

# Incidence of traumatic injection neuropathy among children in Pakistan

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معدّل وقوع اعتلال الأعصاب الرضحي الناتج عن الحقن لدى الأطفال في باكستان  
فيصل منصور، سامية حميد، طاهر مير، ريجان عبد الحافظ، أنتوني مونتس.

**الخلاصة:** استخدم الباحثون في هذه الدراسة المعطيات الخاصة بترصد الشلل الرخو الحاد، التي جمعت من خلال مبادرة استئصال شلل الأطفال في باكستان، في المدة من 2001/1/1 إلى 2003/12/31، لوصف الخصائص الوبائية والعبء المرضي لاعتلال الأعصاب الناتج عن الحقن لدى الأطفال الذين تقل أعمارهم عن 15 عاماً. وبمراجعة 5627 حالة شلل رخو حاد تم التبليغ عنها، أمكن تحديد 456 حالة اعتلال أعصاب رضحي. وكانت هذه الحالة أكثر شيوعاً بين صغار الأطفال الذين يزيد أيضاً احتمال تعرضهم للإصابة بالشلل المستديم. وتشير تقديرات الباحثين إلى أن المعدل السنوي لوقوع اعتلال الأعصاب الرضحي في باكستان هو 7.1 لكل مليون طفل دون الثالثة من العمر.

**ABSTRACT** We used acute flaccid paralysis surveillance data collected between 1 January 2001 and 31 December 2003 from the Pakistan Polio Eradication Initiative to describe the epidemiological characteristics and disease burden of traumatic injection neuropathy among children aged under 15 years. Of the 5627 acute flaccid paralysis cases reported, 456 were identified as traumatic injection neuropathy by case review. The condition was more common in younger children who were also more likely to have persistent paralysis. We estimate that the annual incidence of traumatic injection neuropathy rate in Pakistan is 7.1 per 1 000 000 in children under 3 years old.

**Incidence de la neuropathie traumatique consécutive à une injection chez les enfants au Pakistan**  
**RÉSUMÉ** Nous avons utilisé les données de la surveillance de la paralysie flasque aiguë collectées entre le 1<sup>er</sup> janvier et le 31 décembre 2003 par l'Initiative d'éradication de la poliomyélite au Pakistan pour décrire les caractéristiques épidémiologiques et la charge morbide des neuropathies traumatiques consécutives à une injection chez les enfants de moins de 15 ans. Sur les 5627 cas de paralysie flasque aiguë notifiés, 456 ont été identifiés comme neuropathie traumatique consécutive à une injection lors de l'examen des cas. Cette pathologie était plus courante chez les jeunes enfants qui étaient aussi davantage susceptibles d'avoir une paralysie persistante. Nous estimons que l'incidence annuelle de la neuropathie traumatique consécutive à une injection au Pakistan s'élève à 7,1 pour 1 000 000 chez les enfants de moins de 3 ans.

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## Introduction

Traumatic injection neuropathy (TIN) can occur because of unsafe intramuscular injection practices. TIN involving the sciatic and radial nerves presents as acute peripheral neuropathy with flaccid paralysis of the injected limb within 24 hours after injection and is associated with pain and hypothermia in the affected limbs [1-6]. This complication is of particular concern in countries with high rates of unnecessary injections. The World Health Organization (WHO) estimates that of the 12 billion injections administered worldwide annually, 50% are unsafe and 75% are unnecessary [7].

In Pakistan, injections are over-prescribed and are often given without regard to the patient's chief complaint [8]. The rate of injection prescriptions in the country is estimated to be from 6.5 to 15 injections per person per year, with children under 5 years old receiving as many as 21 injections annually [9]. A recent national survey indicated that a high proportion of these injections are unnecessary and given in an unsafe manner [10]. While some data exists regarding the medical complications of these injections, no estimate has been published regarding the disease burden caused directly by injection trauma.

In Pakistan, all acute flaccid paralytic conditions are reported to the acute flaccid paralysis (AFP) surveillance system of the poliomyelitis eradication initiative. The AFP surveillance system has achieved or exceeded global targets for quality and sensitivity since 2000.

This study was a review of AFP surveillance data to identify the incidence of TIN in Pakistan and to describe the basic epidemiology of the disease.

## Methods

We searched the case records of AFP surveillance data collected between 1 January 2001 and 31 December 2003 to identify potential cases of TIN, using multiple diagnostic terms such as traumatic injection, traumatic neuritis, injection injury, etc. The case records of all potential cases were carefully reviewed.

A case of AFP was considered to be confirmed TIN if the paralysis was asymmetric, had rapid progression, had no other neurological signs or symptoms of recent onset, had no poliovirus isolated from a stool specimen and had a definite history of injection in the affected limb less than 24 hours before the onset of paralysis. A case was considered probable TIN if the clinical records were incomplete or unavailable but the diagnosis of TIN was given by a qualified physician and certified by a panel of physicians including at least one paediatrician and a neurologist. In Pakistan, a panel of experts reviews all AFP case records in which poliomyelitis is excluded before the diagnosis is included in the permanent case record.

Details of epidemiological characteristics were extracted from case records by the principal investigator using a standard data collection form. The population data for Pakistan was gathered from the 1998 census of Pakistan and extrapolated for the years 2001, 2002 and 2003 [11]. The data were entered and analysed using SPSS, version 7.5. Differences between epidemiological characteristics were tested using the chi-squared test and expressed in terms of odds ratio with a *P*-value considered statistically significant at  $\leq 0.05$ .

## Results

Of the 5627 AFP cases reported in Pakistan in the years 2001–03, 515 were potential TIN cases. After the complete record review, 417 cases were classified as confirmed TIN and 39 probable. There was no significant difference between confirmed and probable cases with regard to age, sex or clinical presentation. The median age of confirmed and probable cases was 22 months (range 2–161 months) and 75% of cases were less than 36 months old.

Residual paralysis 60 days after the onset of paralysis was more common in children below 1 year of age than in older children (37% versus 26%, OR = 1.6,  $P = 0.026$ ) (Figure 1). The lower limb was involved in 91% of cases, with right and left sides equally affected. Of the children, 72% were reported to have fever at the start of their illness. TIN cases were more common in boys than girls (62% versus

38%, OR = 1.5,  $P < 0.0001$ ). Of the cases, 75% had received 5 or more doses of oral polio vaccine (median 7 doses) and only 33 (7%) had a confirmed history of polio in the community in the last 60 days.

The geographic distribution of cases was uneven and more prominent in rural areas (76%) in contrast to the overall population distribution of the country living in rural areas (67%) ( $P = 0.002$ ). Of note, there was no clustering around densely populated urban areas. Two-thirds of cases (65%) had unskilled fathers compared with 22% with skilled fathers. This is higher than the general population of Pakistan in which 58% of fathers were classified as unskilled in the 1998 national census (OR = 1.35,  $P = 0.009$ ) (Table 1).

Some seasonality was observed with 42% of cases occurring from May to August. This pattern was consistent in each of the 3 years studied (Figure 2).

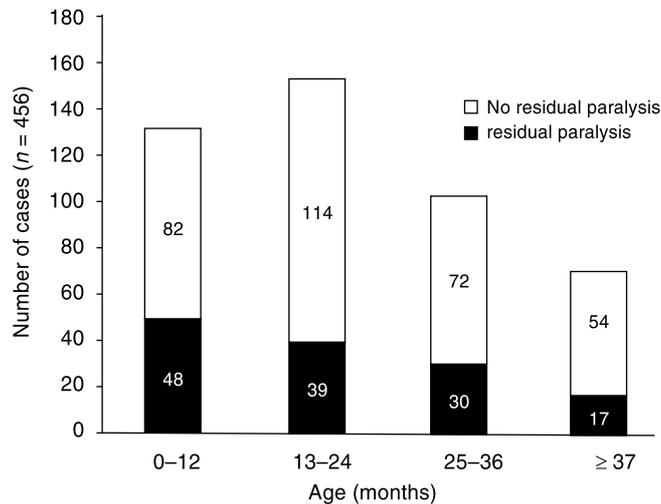


Figure 1 Age distribution of traumatic injection neuropathy

**Table 1 Demographic and clinical features of traumatic injection neuropathy cases reported as acute flaccid paralysis in Pakistan 2001–03**

Variable	No. of cases (n = 456)	%	P-value
<i>Sex</i>			
Male	282	62	< 0.0001
Female	174	38	
<i>Father's occupation</i>			
Unskilled	295	65	0.009
Skilled	102	22	
Government job	43	9	
<i>Location</i>			
Rural	345	76	0.002
Urban	111	24	
<i>Clinical features</i>			
Fever at the start of illness	318	70	
<i>Affected limb</i>			
Right lower limb	234	51	
Left lower limb	181	40	
Right upper limb	12	3	
Left upper limb	25	5	
<i>Muscle groups affected</i>			
Proximal	41	9	
Distal	126	28	
Both	198	43	
<i>Residual paralysis at 60 days follow-up</i>			
< 1 year old (n = 130)	48	37	0.026
≥ 1 year old (n = 329)	86	26	
<i>Polio</i>			
Stool specimen tested for polio	413	91	
Confirmed polio case in the community in the last 60 days	33	7	

n = total number of cases.

The annual incidence of TIN for children under the age of 15 years was estimated to be 3.38 cases per 1 000 000 per year, with the highest incidence occurring in the

youngest age groups where the annual incidence was 7.10 cases per 1 000 000 children under the age of 3 years.

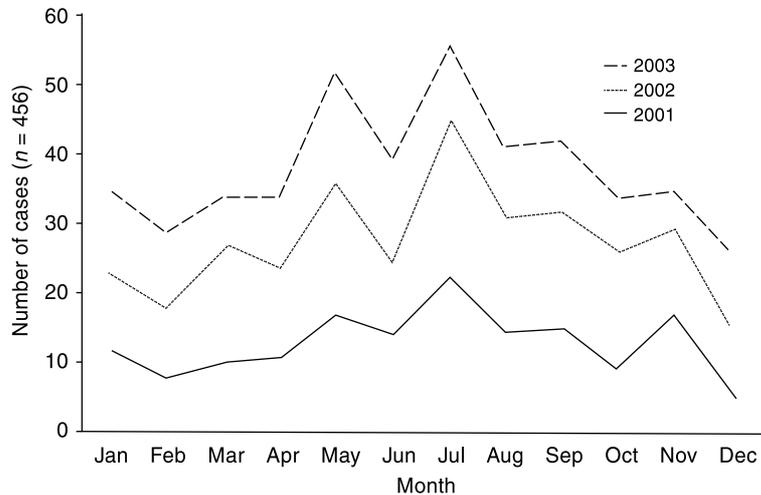


Figure 2 Seasonal occurrence of traumatic injection neuropathy in children under age 15 years

## Discussion

Injection-related traumatic neuropathy often results in life-long disability [1,3]. As we progress towards eradication of poliomyelitis, causes of AFP other than polio are becoming more apparent [12] and TIN has now emerged as the third most common cause of acute flaccid paralysis in Pakistan in children under the age of 15 years after Guillain-Barré syndrome and infantile hemiplegia [13]. The problem is particularly severe in children under the age of 1 year who suffer from a higher complication rate from injection methods inappropriate for this age group. The observation that fever was often reported to have occurred before the injection agrees with the fact that, even in this age group, most injections in Pakistan are given for therapeutic purposes rather than for vaccination [10]. However, routine immunizations have been observed being given in the gluteus of infants that also pose a potential risk [11].

The rural predominance of this disease and the association with unskilled parents suggests that the problem may be one of limited access to and affordability of qualified medical practitioners. Data about the health-seeking behaviour of the families in our study were not available. However, an earlier study in the Sindh province of Pakistan found that 75% of the respondents received injection by dispensers, who are paramedical support persons with varying degrees of training, and that injections received in urban areas were more likely to be administered by a medical doctor than in the rural area (20% versus 11% respectively) [10]. In Pakistan, it is observed that many untrained, unlicensed practitioners give injections [1,8,9], but that inappropriate and unsafe injection practices, including gluteal injections of infants, have also been observed in government vaccination centres and in the clinics of licensed physicians [11].

The predominance of males in the results is unexplained but may reflect the greater priority for health care given to boys over girls. Although the difference was significant, the same trend is noted in overall AFP case reporting [13]. Others have found that, in the Indian subcontinent, boys at every age and stage of disability receive preferential treatment [14].

The clinical features of the cases in this study are consistent with those seen elsewhere. Typically, motor loss in TIN shows predominance of lower limb involvement in 95% of cases [4]. When an upper limb is involved, the left is more often affected than the right, probably because the right upper limb is usually considered the dominant limb that might be incapacitated due to the pain of injection [3].

Although the AFP reporting system in Pakistan has long reached global standards for sensitivity, the true incidence may have been underestimated by the health-seeking behaviour of some parents, particularly the poor, uneducated and under-served who often seek care from unlicensed medical practitioners who may be reluctant to report complications. Enteroviruses other than poliovirus are also a rare cause of paralysis and may occur when infection is coincident with an intramuscular injection [15]. Although we did not exclude cases with enterovirus infections from this study, it is unlikely, given the rarity of enterovirus-related paralysis, that these contributed significantly to the burden of disease estimates

of traumatic injections. The study is further limited by the fact that the data was originally gathered for all cases of acute flaccid paralysis to look for polio and not specifically for injection neuritis. A more extensive study in which the actual cases are visited and interviewed could generate information on what was injected and by whom, thereby identifying categories of health care providers and health care settings who are responsible for inappropriate injection.

TIN is responsible for an increasing proportion of cases of paralysis of the children in Pakistan. While it is important to alert licensed health care providers to the dangers of gluteal injections in children, it is unlikely that this will completely solve the problem as a large portion of the responsible injections are given by unlicensed practitioners. Indeed there are many disincentives in the control of the problem as patients often request injections and they are often a major source of income for health care providers [16]. Public awareness of the dangers of unnecessary injections and unsafe injection procedures will likely be more effective in limiting these practices in the future.

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## References

1. Agha AA, Shah SS. Unnecessary therapeutic injections: a cause of physical disability. *Infectious disease journal of Pakistan*, 2001, 10: 22–3.
2. Gaur SC, Swarup A. Radial nerve palsy caused by injections. *British journal of hand surgery*, 1996, 21:338–40.

3. Azhar M et al. Radial nerve palsy an analysis of 50 cases. *Journal of the College of Physicians and Surgeons Pakistan*, 2001, 11(7):417–20.
4. Tong HC, Haig A. Posterior femoral cutaneous nerve mononeuropathy: a case report. *Archives of physical medicine and rehabilitation*, 2000, 81:1117–8.
5. Fremling MA, Mackinnon SE. Injection injury to the median nerve. *Annals of plastic surgery*, 1996, 37: 561–7.
6. *Peripheral nerves*. In: Russell R, Williams N, Bulstrode C, eds. *Bailey & Love's short practice of surgery*, 23rd ed. London, Arnold, 2000.
7. Halsey NA. Commentary: Poliomyelitis and unnecessary injections. *International journal of epidemiology*, 2003, 32, 278–9.
8. Raglow GJ, Luby SP, Nabi N. Therapeutic injections in Pakistan from the patients' perspective. *Tropical medicine and international health*, 2001, 6(1):69–75.
9. Zafar N et al. Injection practices in Sindh, Pakistan: a population survey. In: *Pilot-testing the WHO tools to assess and evaluate injection practices: a summary of 10 assessments coordinated by WHO in seven countries (2000–2001)*. Section III. Geneva, World Health Organization, 2003 (WHO/BCT/03.10).
10. Mantel F. *Survey on the safety of injections in the Islamic Republic of Pakistan, 8–28 April 2002*. Executive action document for the Government of Pakistan. Cairo, World Health Organization, 2002 (WHO/EMRO STC).
11. Population Census Organization, Statistics Division. *Census report of Pakistan 1998*. Islamabad, Government of Pakistan, 1998.
12. Kohler KA et al. Predictors of virologically confirmed poliomyelitis in India, 1998–2000. *Clinical infectious diseases*, 2002, 35:1321–7.
13. *AFP surveillance annual report 2002*. Islamabad, Pakistan Ministry of Health, 2003.
14. Wyatt HV. Differential diagnosis in AFP; poliomyelitis in developing countries. *Indian journal of paediatrics*, 1998, 65:S1–S98.
15. Centers for Disease Control. Case of paralytic illness associated with enterovirus 71 infection. *Morbidity and mortality weekly report*, 1988, 37:107–8.
16. Wyatt HV. Unnecessary injections and poliomyelitis in Pakistan. *Tropical doctor*, 1996, 26:179–80.