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Short Communication

Provocative Poliomyelitis Causing Postpolio Residual Paralysis among Select Communities of Two Remote Villages of North Karnataka in India: A Community Survey

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Summary

Intramuscular injections can provoke muscular paralysis especially, if the child has had exposure to polio virus. The purpose of the study was to determine the association with known risk factors for motor disabilities in two remote villages of North Karnataka (India), where an increased number of disabled people among select communities had been reported. A community based survey was conducted. The selection of study subjects was done through screening, history related with occurrence of musculoskeletal disability, screening and general examination of the affected joints and muscles. Data analysis was done by estimation of percentages. Among the physical disabilities identified, the most common was post-polio residual paralysis. 35.65% (n = 41) subjects had developed paralysis following the administration of an intramuscular injection when they had acute viremia in childhood, indicating that (probably) muscle paralysis would have been provoked by intramuscular injections, resulting in provocative poliomyelitis. Unnecessary injection must be avoided in children during acute viremia state and use of oral polio vaccine should be encouraged.

Key words: Community survey, Post-polio residual paralysis, Provocative poliomyelitis

Poliomyelitis is an acute viral infection of the central nervous system. Due to acute paralytic poliomyelitis, because of motor neuron cells destruction, muscle weakness and atrophy develops, which is referred to as Post-Polio Syndrome (PPS).[1]

In India, routine immunization began in 1978. The use of oral polio vaccine (OPV) reached all districts in India in 1990.[2] After the success of "Pulse Polio" program in Kerala, Tamil Nadu and Delhi, in 1995, the government implemented the "Pulse Polio" strategy.[2] During 2001, nearly 70% infants aged less than 1 year received more than three doses of OPV through routine nationwide immunization, but substantial variations were found in routine coverage with three dosages of OPV from state to state.[2]

Acute paralytic poliomyelitis is continued to be reported in spite of large-scale immunization programs. Paralysis is provoked due to administration of intramuscular (IM) injections especially, when the child has had an exposure to poliovirus.[3] IM injections are commonly prescribed in cases of fever and diarrhea.[4,5] Studies have reported the relationship of parenteral injections with paralytic poliomyelitis.[4,6,7] Provocation is defined as paralytic polio occurring 7–21 days after an IM injection of inflammatory material.[8] Following IM injection, infection may lead to reflex hyperemia in spinal cord, causing increased susceptibility of anterior horn cells to the poliovirus[9] and consequential paralysis.[4,6,7] The damage to nerve endings by the injection may allow the virus to access the nervous system.[9]

A high rate of disability was reported by the local

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administrative authorities of two remote villages (Adagalu and Muttalageri) in North Karnataka (India). Valmiki, Kuruba and Madiga communities are the predominant residents of these two villages. Based on the request of the local administrative authorities, a community-based survey was conducted to ascertain why in select communities in these two villages has had high incidence of disabilities.

The objectives of the study were to identify the risk factors associated with motor disabilities among people affected in these two villages, and to recommend an educational intervention program for the village health care workers and community members to prevent the re-occurrence of such disabilities among the newborn children.

This was a cross-sectional community-based survey. Adagalu and Muttalageri villages in North Karnataka were the areas studied. The study duration was from 2006 to 2008. A team of professionals visited the two villages to screen the population affected with disabilities. The local administrative authorities intimated the residents of these two villages regarding the purpose of the team's visit and the need for screening of the disabled individuals. The screening of people with disability was done in one of the government schools with the help of Aanganwadi teachers. There were equal representations from each community.

Details of general demographic data, history of significant illness and IM injections, immunization history, onset of muscle weakness and its progression pattern, duration of disability, diagnosis, treatment sequences (drug names ascertained and confirmed when the prescription was available) and follow-ups were recorded. Detailed physical examination was performed for individuals with disability. House visits were carried out to screen the individuals who were not able to visit the school. The prevalence of physical disability, diagnosis and incidence of polio in the last 10 years was recorded through personal interview with village heads of each community. In this study, the diagnosis of post-polio residual paralysis (PPRP) was done based on epidemiological and immunization history, IM injections received within 1 month prior to onset of paralysis or illness (risk factor), physical signs, past history, basic hygiene levels, sensory examination, joint range of motion, muscle girth and strength tests, and joint deformity type. Provocative polio was defined as paralytic polio occurring 7–21 days after an IM injection of inflammatory material.[8]

The data were analyzed using descriptive statistics by estimation of percentages.

The population of Adagalu village was 3600 and that of Muttalageri village was 4501. The total number of disabled subjects in these two villages was 115, of whom 68.70% (n = 79) had physical disability. The type of disability in the two villages is shown in Table 1. In Adagalu village, 40.35% (n = 23) had PPRP, while the same was 31.03% (n = 18) in Muttalageri village.

Of those who developed PPRP, 17% had a history of injection in paralyzed muscle group and 29% had history of injection in non-paralyzed muscles group. It was noted that the paralyzed injected leg muscles were weaker compared to non-injected paralyzed muscles. Only the lower limbs were affected among the polio-affected individuals. Out of 41 individuals affected with PPRP in these two villages, only 21.95% (n = 9) had paralysis of both lower limbs, while the remaining 78.04% (n = 32) had single limb paralysis. PPRP was limited only to Valmiki and Kuruba communities of these villages.

Poliomyelitis continues to be one of the most crippling diseases affecting children in our country, but in the year 2010, a total of 232 cases of polio were reported from India, Nigeria, Afghanistan and Pakistan, indicating that the new Global Polio Eradication Initiative approach does work.[10,11]

In the present study, most of the subjects (95.12%, n = 39) with PPRP had a history of fever and were given IM injections. Parents reported that their children developed weakness of muscles within 7–10 days

Table 1: Causes of disabilities recorded in Adagalu and Muttalageri villages

Causes for disabilities	Adagalu village (n 57) No. (%)	Muttalageri village (n 58) No. (%)
Post-polio residual paralysis	23 (40.35)	18 (31.03)
Cerebral palsy, developmental delay and mental retardation	13 (22.80)	8 (13.79)
Down's syndrome and muscular dystrophy	2 (3.50)	2 (3.44)
Congenital talipes equinovarus	5 (8.77)	-
Stroke	-	2 (3.44)
Amputation	3 (5.26)	3 (5.17)
Osteoarthritis and orthopedic disorders	7 (12.28)	7 (12.06)
Other disorders (visual disorders, cataract, sinusitis, UTI, etc.)	4 (7.01)	18 (31.03)

of administration of the injection. This suggests that paralysis of muscles would have been provoked by IM injections, when the child was in a state of acute viremia, and facilitated the development of provocative poliomyelitis. It was observed that no child among the Madiga community had received injections during the episode of fever as parents did not visit their doctors due to poor socioeconomic status. Children from Valmiki and Kuruba communities had received IM injections or vaccines during acute fever, resulting in the development of paralysis and causing increased disability due to polio. It suggests that provocative poliomyelitis[5] might have been the most common cause of PPRP. It may be inferred that if injections are replaced by oral medicines for fever and diarrhea, the prevalence and severity of paralytic polio would be reduced significantly.[3]

Similar findings were reported in other studies[4,6-8] where IM injection was found to serve as a provocative factor. Mathur *et al*. suggested that IM injections must be avoided, particularly during summer, and, if required, in serious cases, the drugs should be given intravenously.[12] Thus, if an outbreak of poliomyelitis is detected, then one must suspend the program for injectible vaccines. Clinicians must weigh carefully the risk of paralysis in these circumstances against the risk of diseases that vaccination might prevent.[13] It has been suggested that injectible vaccines must be avoided in countries with endemic poliomyelitis.[13]

In the present study, it was noted that fresh cases of PPRP had significantly reduced in both villages due to the introduction of OPV and the avoidance of unnecessary injections. This may also be attributed to the increase in education level and awareness among the villagers and improved awareness among the clinicians regarding careful use of injections in children during acute viremia.[12,13]

In our study, it was observed that nearly 93% of the subjects affected with PPRP were in need of major orthopedic intervention and all of them required orthotic support for their improvement in functional skills. Analysis of cases showed that 51% of them could have been prevented from developing severe contracture if treatment was made available at initial ages. It is important to regularly follow-up the affected population and provide intervention in terms of educational awareness to the health worker/community members/ Aanganwadi workers about disability causes and effects, need for hygiene and sanitation, ways of improving literacy rates (especially among women), training in identifying disabilities, and vocational training for the disabled, which will be of great benefit to the affected society in minimizing the impact of disability among its members.

The limitations of the study were as follows: It may not be possible to distinguish between provocative poliomyelitis (caused by incubating polio virus attacking the hyperemic anterior horn cells) and traumatic neuritis (direct mechanical damage to peripheral nerves) without testing for the presence of viruses in stool samples during the acute phase. In addition, prevalence of residual paralysis underestimates polio incidence because polio cases which die in the acute phase or later due to complications of disability are missed from the count.

Based on this community survey, it may be concluded that injection must be avoided among children during acute viremia state and use of OPV should be encouraged.

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