Enhanced disease surveillance through private health care sector cooperation in Karachi, Pakistan: experience from a vaccine trial


Introduction

In research projects such as vaccine trials, accurate and complete surveillance of all outcomes of interest is critical. In less developed countries where the private sector is the major health-care provider, the private sector must be included in surveillance systems in order to capture all disease of interest. This, however, poses enormous challenges in practice. The process and outcome of recruiting private practice clinics for surveillance in a vaccine trial are described.

Methods

The project started in January 2002 in two urban squatter settlements of Karachi, Pakistan. At the suggestion of private practitioners, a phlebotomy team was formed to provide support for disease surveillance. Children who had a reported history of fever for more than three days were enrolled for a diagnosis.

Results

Between May 2003 and April 2004, 5540 children younger than 16 years with fever for three days or more were enrolled in the study. Of the children, 1312 (24%) were seen first by private practitioners; the remainder presented directly to study centres. In total, 5329 blood samples were obtained for microbiology. The annual incidence of Salmonella typhi diagnosed by blood culture was 407 (95% confidence interval (95% CI), 368–448) per 100 000/year and for Salmonella paratyphi A was 198 (95% CI, 171–227) per 100 000/year. Without the contribution of private practitioners, the rates would have been 240 per 100 000/year (95% CI, 211–271) for S. typhi and 114 (95% CI, 94–136) per 100 000/year for S. paratyphi A.

Conclusion

The private sector plays a major health-care role in Pakistan. Our experience from a surveillance and burden estimation study in Pakistan indicates that this objective is possible to achieve but requires considerable effort and confidence building. Nonetheless, it is essential to include private health care providers when attempting to accurately estimate the burden of disease in such settings.

Keywords

Epidemiologic surveillance; Vaccination; Clinical trials; Private sector; Salmonella typhi; Pakistan (source: MeSH, NLM).

Mots clés

Surveillance épidémiologique; Vaccination; Essai clinique; Secteur privé; Salmonella typhi; Pakistan (source: MeSH, INSERM).

Palabras clave

Vigilancia epidemiológica; Vacunación; Ensayos clínicos; Sector privado; Salmonella typhi; Pakistán (fuente: DeCS, BIREME).

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is essential for success and cost effectiveness. The private sector may offer the only functioning public health care system or public clinics may compete with private practitioners for patients. The inclusion of the private health care sector as a sentinel point for disease surveillance is essential but difficult to achieve, although regular contact with private practitioners and continuous feedback has been effective in some surveillance activities.

In preparation for a large trial on a vaccine for typhoid fever, we conducted fever surveillance in two urban squatter settlements of Karachi, Pakistan, starting in January 2002. The study site was chosen because it had a high reported incidence of typhoid fever and no specific typhoid fever control programme had been initiated. Two study health-care centers were established to take blood samples and treat patients with a reported history of fever.

A modified passive surveillance system called “augmented passive surveillance” was adopted for the trial. Cases of reported fever at the household level were identified through weekly household visits by community health workers. Active surveillance was not possible because of the extensive logistic and resource requirements in such a setting. All cases that fulfilled the case definition were encouraged to visit the study centres or the private practitioners of their choice. The process gave the project an estimate of cases of reported fever in the community that was then compared with the number enrolled in the study to assess the surveillance’s sensitivity. Household members with reported episodes of fever were encouraged to attend the study centre for treatment and recruitment into the surveillance study.

During the baseline census of the study setting, information on health-care-seeking behaviour for febrile illnesses was collected. About 60% of households stated that they visit a private health-care provider. The private practitioners in the area come from a range of backgrounds. They include dispensers, nurses, health technicians, traditional healers and people who had worked with a health-care provider in the past. The relatively lower use of study centres by residents who lived far from study centres meant that private practitioners were included systematically in surveillance activities. The participation of private practitioners was useful in establishing sentinel points that were more accessible and did not affect the health-care-seeking behavior of the study population.

We report our experience of engaging private practitioners during the first year of this surveillance, the processes of working with them and their importance in assessing various estimates of disease burden in developing countries.

Methods

Surveillance for infection with Salmonella typhi was carried out in two urban squatter settlements (Sultanabad and Hijrat Colony) of Karachi, Pakistan. The study population of 46 273 people lives in about 7000 households and consists mostly of immigrants from elsewhere in Pakistan, especially the north. Domiciliary surveillance was conducted through a team of community health workers. They visited each household weekly and asked whether any child in the household currently suffered from fever or had done so during the past week. A study health-care centre was established in each settlement for disease surveillance activities and provided consultation and free treatment. The working hours of the study centre were 10:00 to 22:30. The target group for the trial was children aged 2–16 years, but consultation and treatment was provided to all children. The population seeks health care for mild illnesses from private health care providers (professionals and non-professionals) in the study area, whereas for more serious illnesses, tertiary hospitals of the city are preferred. Because residents were known to obtain most health care from private health care providers, we decided to integrate private practitioners into the study as sentinel points for disease surveillance. Regardless of qualification, each health-care provider in this study was considered a private practitioner.

Aga Khan University, Karachi, previously has conducted studies of enteric fever in the study area but had limited success in collaborating with local private practitioners to detect cases of enteric fever. In our study, staff visited health-care providers at regular intervals to discuss strategies to optimize patient referral. Initially, microbiology results were provided to private practitioners free of charge in return for referring patients, but these efforts resulted in few referrals. We therefore explored alternative approaches to increase the referral of children with prolonged episodes of fever. Basic information was collected about all private practitioners in the study area, including staffing and hours of operation. In December 2002, an invitation letter was distributed to all private practitioners to introduce the study’s aims, objectives and processes. During meetings with private practitioners in January and February 2003, the private practitioners were given the case definition for the project, and various options for case referral were discussed.

After suggestions from private practitioners for case referrals, a two-person phlebotomy team comprising a research medical officer and a phlebotomist was formed. The team was given a cellular phone for communication. The working hours of the phlebotomy team matched the clinic hours of private practitioners. Private practitioners also received a cash incentive for the cases referred to compensate them for the time they spent

Table 1. Characteristics of population in study settings (Sultanabad and Hijrat Colony, Pakistan) based on project census data from January 2003

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sultanabad</th>
<th>Hijrat Colony</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total households</td>
<td>3191 (46)</td>
<td>3823 (54)</td>
<td>7014</td>
</tr>
<tr>
<td>Total population</td>
<td>21 133 (46)</td>
<td>25 140 (54)</td>
<td>46 273</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 005 (46)</td>
<td>14 185 (54)</td>
<td>26 190</td>
</tr>
<tr>
<td>Female</td>
<td>9128 (54)</td>
<td>10 955 (46)</td>
<td>20 083</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>1251 (05)</td>
<td>1257 (05)</td>
<td>2508</td>
</tr>
<tr>
<td>2–16</td>
<td>8693 (41)</td>
<td>10 468 (42)</td>
<td>19 161</td>
</tr>
<tr>
<td>&gt;16</td>
<td>11 189 (53)</td>
<td>13 415 (53)</td>
<td>24 604</td>
</tr>
<tr>
<td>Average monthly household income (rupees)²</td>
<td>5452</td>
<td>5730</td>
<td>5591</td>
</tr>
</tbody>
</table>

² Numbers in parentheses are percentages.

US$ 1 = 59 Pakistani rupees.
Referral process

When private practitioners were visited by a child who had a reported history of fever for three or more days, the phlebotomy team was contacted by the private practitioner. Variations in the clinical expertise and qualification of private practitioners meant that only reported history of fever was set as a criterion for enrolment to reduce subjectivity. Private practitioners, however, were encouraged to refer cases who did not have localizing signs, such as sore throat, otitis media, etc. The other rationale for keeping our case definition simple was to ensure that qualified and unqualified practitioners understood fever in the same way. Informed verbal consent for participation in the study, including consent for blood sampling, was taken from each patient. After consent was given, the phlebotomy team drew blood at the private practitioner’s clinic for laboratory investigation. Blood samples then were brought to the microbiology laboratory for serological and microbiological diagnosis of infection with S. typhi. The most preferred way for taking blood samples from children was at private practitioners’ clinics; however, some of the samples were collected at study centres.

Results of all investigations were distributed to the private practitioner concerned as soon as these were received from Aga Khan University’s laboratory. We visited all private practitioners in the study setting weekly to distribute a report on burden of prolonged fever in the community and number of patients who sought health care from the private health care sector and study treatment centre, as well as the patients’ serology and microbiology results. Before the study started, a research medical officer visited each practitioner to explain the objectives of the study and how to refer a case. To keep the private practitioners motivated towards the referral process, individual meetings were held with them at regular intervals. We compared our weekly surveillance data with the culture-proved cases. This graded payment system was chosen to limit inappropriate referrals.

Laboratory methods

Blood samples from consenting patients were tested. If 6 ml of venous blood had been obtained, it was inoculated into Bactec bottles (Bectec, Becton Dickenson, Franklin Lakes, NJ, USA). Blood volumes of ≤3 ml were inoculated into Bactec Peds Plus blood culture bottles. One ml of blood was put in a plain tube with no anticoagulant for Widal serological diagnostic tests (BioRad, Raymond Poincaré, Marnes-la-Coquette, France). An additional 1 ml was used to assess complete blood counts. Culture identification of S. typhi and S. paratyphi included biochemical and serological (agglutination) procedures. Results of complete blood counts and typhoid serology were shared with each patient one day after the blood sample was collected. For blood culture and antimicrobial sensitivity, the results were shared on day 2 or 3 if any growth was noticed, and the final report was delivered to the patient on day 7. An episode of fever in which S. typhi or S. paratyphi was isolated from blood cultures was considered positive for enteric fever.

Data collection and management

Patient information was collected through structured questionnaires by trained research medical officers at the health centres. For private practitioners, a modified shorter version of the case report form was filled in by the referring person or the phlebotomy team. All forms were reviewed by the in-charge research medical officer before they transferred them to the data management unit. Log books were maintained to ensure that no valuable information was lost. The forms were double entered into visual FoxPro 6 (a database management system). The system included data entry, editing, reporting of errors and data documentation. Means (standard deviation) and proportions were calculated for variables, wherever applicable, with SPSS software.

Ethical considerations

The study was approved by the International Vaccine Institute’s institutional review board, the Aga Khan University of Pakistan’s ethical review committee and WHO’s Secretariat Committee on Research Involving Human Subjects.

Results

The study setting consisted of 46 270 people, of whom 21 669 (47%) were younger than 16 years. The characteristics of the study population are shown in Table 2. About half (25/52) of the private practitioners in the area were licensed physicians; the remaining 27 were trained paramedics who worked in public hospitals, traditional healers or unqualified practitioners (Table 2).

Between May 2003 and April 2004, 5540 children with prolonged fever were enrolled in the disease surveillance study and 5329 blood samples were taken. In all, 211 (4%) children or their parents refused permission for blood sampling. A mean of 461 children were registered monthly (353 per month from study health centres). On average, private practitioners referred 109 cases each month. In total, 56 private practitioners referred cases to the project in one year’s surveillance. Fifty-three per cent of referrals were from 5/56 (9%) practitioners, 30% from 13/56 (23%) practitioners and the remaining 17% from 38/56 (67%) practitioners. Five practitioners referred cases every month, six referred 9–11, seven referred 6–8, 18 referred 3–5 and

<table>
<thead>
<tr>
<th>Health care providers</th>
<th>Study setting</th>
<th>Sultanabad</th>
<th>Hijrat Colony</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>Government dispensaries</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal and child health centres</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expanded programme of immunization centres</td>
<td></td>
<td>5</td>
<td></td>
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</tr>
<tr>
<td>Private</td>
<td></td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualified*</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not qualified</td>
<td></td>
<td>27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Had formal training from a medical university.
19 referred cases only once or twice during the surveillance period. The median age of study participants was seven years, and the median duration of fever was four days. No statistically significant differences in age or sex were seen between children enrolled at study centres and those referred by private practitioners. Blood cultures identified 116 organisms: 78 S. typhi, 36 S. paratyphi A and two S. paratyphi B. Of these, 32 S. typhi, 15 S. paratyphi A and 1 S. paratyphi B were from blood samples of children referred by private practitioners (Table 3).

On the basis of disease surveillance system findings, the annual incidence in children aged 2–16 years was estimated to be 407 (95% confidence interval (95% CI), 368–488) per 100 000/year for S. typhi and 198 (95% CI, 171–227) per 100 000/year for S. paratyphi A. Overall, the results of cultures showed an incidence of 605 cases of enteric fever per 100 000/year in Karachi's squatter settlements. Without the patients referred by private practitioners, the rates would have been 240 per 100 000/year for S. typhi and 114 per 100 000/year for S. paratyphi (Table 4).

Discussion

The results showed an incidence of enteric fever in two Karachi squatter settlements of 605 per 100 000 population. Private practitioners referred 23% of the patients who had fever and 41% of the culture-proved cases of S. typhi. Without these referrals, the incidences of culture-proved S. typhi and enteric fever would have been 240 per 100 000 and 354 per 100 000, respectively. In this study, therefore, the private health sector played an important role in determining the burden of disease.

Some diagnoses of enteric fever were missed because the patient or guardian refused to have blood drawn. Patients who visit private practitioners usually look for a quick recovery at a low price and may be reluctant to spend additional time involved in study procedures. All patients referred from private practitioners agreed to phlebotomy, which perhaps indicates that patients who refused or were reluctant to take part in the study were not referred. It also is possible that a proportion of febrile patients visited health-care providers who did not participate in the surveillance and therefore were missed by the disease surveillance system. Furthermore, not all private practitioners referred cases of prolonged fever to the project health centre: some run busy clinics and have no time for enrolment procedures. As these potential cases of enteric fever could not be evaluated, our estimates of incidences are likely to be underestimates. Some private practitioners may have feared losing patients to the project health facility. Competition with private practitioners for relevant cases is likely to be futile and ultimately not in the interest of the study population. Studies tend to be limited in time, and services provided by the study are not sustainable. If the study replaced private practitioners, the community might be left with an inferior health care system once the study is closed.

Information on cases of fever at the household level and health-care-seeking behaviour for the particular case was collected through the domiciliary surveillance component of the project. This information was compared regularly with the number of cases referred by private practitioners. This gave the project staff an idea of the quality of the referral procedure. As the private practitioners were not bound to refer all patients, referral of children with fever could not be enforced on private practitioners.

The project staff worked hard to integrate private clinics without competing for patients, but in the densely
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Research

Enhanced disease surveillance through private sector in Pakistan

Introduction

Amélioration de la surveillance des maladies grâce à la collaboration du secteur privé des soins de santé de Karachi, Pakistan : expérience tirée d’un essai vaccinal

Méthodes

Méthodes

Results

Acknowledgements

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Competing interests: none declared.

Resumen

Mejora de la vigilancia de la morbilidad mediante la cooperación con el sector sanitario privado en Karachi, Pakistán: experiencia de ensayo de una vacuna

Introducción

Resumen

Resultados

Una historia de fiebre de más de tres días.

Entre mayo de 2003 y abril de 2004 se reclutó para el estudio a 5540 niños menores de 16 años con una historia de fiebre de al menos tres días de duración. De ellos, 1312 (24%) fueron examinados por primera vez por médicos privados; los otros acudieron directamente a los dispensarios de los médicos privados. Los resultados de los análisis microbiológicos se obtuvieron de los salmonelas y de S. typhi. Aunque las tasas de fiebre de al menos tres días en el estudio fueron superiores a las observadas en los estudios previos, las tasas de fiebre de tres días o más en los niños en el estudio fueron inferiores a las observadas en los estudios previos. Los resultados de los análisis microbiológicos se obtuvieron de los salmonelas y de S. typhi. Aunque las tasas de fiebre de al menos tres días en el estudio fueron superiores a las observadas en los estudios previos, las tasas de fiebre de tres días o más en los niños en el estudio fueron inferiores a las observadas en los estudios previos.
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Conclusión El sector privado cumple una importante función de atención sanitaria en el Pakistán. La experiencia de nuestro estudio de vigilancia y estimación de la morbilidad en el país indica que el objetivo planteado se puede lograr pero requiere un considerable esfuerzo y medidas que estimulen la confianza. No obstante, si se desea estimar con precisión la carga de morbilidad en estas circunstancias, la participación de proveedores de salud privados es fundamental.

References