Surveillance of acute flaccid paralysis in the Netherlands, 1992–94

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Detection and investigation of all cases of acute flaccid paralysis (AFP) in children below 15 years of age are among the criteria for poliomyelitis-free certification. In the absence of poliomyelitis the incidence of AFP is around 1 per 100,000 children aged <15 years. In the Netherlands, surveillance of AFP began in October 1992 under the supervision of the Dutch Paediatric Surveillance System (NSCK). Over 90% of clinically active paediatricians participated in the monthly reporting of new cases of AFP.

From October 1992 to December 1994 (27 months), 52 cases of AFP were reported. The incidence was 0.7 per 100,000 over the period, and reported cases were evenly distributed throughout the country. The main cause of AFP was Guillain–Barré syndrome. The average time between onset of symptoms and visiting a doctor was less than 3 days. The median reporting delay was 29 days, although the system was not intended as surveillance for action. Virological examination of faeces was carried out for only 40.4% of AFP patients.

The start of the NSCK surveillance system coincided with the 1992–93 outbreak of poliomyelitis in the Netherlands, but only 7 of the 18 children with paralytic poliomyelitis were reported through the AFP surveillance system. For certification purposes, the present AFP surveillance system in the Netherlands needs to be improved with respect to coverage by including neurologists, rapidity of reporting, and completeness of laboratory investigations.

Introduction

In 1988 the 41st World Health Assembly launched the initiative to eradicate poliomyelitis by the year 2000 (1). The objectives for poliomyelitis eradication are as follows: no more cases of the disease due to wild poliovirus and no more wild poliovirus circulation identified anywhere in the world through sampling of communities and the environment (2). Subsequently, WHO has developed a plan of action for the eradication of poliomyelitis (2). In many ways, the eradication of smallpox provided a successful blueprint for poliomyelitis eradication (3). The WHO plan identified the programmatic priorities to be (i) immunization, (ii) surveillance and, at the final stage, (iii) certification.

Surveillance focuses on rapid detection of all circulating wild polioviruses. The implementation of adequate surveillance of acute flaccid paralysis (AFP) is one of the cornerstones for certification of the global eradication of poliomyelitis (4). The following standard case definition is used for cases of AFP: a child under 15 years of age with acute flaccid paralysis (including Guillain–Barré syndrome (GBS)) for which no other cause is identified, or a patient of any age for whom poliomyelitis is considered a possible diagnosis. All cases should be investigated clinically, virologically, and epidemiologically. For laboratory testing the collection of two faecal samples, taken 24 hours apart, is requested. Adequate surveillance requires complete reporting of cases, including “zero cases”.

The Global Commission for the Certification of the Eradication of Poliomyelitis has defined the criteria and process through which global poliomyelitis-free certification will eventually be made (5). High-quality AFP surveillance is of paramount importance. At present the following performance indicators for AFP surveillance have been defined:

— timeliness receipt of ≥80% of expected, routine surveillance reports, including zero reporting;
— a calculated AFP rate of 1 per 100000 children below 15 years of age;
— at least 80% of reported AFP cases should be investigated within 48 hours; and
— all suspected poliomyelitis cases should be investigated in detail, including clinical, epidemiological, and virological examinations and a 60-day follow-up examination for residual paralysis.

Before the start of the AFP surveillance in the Netherlands in 1992, cases of poliomyelitis had been absent since 1978. The immunization coverage of 1-year-olds in this country had been around 97% for many years. The Netherlands is one of the few countries relying exclusively on inactivated poliovirus vaccine (IPV) rather than oral poliovirus vaccine (OPV), which remains the vaccine of choice for global eradication. Immunized children were considered well protected against poliomyelitis (6). There is, however, a clearly recognizable high-risk group in the Netherlands: persons refusing vaccination for religious reasons. In the Netherlands, poliomyelitis is a notifiable disease, such that immediate reporting at suspicion is compulsory. This passive poliomyelitis surveillance system was extended when a paediatric surveillance system known as the Netherlands Paediatric Surveillance Centre (NSCK) started. The reasons for including AFP-surveillance within the NSCK network were as follows: to evaluate the feasibility of the system as a national AFP surveillance system; to measure the annual incidence of AFP; and to obtain further information on the causes of AFP in the absence of poliomyelitis. This article presents the results of the first 27 months of the NSCK surveillance of AFP.

Materials and methods

The objective of the NSCK surveillance system is to obtain information on rare childhood disorders with a low prevalence at the national level. The system began in October 1992 with support from the Ministry of Public Health, Welfare and Sports. The system is similar to the British Paediatric Association Surveillance Unit (7) and is based on reporting by all clinically active paediatricians through the monthly return of a card listing a limited number of rare disorders. All paediatricians have received this easily recognizable reporting card each month since October 1992 and are asked to indicate new cases of the listed disorders identified during the previous month, with initials and date of birth. All cards are returned to the NSCK, thereby including negative findings. The NSCK reports back monthly to the various investigators, who then contact the reporting physicians to collect further clinical and laboratory details of the patients. AFp has been included in the system since the outset and the following case definition is used: all children with acute flaccid paralysis, including bulbar paralysis.

Results

Response. The rate of returned cards reached high levels shortly after introduction of the surveillance system. The response rate was 87% in 1992, 91% in 1993, and 93% in 1994.

Reported AFP cases. Between 1 October 1992 and 31 December 1994, a total of 61 patients with AFP were reported to the NSCK. By means of questionnaires, additional clinical and laboratory data were collected from the reporting paediatricians. Of the 61 questionnaires issued, 57 (93.4%) were returned. Four patients did not match the case definition; two had contracted poliomyelitis abroad some time in the past; and one patient was reported twice. Therefore, a total of 52 reports (85.2%) were eligible for final analysis.

Timeliness of reporting. For the 52 patients, the median interval between the onset of illness and reporting to the NSCK was 29 days.

Age and sex distribution. The average age of the AFP patients was 7.2 years. There were 34 boys and 18 girls, giving a male-to-female ratio of 1:0.53. Only in one case was the patient above 15 years of age. The age and sex distribution of the 52 reported AFP patients, including the confirmed poliomyelitis patients (see below) is given in Table 1.

Geographical distribution of AFP in the Netherlands. As indicated by their postal area codes, the
reported AFP patients were evenly distributed over the country.

**Reported diagnoses, signs and symptoms.** The reported final diagnoses of AFP cases are given in Table 2, along with the sex and age characteristics of patients according to diagnosis. For 18 AFP-patients there was an association with an infection, including poliomyelitis (7 cases), varicella-zoster virus (2 cases), *Borrelia burgdorferi* (4 cases), and *Salmonella* group D, adenovirus, influenza B virus, echovirus, and viral meningitis of unknown origin (1 case each). GBS was the final diagnosis in 16 cases, of which 5 (31.2%) were associated with infection, including 2 cases of *Mycoplasma pneumoniae* infection, and 1 case each of Epstein-Barr virus, cytomegalovirus and influenza virus infections. Clinical signs other than paraesthesia and motor disturbances were absent among GBS patients. AFP resulted from illness in two cases, including one patient with contusio medullae spinalis and one with post-traumatic syringomyelia. The remaining two diagnoses of AFP resulted from phosphofructokinase deficiency and arteria spinalis anterior syndrome. In 14 cases of reported AFP (26.9%), the final diagnosis remained unknown.

Clinical characteristics such as motor disturbances, fever, meningism, paraesthesia and sensibility disturbances, summarized according to diagnosis, are given in Table 3. Motor disturbances were, of course, reported for all patients.

Fever occurred in 85.7% of the poliomyelitis patients (see below), in 84.6% of those with other infections, and in 12.5% of GBS patients. Meningism occurred in 42.9% of NSCK-reported poliomyelitis cases.

All poliomyelitis cases were confirmed by isolation of wild poliovirus from stool samples. Stool samples were investigated in only 38.2%, 31.3%, and 33.3%, respectively, of the patients with other infections, GBS, or unknown diagnosis. Throat swabs for virus isolation were taken in 23.1%, 12.5%, and 41.7%, respectively, of the patients in the above-mentioned groups.

**AFP rate**

Table 4 shows the reported rate of AFP cases per 100000 population under the age of 15 years as well as the number of cases expected on the basis of an incidence of 1 per 100000. The expected number of AFP cases annually was 28 per 100000 population in the Netherlands during the study period. Between October and December 1992, 10 cases were reported, of which 4 were due to poliomyelitis. In 1993, 23 cases were reported, including 3 due to poliomyelitis. In 1994 there were 19 cases of AFP. The AFP rates in the years 1992, 1993 and 1994 per 100000 population under 15 years of age were therefore 1.45, 0.82, and 0.67, respectively, including poliomyelitis patients, and 0.87, 0.72, and 0.67, respectively, excluding such patients. Therefore, a fairly constant rate close to 0.7 per 100000 was seen over the reporting period.

**The poliomyelitis outbreak of 1992–93**

A nationwide outbreak of poliomyelitis occurred in the Netherlands between September 1992 and February 1993 (8). This outbreak partially interfered with the study objective of detecting the rate and causes of AFP in the absence of wild poliovirus circulation. However, it did allow us to evaluate the sensitivity of the AFP surveillance system. A total of 18 patients aged <15 years with paralytic poliomyelitis were notified to the public health authorities dur-
ing the outbreak. Of these, only 7 cases were confirmed poliomyelitis, including 2 males aged <1 year, 1 male in the 1–4-year-old age group and 4 cases (2 girls and 2 boys) in the 10–14-year-old group (Table 1). The male-to-female ratio for these seven confirmed poliomyelitis cases was 1:0.40. Fig. 1 presents the monthly reported number of cases in the NSCK surveillance system, including the confirmed poliomyelitis cases, by data of onset of disease. No previously unconfirmed cases of poliomyelitis were detected by the surveillance system.

**Discussion and conclusions**

With the ongoing success of the eradication initiative, surveillance of patients with poliomyelitis and of wild poliovirus circulation is becoming increasingly important. In the end stage of eradication, it will be crucial to document convincingly the absence of disease cases and of wild poliovirus circulation. Only then can the world be declared free of poliomyelitis and vaccination be stopped.

Surveillance of AFP is the cornerstone of adequate poliomyelitis surveillance as requested by the Global Commission for the Eradication of Poliomyelitis (5). Only because of the presence of a high quality AFP surveillance system could the Americas be declared poliomyelitis free in 1994 (9). AFP surveillance has been implemented successfully in countries emerging as poliomyelitis free, most notably in Latin America and the Caribbean. In Oman, a well-organized AFP surveillance system was implemented after the outbreak in 1988 and led to the detection of a poliovirus type 3 epidemic (10). While the need for AFP surveillance has been well established in countries recently free of poliomyelitis, the necessity and feasibility of AFP surveillance in developed countries that have been free of the disease

### Table 3: Clinical signs and symptoms for different diagnostic groups of AFP cases

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>% of patients exhibiting symptoms:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor disturbances</td>
</tr>
<tr>
<td>Infection</td>
<td></td>
</tr>
<tr>
<td>Poliomyelitis</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>100</td>
</tr>
<tr>
<td>Guillain–Barré syndrome</td>
<td>100</td>
</tr>
<tr>
<td>Post-trauma</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>100</td>
</tr>
<tr>
<td>Unknown</td>
<td>100</td>
</tr>
<tr>
<td>All diagnoses</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table 4: Expected and reported AFP cases per 100,000 population aged <15 years, and the NSCK response rate, October 1992 to December 1994

<table>
<thead>
<tr>
<th>Year</th>
<th>Population &lt;15 years*</th>
<th>No. of AFP cases</th>
<th>NSCK response (%)d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expectedb</td>
<td>Reported</td>
<td>AFP ratec</td>
</tr>
<tr>
<td>1992 (3 months)</td>
<td>2764914</td>
<td>7</td>
<td>10(6)*</td>
</tr>
<tr>
<td>1993</td>
<td>2791061</td>
<td>28</td>
<td>23(20)</td>
</tr>
<tr>
<td>1994</td>
<td>2815732</td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>—</td>
<td>63</td>
<td>52</td>
</tr>
</tbody>
</table>

* Data provided by the National Office for Statistics.

b Based on an AFP incidence of 1 per 100,000 population <15 years of age.

c Cases per 100,000 population aged <15 years per year.

Proportion of all paediatricians returning completed reports monthly.

Figures in parentheses are number of cases excluding confirmed poliomyelitis cases.
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Fig. 1. Number of cases of acute flaccid paralysis (AFP) reported per month in the Netherlands from September 1992 to December 1994, by date of onset of disease.

for many years is less clear. Countries such as the United Kingdom, where poliomyelitis has been absent for 10 years or even longer, have reported on their experience with AFP surveillance (11). A feasibility study on AFP surveillance was started in the Netherlands in October 1992 as part of the NSCK surveillance system of rare childhood diseases, and provides excellent access to practising paediatricians in the Netherlands. In May 1992 investigators at the Rijks Instituut voor Volksgezondheid en Milieu proposed that AFP surveillance be included in the NSCK system. Once the scientific board of NSCK had been convinced of its usefulness, AFP was added to the list of rare conditions covered by the surveillance system. The system requires little effort from participating paediatricians, who only have to tick a box if cases have occurred and return the postcard once monthly. Shortly after the introduction of the programme the average response rate increased rapidly to reach a stable 90% of the nearly 400 practising paediatricians over the period studied. This rate is slightly higher than those in the action-oriented surveillance system in the Americas, where approximately 80% of all health facilities report weekly.

Excluding patients with poliomyelitis, the incidence of reported AFP cases was 0.7 per 100 000 population <15 years of age over the entire study period. It peaked at 1.45 per 100 000 around the poliomyelitis outbreak in 1992. The overall AFP incidence is slightly less than the benchmark rate and that reported from most other countries with adequate AFP surveillance. For the Region of the Americas the AFP reporting rate between 1988 and 1995 ranged from 1.20 to 1.35 per 100 000 population aged <15 years (12). In 1996 the overall rate for this region was 1.20; the rates per reporting country varying from 0.04 (HAI) to 2.53 (ELS) per 100 000 population aged <15 years (13). The average AFP rate in Oman was 2.1 per 100 000 population aged <15 years, with a variation per district of 0.5–3.3. In the Czech Republic, Poland, Russian Federation (St. Petersburg), Turkey, and the Ukraine, AFP rates of 0.3, 0.6, 2.6, 0.5, 1.7, and 0.7 per 100 000 population, respectively, have been reported (WHO, unpublished data).

Data on AFP incidence from Western European countries are scarce and have to our knowledge only been published for the United Kingdom. The average AFP incidence in the BPSU surveillance was 0.38 per 100 000 population under 16 years of age for the period July 1991 to June 1994, and declined from 0.48 per 100 000 in 1991 to 0.23 per 100 000 in 1994. The age and sex distributions of our patients were comparable to those found in the United Kingdom.

The reasons for the differences in AFP rates among countries are unclear. Comparison of the various final clinical diagnoses in the surveillance systems of the Region of the Americas and the United Kingdom with our data is difficult because of the relatively large percentage of patients for whom
the final diagnosis was not reported. It is remarkable, however, that the percentage of patients with GBS in our study is well below that in the PAHO and United Kingdom studies (30% versus approximately 60%). This difference may have arisen because some of the paediatricians covered by the NSCK system were not aware that GBS fell within the case definition of AFP.

The specificity of our surveillance system appeared to be satisfactory; only 4 of the 52 reported cases did not match the case definition. The sensitivity, however, was poor. The objective of AFP surveillance is to detect all cases of poliomyelitis. The concurrent poliomyelitis outbreak in the Netherlands in 1992–93 allowed us to determine the sensitivity of AFP surveillance at detecting cases of poliomyelitis. Of the 71 officially registered patients with poliomyelitis during the 1992–93 outbreak, 59 were paralytic and of those, 18 were aged <15 years. Only 7 of these 18 cases (39%) were reported to NSCK (Fig. 2). This low sensitivity is probably because most poliomyelitis patients were seen by their general practitioner and were referred directly to a neurologist and not a paediatrician. In consequence, they were not reported to NSCK. Thus, to improve coverage in the Netherlands, AFP surveillance should be extended to include neurologists. In other countries with highly specialized health care systems, AFP patients may be seen by paediatricians or neurologists. Countries considering implementation of AFP surveillance should take this into account. In view of the long period between onset of illness and reporting (median, 29 days), the Dutch AFP surveillance in its present form is not suitable for immediate action. Rapid reporting was, so far, not one of the surveillance system objectives, in contrast to that in the United Kingdom. It would, however, be quite feasible to improve the speed at which AFP cases are reported, thereby permitting immediate action to be taken. For this purpose, telephone reporting will be introduced shortly, along with other measures to improve the system.

Adequate virological examination was performed for less than 50% of patients (data not shown). Virus isolation from faeces or throat swabs was attempted for only 40.4% and 25% of the patients, respectively, including all poliomyelitis patients. In one third of all AFP patients, virological examination was not carried out at all. Therefore, poliomyelitis cannot be excluded for some patients. For example, one AFP patient living in the area where the poliomyelitis outbreak started in the Netherlands in 1992 became ill on 15 September 1992, a total of 2 days before the index patient was notified. No virological examination was carried out and no information on the immune status of this AFP case was available. The case was reported to the NSCK system only in early 1993. Clearly there is a strong need to improve virological examination of patients with AFP. Acute-onset flaccid paralysis itself is a syndrome with numerous possible causes and will continue to occur worldwide even after complete eradication of poliovirus (14). Clinically, poliomyelitis is quite difficult to distinguish from other causes of AFP. As observed by PAHO (15), our data confirm fever to be a good parameter to distinguish poliomyelitis from other infectious diseases or GBS.

It is clear that in its present form the Dutch AFP surveillance system does not meet the requirements set by the Global Commission on the Certification of the Eradication of Poliomyelitis. Performance indicators are not being met with regard to AFP rate, timeliness of reporting, and adequate epidemiological and virological investigations. In addition, an expert committee for classification of cases has not been established. The main reason that the system does not yet meet the required performance level is that it started as part of a surveillance system for a number of rare conditions. The emphasis was on determining the incidence and causes of these conditions, and not on investigating and following-up these cases. Using this approach it was fairly easy to introduce AFP surveillance, but it will be more difficult to improve the system to the required performance level.

Our report shows that improvements are needed, particularly with regard to the sensitivity of the system, the timeliness of reporting and especially laboratory investigation of AFP cases. It is crucial that laboratories correctly identify polioviruses; to
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this end, a global network has been developed for technical support (16). Paralytic illness may also be due to other enteroviruses, notably enterovirus 71 (17), and a recent study in Brazil stressed the importance of detecting and correctly typing enteroviruses as possible causes of AFP (18).

In countries where poliomyelitis has apparently been eradicated for many years, flexibility will be needed in the Global Commission’s assessment of the absence of circulating wild poliovirus. Further documentation and definition of acceptable techniques in such countries is needed (5). In order to detect all circulating polioviruses, all clinically suspect cases of AFP should be identified and investigated by virological examination.

The Netherlands continues the present AFP surveillance system, with increased attention on the laboratory aspects. Additionally, increased awareness of the poliomyelitis eradication initiative should improve the overall performance.

Résumé


La qualité de la surveillance de la paralysie flasque aiguë (PFA) sera l’un des critères qui serviront de base à la certification de l’éradication mondiale de la poliomyélite. On sait, grâce à l’initiative pour l’éradication de la polio-myélite dans les Amériques, que l’incidence de la PFA en l’absence de poliomyélite est voisine de 1 pour 100000 enfants de moins de 15 ans. Une surveillance adéquate des patients atteints de PFA doit comporter des investigations virologiques (isolement et typage du virus) pour exclure la poliomyélite. Le système actuel de surveillance de l’éradication de la poliomyélite dans la Région des Amériques signale de 2000 à 2500 cas par an et s’appuie sur plus de 20 000 unités sanitaires; aucun poliovirus sauvage n’a été décelé dans la région pendant les 5 années passées. Hors des Amériques, la surveillance de la PFA a débuté plus récemment. Si la mise en œuvre de cette surveillance dans les pays d’endémie ou indemnes de poliomyélite depuis peu n’est pas contestée, son introduction dans les pays sans cas de poliomyélite depuis plus longtemps n’est pas bien acceptée.

Cet article rapporte les résultats de la surveillance de la PFA aux Pays-Bas d’octobre 1992 à décembre 1994. Depuis octobre 1992, la surveillance pratiquée aux Pays-Bas consiste à inclure les cas déclarés de PFA dans le système nouvellement créé par le centre de surveillance pédiatrique néerlandais (NSCK). Ce système s’attache plus à recueillir les données de l’incidence que des informations permettant une intervention rapide. Il est demandé à tous les pédiatres néerlandais ayant une activité clinique (soit 400 environ) de déclarer chaque mois les cas de PFA, y compris zéro cas. Après chaque notification au NSCK, les pédiatres reçoivent un questionnaire qui permet de recueillir des données cliniques et diagnostiques complémentaires. En 27 mois (octobre 1992-décembre 1994) 52 cas de PFA ont été déclarés. L’incidence était donc de 0,7 pour 100 000 pour la période, chiffre qui est resté relativement constant au cours du temps. Le rapport de masculinité était de 1:0,53 et l’âge moyen de 7,2 ans. La médiane du temps qui sépare le début de la maladie de la déclaration au NSCK est de 29 jours. Les cas sont uniformément répartis dans tout le pays. Comme ailleurs, la cause principale de la PFA est le syndrome de Guillain-Barré.

La mise en place de la surveillance de la PFA aux Pays-Bas a coïncidé avec la flambée de poliomyélite de 1992–1993 dans ce pays. Sur 18 cas déclarés de poliomyélite paralytique avant l’âge de 15 ans, 7 ont été déclarés grâce au NSCK. Ce faible taux de déclaration est peut-être dû à ce que les patients n’ont pas consulté un pédiatre, mais plutôt un généraliste ou un neurologue.

Le pourcentage d’examens virologiques à partir d’échantillons de selles des patients est remarquablement bas (40,4%). La recherche du diagnostic par isolement du virus et typage est nécessaire, non seulement pour exclure la poliomyélite, mais encore pour mieux connaître les autres causes de PFA. Si la surveillance de la PFA se poursuit dans des pays où la poliomyélite est apparemment éliminée depuis plusieurs années, comme aux Pays-Bas, il est recommandé d’y inclure les déclarations de PFA par les neuro-logues. L’attention est également attirée sur la rapidité de la déclaration et la réalisation d’examens microbiologiques complets des cas de PFA.

References