Safety of immunization injections in Africa: not simply a problem of logistics

M. Dicko,[1] A.-Q.O. Oni,[2] S. Ganivet,[3] S. Kone,[4] L. Pierre,[5] & B. Jacquet [6]

In 1995, the WHO Regional Office for Africa launched a logistics project to address the four main areas of immunization logistics: the cold chain, transport, vaccine supply and quality, and the safety of injections in the countries of the region. The impact of this logistic approach on immunization injection safety was evaluated through surveys of injection procedures and an analysis of the injection materials (e.g. sterilizable or disposable syringes) chosen by the Expanded Programme on Immunization (EPI) and those actually seen to be used. Re-use of injection materials without sterilization, accidental needle-stick injuries among health care workers, and injection-related abscesses in patients were common in countries in the WHO African Region. Few health centres used time–steam saturation–temperature (TST) indicators to check the quality of sterilization and, in many centres, the injection equipment was boiled instead of being steam sterilized. Facilities for the proper disposal of used materials were rarely present. Although the official EPI choice was to use sterilizable equipment, use of a combination of sterilizable and disposable equipment was observed in the field. Unsafe injection practices in these countries were generally due to a failure to integrate nursing practices and public awareness with injection safety issues, and an absence of the influence of EPI managers on health care service delivery. Holistic rather than logistic approaches should be adopted to achieve safe injections in immunization, in the broader context of promoting safe vaccines and safety of all injections.

Keywords: Africa; disease transmission, horizontal; equipment reuse and safety; evaluation studies, immunization programmes, organization and administration; injections, adverse effects.

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Introduction

According to studies conducted between 1989 and 1994, unsafe injection practices are widespread in West and East Africa. For example, in West Africa in 1989 the annual rate of injection-associated abscesses was 231 per 100 000 population (*1*); in East Africa in 1994, 37% of households had at least one member who had developed an abscess following injection (*2*). In 1997–98, injection-associated abscesses were reported from 40% of health centres in Swaziland (where only disposable syringes and needles were used) and 55% of health centres in Chad (where a mixture of disposable and sterilizable syringes were used) (*3*).

In 1995 the WHO Regional Office for Africa (WHO/AFRO) launched the AFRO Logistics Project to address the four main areas of immunization logistics: the cold chain, transport, vaccine supply and quality, and safety of injections. Initially staffed by only two inter-country logisticians, each in charge of six countries, the project now has a staff of 13 — two working at the regional level, three at inter-country level, and eight at country level — to provide assistance to 36 African countries. Injection safety has been given a great deal of attention by the project although, since the end of 1996, emphasis has been placed at intercountry and country levels on the logistic aspects of the national immunization days (NIDs) of the poliomyelitis eradication initiative.

The project has assessed the level of injection safety during immunizations by conducting surveys of immunization logistics, organizing workshops for discussions and feedback on the survey results, and assisting in the formulation of policy and advocacy recommendations to the managers of the Expanded Programme on Immunization (EPI) and donors. Specifically, the project has monitored the progress of countries by carrying out rapid assessments of injection safety logistics, holding a national policy workshop to review the results of these assessments and develop activity plans, and inquiring into the following: whether the budget covered 100% of the required number of syringes and needles, the set-up of maximum-minimum stock levels for injection equipment in all stores, the collection of used syringes and needles in safety boxes, the incineration of used syringes and needles, and the monitoring of steriliz-

[1] Technical Officer, World Health Organization Regional Office for Africa, P.O. Box BE 773, Belvedere, Harare, Zimbabwe. Correspondence should be addressed to this author.

[2] Technical Officer, WHO Regional Office for Africa, Harare, Zimbabwe.

[3] Inter-country Logistician for Central Africa, Office of the WHO Representative, Yaoundé, Cameroon.

[4] Inter-country Logistician for West Africa, Office of the WHO Representative, Abidjan, Côte d'Ivoire.

[5] Inter-country Logistician for the Great Lake Region, Office of the WHO Representative, Addis Ababa, Ethiopia.

[6] Country Logistician for Ethiopia, Office of the WHO Representative, Addis Ababa, Ethiopia.

Ref. No. **0269**

able syringes and needles by steam sterilization using time–steam saturation–temperature (TST) indicators. This article reviews the impact of the project on immunization injection safety in the period 1995–98.

Methods

Immunization injection safety surveys

From 1995 to 1998 surveys of injection safety were carried out according to the AFRO Logistics Project's rapid assessment protocol in the following countries: Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Ethiopia, Guinea-Bissau, Kenya, Rwanda, Senegal, Swaziland, Uganda, United Republic of Tanzania, and Zambia. The protocol covered injection practices, the disposal of used syringes and needles, and surveillance for adverse events following immunization (AEFI). To assess injection practices, information was collected on the following: the injection site, whether a sterile syringe and needle were used for all immunization injections including BCG, the timing of vaccine reconstitution, the occurrence of needle-stick injuries, and the fate of sterilizable syringes immediately after the administration of an injection. For the last-mentioned of these, information was collected on the disposal of used syringes and needles (by burning, burial, disposal in a pit, disinfection with alcohol, or disposal with ordinary waste), and on whether used syringes were observed lying around the incineration areas or in the health centres. In AEFI surveillance, information was collected to determine whether records were kept of these adverse effects and whether injection abscesses had been reported or observed in the health centre during the previous 12 months.

Policy

The question of whether there was a national policy for immunization injection safety was addressed as part of the assessment. In Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea-Bissau, Senegal, Swaziland, and Uganda the surveys were followed by feedback workshops to assist in the formulation of policies and recommendations. In addition, the type of injection equipment (sterilizable or disposable or both) officially recommended by EPI was checked against that actually observed in use in the health centres.

Results

Surveys

The survey showed that injection equipment was being re-used without sterilization, and that there were accidental needle-stick injuries among health care workers and injection-related abscesses both in Senegal (in 1995), where sterilizable syringes were used, and in Côte d'Ivoire (in 1996), where disposable syringes were used. A substantial proportion (20–80%) of health centres lacked sufficient supplies of injection equipment. Used syringes and needles were observed lying in and around the health centres (Table 1).

A survey of selected African countries in 1997 and 1998 showed that comprehensive injection safety policies were uncommon. Re-use of injection equipment without sterilization, accidental needle-stick injuries among health care workers, and injection-related abscesses were reported. In Swaziland and in Côte d'Ivoire, there were reports of re-use of disposable syringes although there was no shortage of injection equipment. None of the

Table 1. **Results of injection safety assessment in Burkina Faso, Senegal and Côte d'Ivoire, 1995–96**

Criteria	% of health centres				
	Burkina Faso (1996)			Senegal (1995)	Côte d'Ivoire (1996)
	Provincial dispensaries	Urban health centres	Rural health centres		
Use of one syringe and one needle for each injection	60	80	11	65	100
Reported needle-stick injuries among staff members in the last 6 months	N/A[a]	N/A	N/A	70	70
Reports of injection-associated abscesses among patients	N/A	40	78	48	30
Availability of sufficient quantities of injection equipment	52	80	67	52	80
Presence of used syringes and needles in the neighbouring area	N/A	N/A	N/A	10	70
Injections given by untrained labourers	20	N/A	55	N/A	N/A

[a] N/A = data not available.

surveyed health centres used TST indicators, and in many centres the injection equipment was boiled instead of being steam sterilized. Facilities and infrastructure for the safe disposal of used equipment were rarely present (Table 2). Assessments in Eastern Africa suggested equally poor injection practices (Table 3).

Policy

In Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea-Bissau, Senegal, Swaziland, and Uganda, the surveys were followed by feedback workshops attended by staff from the preventive and curative care services at central, district and health centre levels. To obtain their commitment to achieving injection safety, decision-makers were approached during meetings of EPI managers and sessions of the Task Force for Immunization in Africa. Following the workshops, attempts were made to prepare written national policies in only two countries (Côte d'Ivoire and Senegal). However, these policies were subsequently not implemented.

Table 2. **Status of immunization injection safety in selected African countries, 1997–98**

Criteria	Central Africa		West Africa		East Africa	Southern Africa
	Cameroon (1998)	Chad (1997)	Côte d'Ivoire (1997)	Guinea-Bissau (1997)	Uganda (1998)	Swaziland (1998)
Existence of a national policy on injection safety	No	No	Yes	No	No	No
Type of injection equipment in use	Mixed	Mixed	Disposable	Sterilizable	Mixed	Disposable
Proportion of health centres re-using syringes or needles without sterilization	N/A[a]	60%	15%	0%	18%	39%
Use of time–steam saturation–temperature (TST) indicators for sterilization	No	No	—	No	No	—
Proportion of health centres identifying AEFIs,[b] including injection abscesses	N/A	55%	N/A	N/A	25%	40%
Proportion of health centres using boiling for sterilization[c]	N/A	30%	—	50%	N/A	—
Proportion of health centres with facilities for safe disposal of used material	0%	0%	0%	0%	0%	70%
Supervision of injection practices	No	No	No	No	No	No

[a] N/A = data not available.

[b] Adverse events following immunization (AEFI).

[c] Instead of the recommended steam sterilization.

Table 3. **Status of injection safety in six East African countries, 1997–98**

Criteria	Kenya	Ethiopia	Rwanda	Zambia	Uganda	United Republic of Tanzania
Rapid assessment, including injection safety, carried out	No	No	Yes	Yes	Yes	Yes
National policy workshop to develop a plan for injection safety	No	No	No	Yes	Yes	No
Sufficient budget to pay for syringes and sterilization equipment	No	No	Yes	Yes	Yes	Yes
Maximum/minimum stock levels of injection equipment set for all stores	No	No	No	No	N/A	Yes
Collection of used syringes and needles in safety boxes	No	No	Yes	No	No	No
Incineration of used syringes and needles	Yes	Yes	Yes	Yes	No	No
Use of time–steam saturation–temperature (TST) indicators for sterilization	No	No	Yes	No	No	Yes

In the absence of a comprehensive policy on immunization injection safety, a statement was provided to immunization service providers by EPI managers about the EPI-preferred injection technology (use of sterilizable, disposable, or auto-disable syringes), which was referred to as the official policy. However, the technologies used in the health centres were most often a mix. In Cameroon, Chad, and Uganda, where the official policy was to use only sterilizable syringes for routine immunization, different technologies were used in the health centres. Although the official policy in Senegal recommended the use of sterilizable syringes, many immunization injections were in fact given with standard disposable syringes. In Burkina Faso, where the official policy was to use sterilizable syringes, a recent assessment indicated that 17% of health centres actually used sterilizable injection equipment for EPI, while the majority (83%) used both sterilizable and disposable syringes.

The joint UNICEF/WHO "bundling policy", which proposes to supply only auto-disable syringes for mass campaigns, helped reduce the risks associated with immunization injections. However, Botswana, South Africa, and Zimbabwe did not adhere to the bundling policy and used disposable syringes (locally produced in South Africa) for their measles campaigns in 1998. In many other countries, including Burkina Faso, Mali and Niger, poor planning and distribution led to shortages of auto-disable syringes and subsequent use of disposable syringes to meet the demand for immunization during the measles campaigns conducted in December 1998 and February 1999. Although there is no information regarding needle-stick injuries during these campaigns, waste disposal was also reported as problematic in these three sub-Saharan countries.

Discussion

The results of this assessment of immunization injection practices suggest that the study countries have not made any progress with regard to safety over the last 10 years. The high rates of injection-associated abscesses indicate that injection practices are still poor. However, abscesses only represent the tip of the iceberg of AEFIs. In Africa where hepatitis B virus (HBV) and the human immunodeficiency virus (HIV) are very prevalent, transmission of bloodborne pathogens from one patient to another and from patients to health workers could lead to a much higher burden of initially asymptomatic chronic diseases. A mathematical model recently suggested that in Africa, unsafe injection practices might lead, respectively, to 0.78–1.56, 0.25–0.5, and 0.05–0.1 million cases of hepatitis B, hepatitis C, and HIV infection annually (*4*). In addition to injection recipients and health care workers, inappropriate disposal of sharps could expose the community to infections with bloodborne pathogens from accidental needle-stick injuries and allow re-use, re-sale, and recycling of contaminated injection equipment. During mass immunization campaigns, when 50–100 times more injections are given than through the routine immunization delivery system, injection safety becomes acutely problematic. During a recent measles vaccination campaign in Kinshasa, Democratic Republic of the Congo, the number of injections given in three days was 52 times the number given during an entire week of routine immunization (*5*). In addition to multiplying the risks of infections with bloodborne pathogens, a high frequency of injections during mass immunization campaigns may lead to outbreaks of adverse effects which may be publicized and discourage parents from getting their children immunized in the future. In the absence of corrective action, the adverse effects of unsafe injection practices during routine and mass immunization efforts could threaten the future of immunization activities.

The reasons given for re-use of syringes and needles without sterilization included shortage of injection equipment, lack of awareness about the risks of bloodborne pathogen transmission, and improper disposal of sharps leading to recycling and re-sale after repackaging. In settings where sterilizable equipment is used, a number of factors account for the observed inappropriate sterilization procedures. First, usually unqualified staff (e.g. village volunteers in Senegal, unqualified labourers in Burkina Faso) were in charge of sterilization procedures. Second, sterilization equipment cannot function optimally because of a lack of spare parts and shortage of fuel leading to use of unsuitable combustible material (e.g. charcoal or wood). Third, TST indicators were not used to ascertain the quality of sterilization.

The logistic approach to immunization injections in countries in the WHO African Region has rarely involved medical epidemiologists, who were assigned to other tasks, such as increasing immunization coverage and reducing the disease burden. For example, most indicators used to measure progress in injection safety were related to logistics. While there cannot be safe injections without the logistics that provide sufficient supplies of sterile injection equipment, health care workers require knowledge and skills to engage in safer injection practices. First, the injection must be justified. Second, the appropriate medication (vaccine) must be prepared correctly. Third, sterile techniques must be used to administer the injection through the appropriate route. Fourth, providers and recipients must know the benefits and potential adverse effects of injections. For these conditions to be met, the injection providers need training. Injection recipients also have to be educated about the risks of unsafe injections. Thus, in addition to logistics, improvement of nursing practices and health education of the public are needed to ensure safe injection practices. Because the AFRO Logistics Project focused its efforts on logistics, it did not perceive the problems that confronted nurses in the field, particularly those related to the medical, time

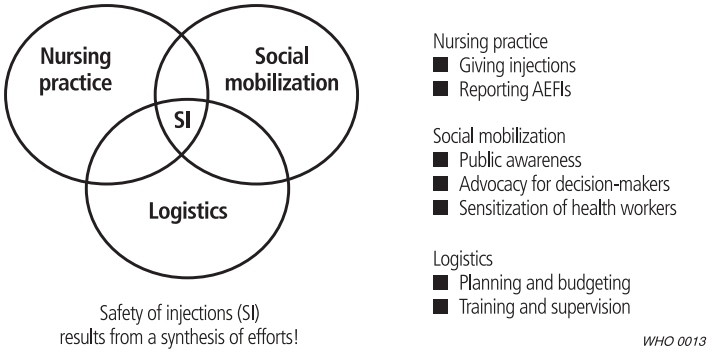
management, and social issues of safe injections. Because of this one-sided approach, the AFRO Logistics Project was unable to find appropriate solutions.

The findings of our survey showed inconsistencies between the injection equipment recommended by EPI for each country and the practices observed in the health centres. The reasons for not using the recommended sterilizable injection equipment and using disposable syringes included the following: the impact of acquired immunodeficiency syndrome (AIDS) control programme messages, which promote disposable syringes; the time needed for the overworked health care workers to clean and sterilize the injection equipment; the fear of accidental needle-stick injury during this process of cleaning; and the absence of confidence in the safety of sterilizable syringes in the population and among health care workers.

Except during the actual conduct of the surveys, there were few direct contacts between the AFRO Logistics Project and the providers working in health centres. Since EPI managers have to approve all the activities for the implementation of immunization in their respective countries, they were the national counterparts to the AFRO Logistics Project staff. However, EPI managers proved to be ineffective in promoting safe injection practices. First, the presentation by the project staff of safe injection practices as a logistic rather than a medical problem to medically qualified EPI managers undermined the recognition of injection safety as an important issue. Second, because EPI is usually separate in the organizational charts of ministries of health and independent of health services delivery, EPI managers were not in a position to influence directly the activities at health centre level and were not accountable for any mistakes made during health care delivery. Third, the official choice of sterilizable syringes at the national level is a cost-saving option for EPI managers because the immunization services will continue even when EPI funds are not sustained for the provision of supplies and the supervision and quality control of sterilization procedures. The absence of sustained investments in favour of sterilizable injection technology does not affect immunization coverage, which is used to evaluate EPI performance. In contrast, the choice of auto-disable syringes requires a constant supply of injection equipment to achieve high immunization coverage, and the funding for this equipment has usually to be borne by EPI alone. In order to have a favourable impact on injection safety, WHO should target the senior officials in the ministries of health who manage the budgets of both EPI and district health services.

The quality of immunization services, which include immunization injection safety, can no longer be ignored in the interests of quantity. Striving to reduce the EPI target diseases without paying enough attention to the quality of the services could lead to an increase in the incidence of other infectious diseases, including viral hepatitis and AIDS. To achieve injection safety within immunization programmes, immunization should be considered as a medical act, treated as such, and be subject to the "First do no harm" principle. This consideration should bring safe injection practices to the attention of WHO country and intercountry team leaders in the African Region. Medical epidemiologists visiting countries should make every effort to place immunization injection safety high on the agendas of their national EPI counterparts. Injection safety should be approached holistically together with nursing practices, social mobilization, and logistics (Fig. 1). Injection providers should be educated on safe injection practices. Because no medical intervention is 100% safe and injections are potential sources of bloodborne pathogen transmission, social mobilization teams should provide populations with adequate information about immunization so that consumer demand for safe injections can be created and the public receives appropriate information regarding AEFIs. Logistics should provide each immunization team with sufficient supplies of syringes and needles, sterilization equipment with adequate spare parts, boxes for safe disposal of used materials, and fuel for sterilization and/or for burning contaminated sharps before burying them. Necessary training should be provided to all staff involved in these operations. This holistic approach places immunization injection safety in the broader concept of immunization safety, which includes the quality of vaccines, maintenance of the right temperature during storage and transport (cold chain), reconstitution of the vaccine with the right diluent at the right temperature, provision of accurate information about the risks involved with immunization to the population, and AEFIs surveillance. This broader concept of immunization safety should be fixed in the minds of not only providers, social mobilization workers, and logisticians, but also all stakeholders, mothers of vaccinees, policy-makers, donors, and the whole community. This holistic approach to immunization injection safety focuses on the safety of all injections, since immunization injections represent only 5% of all injections worldwide (*6*) and since, in most health

Fig. 1. **The holistic approach to immunization injection safety**



centres, the same provider is in charge of administering all injections, both therapeutic and prophylactic. ■

Acknowledgements

We thank D. Nshimirimana, M. Grabowski and R. Biellik for their valuable comments on the manuscript, and Y. Hutin for helping in its preparation. We are very grateful to J.M. Okwo Bele, Regional Adviser for EPI in the WHO Regional Office for Africa, and to the EPI Managers and health workers in all the countries covered by the study for their immense support.

Résumé

La sécurité des injections vaccinales en Afrique n'est pas un simple problème de logistique

Des études menées entre 1989 et 1998 laissent à penser que les pays de la Région africaine n'ont pas progressé dans le domaine de la sécurité des injections au cours de cette période. On a observé dans la plupart des pays africains que très souvent les injections étaient pratiquées dans de mauvaises conditions, quel que soit le matériel utilisé, ce que confirme la fréquence élevée avec laquelle les abcès associés aux injections sont signalés, ceux-ci étant rapportés dans 40 % des centres de santé du Swaziland, où l'on n'utilise que des seringues et aiguilles jetables, et dans 55 % des centres de santé du Tchad, où l'on emploie un mélange de seringues jetables ou stérilisables. Toutefois, les abcès ne représentent que la partie émergée de l'iceberg que constituent les réactions indésirables faisant suite à une vaccination. En Afrique, où le virus de l'hépatite B et le virus de l'immunodéficience humaine (VIH) sont très fréquents, un modèle mathématique récent laisse à penser que les injections à risque pourraient entraîner chaque année la survenue de 0,78-1,56, 0,25-0,5 et 0,05-0,1 million de cas d'hépatite B, d'hépatite C et d'infection à VIH respectivement. Le fait de ne pas se débarrasser correctement des aiguilles pourrait exposer, outre ceux qui reçoivent les injections et le personnel de soins de santé, la communauté tout entière à des infections par des germes hématogènes contractées à l'occasion de blessures accidentelles avec ces aiguilles et aussi permettre la réutilisation ou la revente et le recyclage de matériel d'injection contaminé. Au cours des campagnes de vaccination de masse, où l'on administre 50 à 100 fois plus d'injections que dans le cadre des services de vaccinations habituels, la sécurité des injections devient extrêmement problématique. Les raisons qui font que l'on réutilise des seringues et des aiguilles sans les avoir correctement stérilisées sont multiples : pénurie de matériel d'injection, manque de sensibilisation des gens au risque de transmission des germes hématogènes, manque de personnel qualifié, absence de pièces détachées et de combustible pour les stérilisateurs; enfin, le fait qu'on ne se débarrasse pas correctement des aiguilles conduit à leur recyclage et à leur revente après qu'elles aient été reconditionnées. En outre, les indicateurs de stérilisation (TST) ne sont pas utilisés pour vérifier la qualité de la stérilisation.

Le projet logistique d'AFRO, lancé en 1995, s'est attaqué à la sécurité des injections vaccinales au moyen d'une approche logistique à laquelle ont rarement participé les épidémiologistes médicaux et les agents de mobilisation sociale auxquels étaient assignées d'autres tâches comme celles d'accroître la couverture vaccinale. S'il ne peut y avoir d'injection sûre sans la logistique qui permet de fournir suffisamment de matériel stérile, l'amélioration des pratiques de soins infirmiers et la mobilisation sociale sont également tout à fait nécessaires pour parvenir à ce que les injections soient pratiquées en toute sécurité. Parce que le projet logistique d'AFRO n'a axé ses efforts que sur la logistique, il n'a pas pu fournir de solutions appropriées. En outre, il faisait des responsables du PEV les points de départ des activités liées à la sécurité des injections, mais cette approche s'est avérée inefficace pour la promotion des bonnes pratiques d'injection, puisque le souci principal de ces responsables était seulement d'accroître la couverture. Toutefois, on ne peut plus dissocier la qualité des services de vaccination de l'aspect quantitatif de leurs activités. Pour parvenir à la sécurité des injections vaccinales dans le contexte plus large de la sécurité des vaccins et de l'ensemble des injections, il faudrait favoriser une approche holistique plutôt que logistique. Une telle approche holistique de la sécurité vaccinale est dans l'intérêt non seulement des prestateurs de soins de santé, des agents de mobilisation sociale et des spécialistes de la logistique, mais aussi de toutes les parties prenantes, mères d'enfants à vacciner, décideurs, donateurs et communauté dans son ensemble.

Resumen

La seguridad de las inyecciones de inmunización en África, un problema no estrictamente logístico

Diversos estudios realizados entre 1989 y 1998 indican que los países de la Región de África no han hecho ningún progreso durante este periodo en lo que concierne a la seguridad de las inyecciones. En la mayoría de los países africanos se ha observado la existencia generalizada de prácticas peligrosas en la administración de inyecciones, independientemente del tipo de material de inyección utilizado. Esto se ha visto confirmado por el elevado índice de notificaciones de abscesos relacionados con las inyecciones; por ejemplo, se notificaron abscesos en el

40% de los centros sanitarios de Swazilandia, donde sólo se utilizaban jeringas y agujas desechables, y en el 55% de los centros sanitarios del Chad, donde se utilizan jeringas tanto desechables como esterilizables. Sin embargo, los abscesos solamente representan la punta del iceberg de los efectos adversos de la inmunización. En África, continente con una alta prevalencia del virus de la hepatitis B y el virus de la inmunodeficiencia humana (VIH), un modelo matemático desarrollado recientemente parece indicar que las prácticas peligrosas en la administración de inyecciones pueden dar lugar a 0,78-1,56, 0,25-0,5 y 0,05-0,1 millones de casos anuales, respectivamente, de hepatitis B, hepatitis C, e infecciones por el VIH. Además de los riesgos que entraña para los beneficiarios de las inyecciones y los agentes de salud, la eliminación inadecuada de objetos punzocortantes puede exponer a la comunidad a infecciones por patógenos transmitidos por la sangre a causa de las lesiones accidentales producidas por las agujas, y propiciar la reutilización, la reventa y el reciclaje del material de inyección contaminado. Durante las campañas de inmunización masiva, en las que se administran entre 50 y 100 veces más inyecciones que en la inmunización sistemática, la administración de inyecciones se convierte en una operación sumamente azarosa. Las razones de la reutilización de las jeringas y agujas sin la adecuada esterilización son la escasez de material de inyección, el desconocimiento de los riesgos de transmisión de patógenos por la sangre, la escasez de personal competente, la falta de piezas de recambio y combustible para los esterilizadores, y la eliminación inadecuada de los objetos punzocortantes, que se traduce en el reciclaje y la reventa de los mismos tras su reembalaje. Por otra parte, no se utilizan indicadores del tiempo-vapor-temperatura (TVT) para determinar la calidad de la esterilización.

El Proyecto Logística de AFRO, emprendido en 1995, ha abordado el tema de la seguridad de las inyecciones de inmunización mediante un planteamiento logístico, y rara vez ha contado con la participación de epidemiólogos médicos y movilizadores sociales, a los que se han confiado otras tareas, como la ampliación de la cobertura de inmunización. Aunque no es posible administrar inyecciones seguras sin la logística necesaria para suministrar suficiente material de inyección estéril, la mejora del ejercicio de la enfermería y la movilización social son igualmente necesarias para garantizar unas prácticas de inyección sin riesgo. Al concentrar sus esfuerzos en la logística, el Proyecto Logística de AFRO no pudo proponer soluciones adecuadas. Por otra parte, el Proyecto identificó a los administradores del Programa Ampliado de Inmunización como punto de acceso para abordar la cuestión de la seguridad de las inyecciones, pero este planteamiento resultó ser ineficaz para fomentar las prácticas de inyección sin riesgo, ya que la principal preocupación de los administradores era aumentar la cobertura. Sin embargo, la calidad de los servicios de inmunización ya no puede disociarse de los aspectos cuantitativos de esos servicios. Para garantizar la seguridad de las inyecciones de inmunización en el contexto más amplio de la seguridad de las vacunas y de las inyecciones en general, debería fomentarse un enfoque más holístico que logístico. Este enfoque holístico de la inmunización sin riesgo redunda en beneficio no sólo de los dispensadores de atención sanitaria, los agentes de movilización social y los expertos en logística, sino también de todas las partes interesadas, las madres de los niños que deben ser inmunizados, los formuladores de políticas, los donantes y la comunidad en general.

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