VACCINATION CAMPAIGN AGAINST TYPHOID IN TEMPORARY SHELTERS AFTER 2015 EARTHQUAKE IN BHAKTAPUR, NEPAL

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ABSTRACT

After the devastating effects of the 2015 earthquake in Nepal, the provisions for safe drinking water, personal hygiene, and sewage management were compromised among displaced people living in temporary shelters. Typhoid fever is endemic in Kathmandu valley, which is transmitted among people by the faecal–oral route and outbreaks can occur in post-disaster situations. To reduce the risk of transmission and outbreaks, typhoid vaccine was introduced for young children and adolescents for whom the risk of typhoid fever was highest. With the collaboration of Siddhi Memorial Hospital, Nepal Paediatric Society, and Nagasaki University, a typhoid vaccination campaign was implemented in Bhaktapur district in the valley. The campaign was conducted in all 23 temporary camps in the district. Among 4,263 children aged 2 to 15 years, 4,216 (98.9%) received a single dose of the typhoid Vi polysaccharide vaccine. Most of the children (47.8%) were 11 to 15 years of age, and girls were 50.2%. Only four children (0.1%) had an adverse event following immunization (AEFI). Local camp leaders, public health officials, and local youth clubs participated in the immunization programme. In a review of admissions to the local children's hospital, there was no apparent increase in typhoid cases in the post-earthquake period. Despite the various difficulties in the post-earthquake situation in Nepal in 2015, the vaccination campaign for the prevention of typhoid fever was successfully carried out among young children and adolescents.

Keywords: campaign, children, disaster, earthquake, Nepal, prevention, relief, Typhoid, vaccine, water.

1 INTRODUCTION

Nepal suffered two major earthquakes of 7.8 R Scale and 7.3 R Scale on 25th April and 12th May 2015, respectively, causing more than 8,900 deaths. More than 600,000 buildings were destroyed, and 900 health centres were affected, mostly in 14 districts. Bhaktapur, a densely populated district in the central region of Nepal, was one of the highly affected districts. Some 330 people including children and adolescents died due to the quake in this district. It is one of the districts in Kathmandu valley where typhoid diseases are prevalent. Siddhi Memorial Hospital is the only children's hospital in the district. The hospital data from April 2014 to March 2015 show that 12.5% of total hospital admissions of children more than 2 years of age were due to typhoid fever (provisional diagnosis). A survey conducted in the district shows that 17% of pre-earthquake sources of water were damaged due to the quake [1]. As 66% of the population was displaced in the district and with inadequate provision of safe water and hygiene, there was a high chance of an outbreak of typhoid in the region.

Typhoid fever is one of the water-borne diseases, which has a potential to be epidemic in the post-disaster situation [2, 3]. There are histories of outbreaks of typhoid fever following a cyclone in Mauritius in 1980, a complex disaster in Tajikistan in 1992–1997 and following a natural disaster in Calamba, the Philippines, in 2008 [4–6]. An investigation of enteric fever in Indonesia also found an association of enteric fever with flooding [7].

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Typhoid vaccines have been used to curtail the outbreaks of typhoid fever in China, Thailand, Iran, and Tajikistan [5, 8]. There are two types of typhoid vaccines licensed for general use: 1. Oral live attenuated (Ty21a) and 2. Vi polysaccharide (ViPS). The oral vaccine, however, is not suitable as a public health measure in developing countries, as three doses of the vaccine are needed on alternative days, and it is heat labile and requires a strict cold chain, which may not be available in developing countries [8]. Vi polysaccharide, on the other hand, is a single intramuscular dose, low cost and a more heat-stable vaccine, which is suitable and effective for rapid, widespread use in emergency situations in developing countries [5]. There are few instances of use of typhoid vaccine in post-disaster situation e.g. following a cyclone in Fiji [9] and following complex disasters in Tajikistan and Iran [5]. The study in Fiji demonstrated that the introduction of typhoid vaccine in the post-disaster stage could reduce the incidence of typhoid cases in an endemic region.

Enteric fever is endemic in Kathmandu valley. The incidence of enteric fever in the valley was 59 cases per 100,000 populations per year in 2005–2009 [10]. The risk of Salmonella Typhi infection is highest among school going children. Resistance to antibiotics such as nalidixic acid, and chloramphenicol are common in Nepal; there is also an emergence of ciprofloxacin and multidrug-resistant strains [11, 12]. Although WHO has recommended vaccination as a preventive tool in typhoid-endemic and multidrug-resistant regions [13], the Government of Nepal has not yet incorporated typhoid vaccination in national immunization programmes to control typhoid in Kathmandu valley.

2 OBSERVATION IN THE FIELD

During visits to the temporary camps in Bhaktapur, we observed that there was no proper provision for the management of liquid waste. Adults and children were living together in a single tent. Overcrowding was very obvious. There were few toilets, and not all toilets had facilities for hand washing. Drinking water was provided intermittently by different non-governmental organizations by bringing from different sources around Kathmandu valley in water tanks, bottles, and jars, and sometimes by purifying the ground water. There was no system established to check the quality of drinking water in any temporary shelters. During rain, rainwater was found to be flooded into the tents.

Children were particularly at risk of getting infections. They were observed playing around any open space in dust and dirt. Very few camps had separate temporary shelters for children for day care and with playing facilities. Few camps had medical clinics staffed with health workers. When they were interviewed about the diseases, they reported that most patients complain of diarrhoea, cough, and headache. A rumour about an outbreak of cholera was there when we visited, but government public health officials later did not confirm the outbreak and dismissed the rumour after investigations of some stool samples.

There was no electricity in the temporary shelters. Mobile phones were seen being charged by solar panels. Meals were prepared outside the tents with kerosene or gas stoves. During the daytime, the plastic tent became very hot, and children seemed to be sweating a lot, and during the night the parents told us that the tents did not protect them from the cold. Besides, people did mention that insects, mosquitoes, and rats entered the tents. People residing there seemed to have enough food, mainly rice, as government as well as non-government officials distributed frequently, but only a few shelters had a shared kitchen that provided balanced meals for the residents. So, children and adults who were residing in most camps were not receiving a balanced diet and particularly children were at risk of malnutrition.

After visiting the camps, we had a meeting about our observations among medical doctors, epidemiologists, and public health workers. The meeting pointed out the risk of outbreaks of typhoid fever particularly among children and adolescents who were living in temporary shelters. To mitigate the risk, we decided to provide typhoid vaccines to 2- to 15-year-old children living in temporary shelters in Bhaktapur district.

3 IMPLEMENTATION OF VACCINATION PROGRAM

A discussion was held about the vaccination programme with Bhaktapur District Public Health Office (DPHO) and Department of Child Health, Ministry of Health and Population. With the technical support of Nepal Paediatric Society (NEPAS) and financial support of Nagasaki University, Siddhi Memorial Foundation planned to implement the vaccination programme against typhoid from June 1, 2015. A Vi polysaccharide vaccine was chosen. The target age group was children of 2 to 15 years of age who were living in the temporary shelters in Bhaktapur district.

A questionnaire was designed to collect relevant basic information and to screen the children whether they had any severe anaphylaxis in any past vaccination or severe bleeding disorder before giving vaccination so as to avoid giving intramuscular vaccine. The questionnaire included the information of the history of typhoid in the child or the family, immunization history of past typhoid vaccine, including any occurrence of adverse effect in the past with vaccines, and any adverse event following immunization (AEFI). Any child who already had typhoid vaccine in the past three years was not vaccinated. A standard medical emergency kit was prepared (contents include Inj. Adrenalin, Inj. Pheniramine, Inj. Hydrocortisone, Paracetamol and supplies for taking vital signs, administering injections and IV fluids) for treating acute adverse effects of vaccination in the field.

The vaccine contains Vi polysaccharide antigen extracted from Salmonella Typhi Ty2 strain. The vaccine was stored in refrigerators in the laboratory of the hospital to ensure the maintenance of the temperature between 2–8°C. Iceboxes were used to transport the vaccines to the field. A team consisting of medical doctors, nurses, and a driver was oriented about the programme. The doctor interviewed the child and parent and obtained informed consent and filled up the questionnaire form. A group of nurses prepared the vaccine according to the guideline recommended by the manufacturer. Another group of nurses vaccinated the children following standard procedures. The content of the vaccine was checked before administration. Only the vaccines that appeared as clear, colourless solutions were administered. Left deltoid was chosen as the site for vaccination unless there was any contraindication. Three-milliliter disposable syringes were used for injection. A single dose of 0.5 mL was administered intramuscularly aseptically. The children were observed for 1 hour after the vaccination for any occurrence of adverse events.

During the campaign, we visited 23 temporary camps in Bhaktapur district and approached 4263 children of age 2–15 years. General characteristics of the children are shown in Table 1. Dust was the commonest cause of allergy found in 148 children. Regarding bleeding history, 19 children had the history of epistaxis; there was no history of major bleeding disorders in any child. Ninety children (2.1%) had minor complaints of illness such as common cold, cough, headache, and abdominal pain for which medication and advice were provided. Only 35 children refused vaccination. Four children (0.1%) had AEFI; all of them were observed and treated by paediatricians and were sent home without any complication.

Table 1: Characteristics of the children.

Characteristics	No of children N = 4263 (%)
Age	
2–5 y	744 (17.5)
6–10 y	1481 (34.7)
11–15 y	2038 (47.8)
Sex	
Female	2140 (50.2)
Male	2123 (49.8)
Any illness at present	
Yes	90 (2.1)
No	4173 (97.9)
History of getting treatment for typhoid fever in the past	
Yes	252 (5.9)
No	4011 (94.1)
History of hospital admission for typhoid fever (n = 252)	
Yes	82 (32.5)
No	133 (52.8)
Unknown	37 (14.7)
Family history of typhoid in past	
Yes	390 (9.2)
No	3873 (90.8)
History of typhoid vaccination	
Yes	321 (7.5)
No	3942 (92.5)
History of allergies	
Yes	194 (4.6)
No	4069 (95.4)
History of any bleeding problem	
Yes (epistaxis)	19 (0.5)
No	4244 (99.5)
Vi polysaccharide vaccine	
Received	4216 (98.9)
Not given, as vaccinated <3 years before	12 (0.3)
Refused	35 (0.8)
Adverse event following immunization (AEFI)	
Yes	4 (0.1)
No	4259 (99.9)

3.1 Adverse event following immunization (AEFI)

Four cases were observed to have AEFI during the vaccination campaign.

1. One 7-year-old male child had immunization anxiety-related reaction. He had a fainting attack (vasovagal syncope) for a few minutes after he was vaccinated. After a few minutes of rest, he became fine.

2. A 14-year-old girl was brought to the emergency room with complaints of fever and dizziness for 2 hours after she was vaccinated. She was febrile, pale, and tachycardic, but her blood pressure was within normal limits. There was no rash in the body. It was revealed that she was menstruating heavily and had low level of haemoglobin.
3. Two other girls complained of pain with swelling at the injection site, which was managed with cold compression and oral analgesic medicine at the field site.

Apart from these minor side effects, there was no serious, life-threatening reaction attributable to the vaccination.

3.2 Lessons learned from the vaccination campaign

Introducing a new vaccine in the post-disaster situation in Nepal was a challenge. The typhoid vaccine was not available in enough quantities in the local market. The vaccines had to be purchased from the manufacturer in India. Due to travelling of people and transfer of goods (relief workers and various emergency aids) in the post-earthquake situation, the transfer of the vaccines was delayed. However, the cold-chain was maintained by the company dealers. The licence of the vaccine had expired in the government office of drug administration at the time; we had to request for the company dealer to renew the licence before buying the vaccine from the company. The local community, as well as Nepal Paediatric Society, welcomed our campaign. They participated directly in managing the campaign. As there was no cold-chain facility in the camps, a small number of vaccines had to be repeatedly carried in the cold-chain boxes to the field site every day from the hospital. Participation of local youth clubs, local leaders, and public health officials was very helpful to explain to the parents about the vaccination programme and gather children on the assigned date and time.

4 POST-EARTHQUAKE DISEASE SURVEILLANCE

Disease surveillance in Siddhi Memorial Hospital showed that there was no increase of typhoid cases after the earthquake. As this hospital is the only children's hospital in Bhaktapur district, it should have indicated if there was any outbreak of the typhoid diseases among children in the region. Besides, there was no news of any outbreak of typhoid diseases from the public health office during the period.

5 CONCLUSIONS

A vaccination campaign against typhoid fever for the most vulnerable children after the 2015 earthquake in Nepal was successfully carried out by immunizing some 4,200 children in temporary shelters in Bhaktapur district with collaborative efforts of Nagasaki University, Siddhi Memorial Foundation, and Nepal Paediatric Society.

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