based on local and systemic adverse events

Among 110 infants who received primary immunization, they developed local reactions like pain, swelling, redness and systemic reactions were fever, diarrhea and vomiting. In the present study local reactions were 42% (54.6% at birth, 51.4% at 6 weeks, 45.6% at 10 weeks, 48.4% at 14 weeks and 8.7% at 9 months). Systemic reactions were 58% (45.4% at birth, 48.6% at 6 weeks, 54.3% at 10 weeks, 51.7% at 14 weeks and 91.3% at 9 months) following primary immunization.

AEFI based on severity of reaction

Among AEFI for vaccination at birth, all 81(100%) reactions were minor. Among minor reaction, majority was pain 34 (42%), followed by 31 (38.3%) fever and 8 (11.1%) irritability.

Among AEFI for vaccination at 6 weeks majority i.e. 81(97.6%) reactions were minor and 2(2.4%) severe AEFI. Similarly AEFI for vaccination at 10 weeks; majority were minor i.e. 41(47.1%) was fever; 24(27.6%) swelling; 10(11.5%) pain; 6(6.9%) irritability and 3(3.4%) redness. Severe reaction was 3(3.4%) prolonged cry >3 hours. AEFI for vaccination at 14 week; majority were 82(98.1%) minor reactions and 1(1.1%) severe AEFI. Among AEFI following Measles Rubella (MR) vaccine all were 22(100%) minor reactions; majority was 20(90.9%) fever followed by 2(9.1%) swelling.

DISCUSSION:

The primary results of the study showed that 96 (87.3%) of study subjects had one or more AEFI for primary immunization. A study done by Nisarg D Joshi et al. found that 899 children (20.8%) suffered from AEFI. The higher rates in current study could be due to involving only infant who are more susceptible as compared with other study which includes study subjects of 0 to 14 years age group and also the study has used older definition of AEFI which includes the causal relationship with usage of vaccine with AEFI.[3]

In the present study 42% and 58% were local (pain, redness and swelling) and systemic reactions (fever was majority) respectively. They were non serious AEFI. These results were similar to study in Europe where the vast majority of AEFI were non-serious local events (e.g. pain, redness and swelling) and fever. Local reactions accounted for 65% of all reported adverse events. Fever occurred in 27% of recorded AEFI. Where as in current study fever accounted for 54.3% of all reported AEFI. [5]

Similar result was obtained in a study conducted at China, showed that majority of reported AEFI were (5013) non-serious AEFI with a rate of 103.24/100 000 doses. Among the non-serious AEFIs, the majority were fever (3314 cases, 68.25/100 000 doses), followed by local reactions (1686 cases, 34.72/100 000 doses). A total of 75 serious AEFIs were reported, with a rate of 1.54/100 000 doses.[6]

A study in Spain included a total sample of 946 children, ranging in age from 0 to 14 years (50.8% girls, 49.1% boys), 191 non-serious suspected adverse reactions were detected. Reactions to the diphtheria, tetanus, pertussis acellular and *Haemophilus influenzae* type b (DTPa + Hib) vaccine appeared in 43.4% of cases and the reactions to the measles, mumps, rubella (MMR) (18.4%). The most frequent types of AEFI: injection-site oedema (12.2 per 1000 doses); pain at site of inoculation (10.3 per 1000 doses); very high temperature (4.6 per 1000 doses). These findings were similar to current study where in reactions following pentavalent (DwPT + Hep B+ HiB) vaccine 1st 2nd and 3rd dose and measles rubella vaccine were 32.7%(6 weeks), 40%, 46.4% and 19.2% respectively. [7]

In present study 63 (57%) infants had AEFI at birth (i.e. BCG+ OPV0+ HEP B). Pain, swelling, redness and fever were 43.3%, 3.7%, 4.3% and 41.3% respectively following vaccination. As per WHO, 90-95% adverse reactions following BCG are local reactions like pain, swelling and redness and systemic reaction like fever are nil.20 In the present study 2.7% (OPV0) and 2.6% (OPV1) infants had systemic reaction like diarrhoea which lasted for 1-4 days. According to WHO, systemic reactions to OPV include diarrhoea, headache and/ or muscle pain. In the present study none of the infants had local reactions for IPV vaccination at 6 and 14 weeks. According to WHO, IPV is one of the safest vaccines in use. In the present study 1.3% of infants had swelling at the site of injection following administration of Hepatitis B vaccine. Pain, redness and fever were 43.3%, 1.3% and 41.3% respectively following vaccination. According to WHO, local reaction like pain, swelling and redness was 5% and fever > 38^0 C was 1- 6%. [8]

In the present study, local reactions like pain, swelling and redness were 49 % to 52% and systemic reaction i.e. fever was 43% to 51% following pentavalent vaccination. There was increase in rate of AEFI with each vaccination i.e. 36 (32.7%), 44 (40%), 51(46.4%) was the proportion of AEFI among the infants following vaccination with pentavalent, OPV and IPV at 6, 10 and 14 weeks. The results were similar to study by Edwards KM et al 2008, mild adverse events following DTwP when administered for both primary and booster immunizations in infants and children are common and consist of local reactions (50%) and systemic reactions such as fever over 38°C and irritability (40% to 75%), drowsiness (33% to 62%), loss of appetite (20% to 35%), and vomiting (6% to 13%).[9]

In the study severe reaction like persistent cry to pentavalent vaccine was 2.2%, 3.2% and 1% with 1st , 2nd and 3rd dose respectively. Similarly in a study by Cody et al persistent crying (>1 hour) occurred in 3.5% of children after both DTwP and DT vaccination but was 4 times more common after DTwP vaccination.27 In the study by Larry et al persistent crying is more frequent with the initial dose and less frequent thereafter which is similar to the present study.

In the present study 8.7 % infants had swelling and 87% of them had fever following measles rubella vaccination**.** Similarly, according to WHO, local reactions following administration of vaccines containing measles antigens develop within 24 hours of vaccination, recipients may experience pain and tenderness at the injection site which is generally mild and transient. Systemic reactions includes fever >103º/39.4 ºC occurs in about 5 to 15% of vaccine recipients.

Table 1: Proportion of infants reporting AEFI (n=110)

AEFI	At birth	6 weeks	10weeks	14 weeks	9 months*
Present	63 (57.3)	36 (32.7)	44 (40)	51(46.4)	20 (19.2)
Absent	47 (42.7)	74 (67.3)	66 (60)	59 (53.6)	84 (80.8)
Total	110 (100.0)	110 (100)	110 (100.0)	110 (100.0)	104 (100.0)

Note: Figures in parenthesis indicate percentage
*loss to follow up due to migration

Table 2: Distribution of AEFI based on Local and Systemic adverse events

Type of reaction		At birth* (n = 75)	6 weeks* (n = 76)	10 weeks* (n = 81)	14 weeks* (n = 91)	9 months* (n = 23)
Local	Pain*	34(45.3)	10(13.2)	10(12.3)	07(07.7)	-
	Swelling	03(4.0)	24(31.6)	24(29.6)	33(36.3)	02(08.7)
	Redness	04(5.3)	05(06.6)	03(3.7)	04(04.4)	-
Systemic	Fever	31(41.3)	33(43.4)	41(50.6)	45(49.5)	20(87.0)
	Diarrhoea	02(2.7)	02(02.6)	-	-	-
	Vomiting	01(1.3)	02(02.6)	03(3.7)	02(02.2)	01(04.3)

Note: Figures in parenthesis indicate percentage
*multiple response

Table 3: Distribution of AEFI based on minor and severe adverse events

Type of AEFI		At birth* (n = 81)	6 weeks* (n = 83)	10 weeks* (n = 87)	14 weeks* (n = 95)	9 months* (n = 22)
Minor:	Fever	31(38.3)	33(39.8)	41(47.1)	45(47.4)	20(90.9)
	Irritability	09(11.1)	09(10.8)	06(6.9)	05(5.3)	-
	Pain	34(42.0)	10(12.0)	10(11.5)	07(7.4)	-
	Swelling	03(3.7)	24(28.9)	24(27.6)	33(34.7)	02(9.1)
	Redness	04(4.9)	05(6.0)	03(3.4)	04(4.2)	-
Severe	Prolonged crying (>3hours)	-	02(2.4)	03(3.4)	01(1.1)	-

Note: Figures in parenthesis indicate percentage
*multiple response

CONCLUSION:

Adverse events following immunization was more with pentavalent vaccine in particular with 3rd dose. Majority of AEFI were minor and solicited. Among minor reaction, majority was pain, fever, redness and irritability. Fever was the most common systemic reaction. All AEFI subsided with or without treatment. Hence the vaccines given under UIP were safe among infants.

Recommendation: An active search system for adverse reactions to vaccines is a good method for detecting and classifying those reactions. Moreover, owing to their mild nature AEFI may be under-reported or unreported by passive surveillance systems. Hence an active system will enables in obtaining the information on the incidence and severity of AEFI in the local population. On-going surveillance of adverse events following immunization (AEFI), and regular analysis and reporting of these data should be integral to the management of immunization programs. Establishment of AEFI database at every vaccination centre can be a worthy long term goal at national level.

REFERENCES:

1. Operational guidelines on Surveillance and Response to AEFI. New Delhi: Ministry of Health & Family Welfare, Government of India. 2015.
2. Definition and application of terms for vaccine pharmacovigilance. Report of CIOMS/WHO Working Group on Vaccine Pharmacovigilance. Geneva: Council for International Organizations of Medical Services. 2012.
3. Nisarg D Joshi, Hiren K Prajapati, Krunal C Solanki, Anupama Sukhlecha, Hiren R Trivedi, Maganlal V Gajera, et al. Pattern of adverse events following immunization in an Indian teaching hospital. Int J Med Sci Public Health. 2013; 2(1):62-8.
4. Building trust and responding to adverse events following immunization in South Asia using strategic communication. Kathmandu: UNICEF; 2005.
5. Jana Danova , Aneta Kocourkova and Alexander M. Celko. Active surveillance study of adverse events following immunization of children in the Czech Republic.BMC public health.2017 Feb;17(1):167.
6. Zhang LP, Yu F, Jin BF, Wang Y, Xu HL, DU Y. Surveillance of adverse events following immunization in Minhang district of Shanghai from 2007 to 2010. Zhonghua Er Ke Za Zhi. 2012;50(11):859-64.
7. Carrasco-Garrido P, Gallardo-Pino C, Jiménez-García R, Tapias MA, de Miguel AG. Incidence of adverse reactions to vaccines in a paediatric population. Clin Drug Invest. 2004;24(8):457-63.
8. Vaccine Safety Basics learning manual. Geneva: World Health Organization; 2013.
9. Decker MM, Edwards KM, Bogaerts HH. Combination Vaccines. In Plotkin SA, Orenstein WA , eds. Vaccines. Philadelphia, PA, WB Saunders Company. 2008;139–56.