Review

Management of the use of public health pesticides in the face of the increasing burden of vector-borne diseases in the Eastern Mediterranean Region

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مراجعات

حُسْنُ تدبير استخدام مبيدات الهوام المستعمَلة لأغراض الصحة العمومية في ضوء العبء المتزايد من الأمراض المنقولة بالنواقل في إقليم شرق المتوسط

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الخلاصة: يواجه إقليم شرق المتوسط لمنظمة الصحة العالمية عبئاً متزايداً من الأمراض المنقولة بالنواقل. ويُنْتَقَص التقدُّم المحرَز في مكافحة هذه الأمراض بسبب العدد المحدود من التدخلات التي تستهدف مكافحة النواقل، والتي يعتمد معظمها على استخدام مبيدات الهوام. على أنَّ النقص الواضح في ابتكار مبيدات جديدة مع انتشار استعصاء النواقل على المبيدات المتوافرة، قد أظهر أكثر من أيّ وقت مضى ضرورة الاستعمال الصائب للمبيدات المتوافرة حالياً للحفاظ على قيمتها من وجهة النظر الصحية العمومية. وقد ساهم سبعة عشر بلداً من بلدان الإقليم في مسح عالمي استهدف توثيق وتحديد مواقع ممارسات تدبير وتسجيل مبيدات الهوام المستخدمة لأغراض الصحة العمومية. وتلخِّص هذه الورقة حصيلة هذا المسح العالمي، وتوصي استناداً إليها بمجموعة من الإجراءات لتوجيه السياسة الوطنية وتقوية القدرات الوطنية بما يكفل التدبير الصائب والحصيف لمبيدات الهوام المستخدمة لأغراض الصحة العمومية.

ABSTRACT The Eastern Mediterranean Region of the World Health Organization is facing an increasing burden of vector-borne diseases. Progress in controlling these diseases is compromised by the limited number of vector control interventions, most of which rely on the use of pesticides. Seventeen countries of the Region participated in a global survey that aimed to map and document registration and management practices for public health pesticides. This paper aims to draw the attention of policy- and decision-makers to the challenges the Region is facing in managing public health pesticides properly to control disease vectors and, based on the outcome of the survey, recommends a set of actions to guide national policy and to strengthen national capacity for the sound management and judicious use of public health pesticides.

Gestion des pesticides utilisés en santé publique et charge croissante des maladies à transmission vectorielle dans la Région de la Méditerranée orientale

RÉSUMÉ La Région de la Méditerranée orientale est confrontée à une charge croissante des maladies à transmission vectorielle. Les progrès de la lutte contre ces maladies sont remis en cause du fait du nombre limité d'interventions de lutte antivectorielle, qui reposent majoritairement sur l'utilisation de pesticides. Dix-sept pays de la Région ont participé à une enquête mondiale visant à dresser la cartographie des pratiques d'homologation et de gestion des pesticides utilisés en santé publique, et à rassembler des données à ce sujet. Cet article entend attirer l'attention des responsables politiques et des décideurs sur les enjeux auxquels la Région est confrontée en matière de gestion rationnelle de ces produits. En s'appuyant sur les résultats de l'enquête, il recommande un ensemble de mesures susceptibles d'orienter les politiques nationales et de renforcer les capacités des pays à garantir une gestion rationnelle et une utilisation judicieuse des pesticides en santé publique.

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Introduction

The Eastern Mediterranean Region of the World Health Organization (WHO) with only 8% of the global population, contributes to 11% of the global burden of vector-borne diseases. Emergence and re-emergence of vector-borne diseases has contributed significantly to the disease burden in countries of the Region in recent years. The rise in vector-borne diseases is the result of natural events, such as climate change, droughts and floods, and man-made factors including uncontrolled urbanization and lack of appropriate policies for vector control. Outbreaks of vector-borne disease have often resulted in significant use of pesticides in countries with limited capacity for their proper handling and management [1,2].

Table 1 summarizes the estimated mortality from and burden of the main vector-borne diseases in the Region in 2004. The burden of vector-borne diseases has increased every year since then, including recent outbreaks of dengue, Rift Valley fever and leishmaniasis [3].

Vector control is an essential component of strategies for the control of vector-borne diseases. WHO promotes vector control within the overall umbrella of integrated vector management (IVM) [4]. IVM is a rational decision-making approach for the optimal use of resources for vector control. It aims at improving cost–effectiveness, ecological soundness and sustainability of vector control interventions for disease control. Some of these interventions include: indoor residual spraying; the use of insecticide-treated bednets; source reduction; space spraying (to some extent). Judicious use of pesticides is a key component of IVM in order to reduce the risks associated with the use of such chemicals. Environmental management, where feasible and cost-effective, remains as the first-line activity and the use of pesticides is regarded as a last resort.

Table 1 Mortality rates and burden of disease estimates for a number of vector-borne diseases, Eastern Mediterranean Region 2004

Disease	Estimated mortality (No. of deaths)	Estimated burden (disability adjusted life-years lost)
Malaria	39 000	1 412 000
Leishmaniasis	5 000	281 000
Dengue fever	1 000	28 000
Lymphatic filariasis	0	75 000
Onchocerciasis	0	11 000
African trypanosomiasis	2 000	62 000
Schistosomiasis	4 000	145 000
Trachoma	0	208 000

Source: [1]

In 2005, the Fifty-second Session of the Regional Committee for the Eastern Mediterranean issued resolution EM/RC52.R.6 on integrated vector management, in which it requested Member States to develop national integrated vector management strategies and plans. Although the Region is making good progress in the implementation of IVM through scaling up access to interventions (Figure 1), and strengthening capacity in medical entomology and vector control, interventions continue to rely heavily on the use of pesticides. This increases the potential risks to human health and to the environment unless they are appropriately managed. Moreover, vector resistance to pesticides, especially to pyrethroids (the only class of pesticides that can be used for both insecticide-treated nets and for indoor-residual spraying), is spreading fast and compromises these efforts. In the Eastern Mediterranean Region, resistance to pyrethroids has been reported in central Sudan and in eastern Afghanistan [2,5].

While countries continue to monitor the susceptibility of local vectors to pesticides, WHO also encourages countries to institute management strategies (rotation of pesticides and their use in combination) even before resistance is reported [6]. Moreover, to extend the useful life of less hazardous and cost-effective pesticides currently available, there is need for their judicious use and sound management. Approximately 47 000 kg of active ingredient organophosphates, 5 000 kg of carbamates and

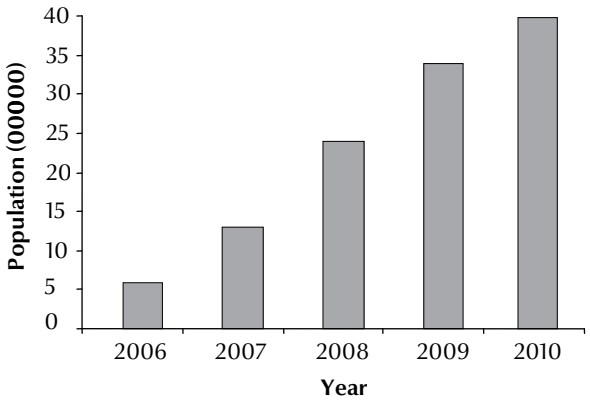

Figure 1 Estimated regional population with access to long-lasting insecticidal mosquito nets 2006–2010

22 000 kg of active ingredient pyrethroids (excluding those used in the manufacture of long-lasting insecticidal mosquito nets) were used annually for vector-borne disease control in the Region in 2007 [7].

The public health burden caused by nuisance pests (mostly insects and rodents) is also significant in the Region, leading to the use of considerable volumes of pesticide for personal protection. However, comprehensive statistics on pesticides used for such purposes are not available in the Region as their use is outside the public health sector.

Strengthening capacity for sound management of public health pesticides has become a priority. This is due to: the increased use of pesticides for vector-borne disease control and personal protection; increasing challenges in managing these chemicals under decentralized health systems; the diminishing arsenal of cost-effective, less hazardous pesticides; the need to extend the useful life of pesticide products currently in use; inadequate national regulatory frameworks; and insufficient human and financial resources to regulate availability, sale and use of public health pesticides. In 2010, the World Health Assembly issued resolution WHA63.26 on improvement of health through rational management of obsolete pesticides and other obsolete chemicals (including DDT), in which it urged Member States to establish or strengthen capacity for the regulation and rational management of pesticides throughout their life-cycle. This will also serve as a preventive measure to avoid their accumulation in the environment.

This paper aims to inform Member States on the increasing burden of vector-borne diseases in the Region and the corresponding use of public health pesticides, and to draw the attention of policy- and decision-makers to the challenges the Region is facing in managing public health pesticides properly to control disease vectors while ensuring health and environmental safety. It outlines relevant areas for policy and strategy development and highlights the need to strengthen national capacities, mobilize resources and improve coordination between the different sectors for the sound management and rational use of public health pesticides.

Pesticide management in the context of vector control

What is pesticide management?

Pesticide management refers to the regulatory control, proper handling, supply, transport, storage, use and disposal of pesticide-related waste, to minimize adverse environmental effects and human exposure.

The *International Code of Conduct on the distribution and use of pesticides* (the Code of Conduct), adopted in 1985 by the Food and Agriculture Organization of the United Nations (FAO) Conference and revised in 2002, promotes rational pesticide management practices that can minimize potential health and environmental risks [8]. The Code of Conduct describes the shared responsibility of many segments of society, including governments, industry, trade and international institutions and provides a framework for management of all pesticides including those intended for use in agriculture and in public health.

Public health pesticides include vector control pesticides and household pesticide products (e.g. mosquito coils and aerosol sprays) as well as pest management products used by professional operators.

What has WHO done in managing public health pesticides?

Since 2002, the WHO Pesticide Evaluation Scheme (WHOPES) has significantly expanded its support to Member States to strengthen capacity for the sound management of public health pesticides. The focus of this support has included development of policies, strategies, guidelines and standards, and the implementation of projects in selected countries. A set of tools for pesticide management has been developed and provided to Member States for the sound management of public health pesticides, including issues related to registration, distribution, sale, use and application of pesticides, disposal of pesticide-related waste, as well as for training and awareness-raising and for enforcement of pesticide regulations. In 2007, through a Memorandum of Understanding signed with FAO, the Scheme established a joint programme for the sound management of pesticides to ensure harmonized and complementary support and advice to Member States and other stakeholders on this priority issue.

Pesticide management challenges globally and in the Region

In 2010, WHOPES carried out a global survey in 113 countries with or at risk of major vector-borne diseases in order to map and document registration and management practices for public health pesticides. The survey aimed to inform future plans to optimize and harmonize public health pesticide registration procedures and post-registration regulation, and to use the information to develop strategies and action plans for strengthening capacity of Member States and for mobilizing required resources. A total of 17 countries of the Region responded to the survey; however, not all countries answered all questions.

The survey identified a number of challenges in pesticide management. These include: weak legislation and regulation of public health pesticides;

inadequate mechanisms and capacity for procurement and quality control of pesticides; challenges in implementation of IVM and application of pesticides; inadequate capacity for pesticide resistance prevention and management; general lack of capacity for monitoring pesticide exposure and poisoning; alarmingly low capacity for disposal of pesticides and pesticide-related waste; and low capacity of managers of vector control programmes for integrated vector management and sound management of pesticides. These are further discussed below.

Legislation and regulation of public health pesticides

It is commonly recognized that a comprehensive legislative and regulatory framework is essential for rational management of pesticides. WHO encourages governments to design and approve a law or legal act on pesticides to provide a firm legal basis for more detailed regulation on pesticides through subsidiary instruments. The survey found that 2 of the 15 countries in the Region responding to the question on legislative requirements have yet to develop such legislation. Among the 13 countries with such legislation, the legislation in 3 countries does not cover public health pesticides but addresses only plant protection products.

Among all countries responding to the survey, about 30% (more than 50% in the Region) have separate executive bodies for the regulation of public health pesticides (vector control, household and professional pest control products) and for agricultural pesticides. This proportion is even higher for regulation of pesticides applied directly to humans (e.g. insecticides used for lice or scabies control and repellents). FAO and WHO promote registration of pesticides for various uses under the responsibility of a single national registration authority to facilitate sharing of resources, improve efficiency and efficient registration of pesticide products.

While registration is a very important aspect of pesticide legislation, it is evident that other aspects of legislative control of pesticides are also lacking in a number of countries. For example, 44% of responding countries in the Region (globally about 30%) have not yet promulgated regulations to control professional pest control operators. In addition, the legislation in a significant number of countries does not include regulation of container labelling, safe storage, transport, proper disposal and pesticide advertisements (Table 2).

Only 9 of the 15 responding countries reported large-scale enforcement of national pesticide regulations in the health sector. A number of factors may be responsible for this including the low priority given by respective governments, inadequate awareness of decision-makers on the importance of enforcement in the context of sound management of pesticides, lack of training of those responsible for decision-making and implementation of vector control and pesticide management, and lack of human and infrastructure resources. Enforcement of regulations is an aspect of pesticide management which, though often overlooked, is of great importance and could be addressed through ***inter alia*** increased political commitment, collaboration, coordination and partnership among all the relevant stakeholders within each country.

Recommendations by WHO on the use of public health pesticides are intended to facilitate registration and use of such pesticides by Member States. At the global level, a significant proportion (74%) of vector-borne disease endemic countries use WHOPES recommendations for registration of public health pesticides either wholly or on a supportive basis. Among responding countries of the Region, this proportion is about 80% (12/15). In addition to expanding the use of WHOPES recommendations, the normative function of WHO could be further strengthened with regard to the use of public health pesticides.

Collection of statistics on imports, local production and export of pesticides is an aspect that requires further attention and strengthening. Many countries, including those of the Region, have not yet put in place a system to collect such data and are encouraged to institutionalize such a system. Statistics are available in the Region for import, local production and export of pesticides in 81%, 70% and 56% of responding countries respectively.

Procurement and quality control of public health pesticides

Procurement of appropriate public health pesticides of acceptable quality that are suitable for their intended use can be a complex task. The challenge of procuring suitable and good quality products is further accentuated by the decentralization of public health services, where vector control personnel may not be technically conversant with the technical aspects of pesticide specifications. While 81% (13/16) of responding countries of the Region reported that they include WHO quality standards for public health pesticide products (i.e. WHO specifications) in procurement requirements of the Ministry of Health, this situation may well be different in the procurement of products by agencies and municipalities down the line in the decentralized health system.

It is noteworthy that a significant number of countries in the Region do not have a national laboratory for quality control of pesticides, even though a considerable number reported concern on the presence of sub-standard, counterfeit and illegal pesticide products sold on the market.

The need for availability of pesticides of acceptable quality cannot be overemphasized and steps need to be urgently taken to address this issue, particularly for countries without pesticide quality

Table 2 Countries in the Region and worldwide with legislation covering pesticide: container labelling, storage, transport, disposal and advertising

Legislation on pesticide:	Eastern Mediterranean Region		Worldwide	
	Responding countries	Positive response	Responding countries	Positive response
	No.	%	No.	%
Container labelling	16	50	108	72
Safe storage	16	63	105	72
Safe transport	16	56	106	63
Proper disposal	16	50	108	56
Advertising	6	38	108	49

control laboratories. For these countries, attempts should be made initially to seek assistance from or collaborate with a neighbouring country in the Region. They may also approach international organizations for assistance in the quality control of the pesticides. These countries could then take steps to build up their own capacity to carry out quality control tests at a later date. For smaller countries, another approach could be to collaborate to establish or join a regional or sub-regional pesticide quality control laboratory. A mechanism could also be developed for the pesticide industry to contribute to the cost of testing for quality of their products.

Implementation of IVM and application of pesticides

WHO promotes the principles of IVM and has invited Member States to accelerate the development of national policies and strategies after carrying out vector control needs assessments to identify needs, gaps and opportunities for IVM implementation. IVM aims to improve efficacy, cost–effectiveness, environmental soundness and sustainability of vector control interventions for vector-borne disease control. In the Region, 13 countries are implementing this strategy. Noting that effective implementation of IVM can contribute significantly towards the sound management of pesticides as well as prolong the useful lives of the limited number of pesticides available for vector control, there is an urgent need for countries to develop and implement national vector control programmes using the IVM approach. Advocacy at the highest political level is also needed for those countries that do not yet have national IVM strategies.

The quality and maintenance of pesticide application equipment is vitally important. Two-thirds of the responding countries reported using the WHO quality standards for vector control pesticide application equipment in the quality control of such equipment. However, this figure does not necessarily reflect the level of maintenance of the application equipment.

Pesticide resistance prevention and management

Resistance prevention and management is a crucial component of sound management of pesticides. Although 88% (14/16) of responding countries of the Region reported that the status of the pesticide susceptibility of vectors is used as a basis for selection of pesticides for vector control, there is a need for more detailed information, such as the frequency of susceptibility testing and number of sentinel sites in each country for monitoring the situation. As recommended by WHO [6], vector control programmes do not need to wait until resistance or control failure are reported before they implement management strategies. Such a pre-emptive approach will contribute to preserving the few pesticides available.

Additionally, more awareness needs to be created among Member States and closer collaboration established between health, agriculture and municipalities for effective public health pesticide resistance monitoring, prevention and management.

Surveillance for occupational exposures and poisoning

Article 5.1.3 of the Code of Conduct stipulates that governments should carry out health surveillance programmes for those who are occupationally exposed to pesticides, and investigate as well as document pesticide poisoning cases. The Ministry of Health, as the main ministry responsible for vector control in collaboration with other relevant agencies, must ensure that spray applicators are protected through a comprehensive programme involving practical training on occupational safety, provision of personal protective equipment and monitoring of their exposure. Only 31% (5/16) of the responding countries in the Region (26% globally) reported having a national programme to monitor applicator exposure to pesticides used in vector control operations.

Pesticide poisoning incidents are of great concern in many developing countries, yet 80% (11/14) of the responding countries of the Region (61% globally) reported non-availability of aggregated data on human pesticide poisoning. This implies that these countries do not have a system in place to collect such data. Article 5.1.5 of the Code of Conduct calls upon governments to establish national or regional poisoning information and control centres

at strategic locations in the country in order to provide immediate guidance on first aid and medical treatment to poisoning cases at all times. This is an important aspect of pesticide management that the relevant Member States should endeavour to address.

Disposal of pesticide waste and used containers

The capacity of countries of the Region for low-risk disposal of pesticide-related waste is alarmingly low. The use of public health pesticides generates various types of waste: leftover pesticides which have become obsolete or otherwise unusable; empty pesticide containers and sachets; used-up or torn long-lasting insecticidal mosquito nets; contaminated personal protective equipment; and disused spraying equipment. The disposal of pesticide waste is not well regulated and organized in many countries in the Region, and public health pesticide waste is no exception in that respect. In fact, in about half the countries of the Region, no legislation exists to ensure proper disposal of pesticide waste (Table 2) and the Ministry of Health does not have guidance documents for low-risk disposal of vector control pesticide containers or pesticide waste. Such waste is often deposited in general purpose municipal dumps or is simply abandoned, resulting in environmental pollution and increased risks to human health.

The prevention of pesticide waste generation, local recycling of empty pesticide containers and the environmentally sound disposal of leftover waste all pose great challenges to national governments and require urgent attention.

Capacity of decision-makers of vector control programmes

Comprehensive knowledge of decision-makers of vector control programmes on all aspects of vector control and sound management of pesticides is essential. In only 35% (6/17) of the responding countries of the Region, had the officers responsible for decision-making and implementation of vector control activities received certified training in vector control. With respect to training on sound management of pesticides, only 29% (5/17) of responding countries reported that all personnel involved in decision-making and implementation of vector control activities had received such training. There may be need for an advocacy initiative to further promote the importance of such training in Member States to further enhance the capability of decision-makers on matters related to vector control and sound management of public health pesticides.

Conclusions

The Eastern Mediterranean Region is facing an increasing burden of vector-borne diseases. Progress in scaling up universal access to interventions is compromised by the limited number of effective vector control interventions. Most of these interventions rely to a great extent on the use of pesticides. The development and spread of vector resistance to pesticides and the lack of new pesticides in the pipeline leave control programmes with no option but to manage the few available pesticides judiciously. In-depth assessment and analysis of the challenges and constraints that countries of the Region face in sound management of pesticides has clearly provided an overview of the challenges, and also the opportunities, for strengthening capacity and for implementation of resolution WHA 63.26 (2010).

The survey findings are expected to better inform future plans to optimize and harmonize public health pesticide registration procedures and post-registration regulation of public health pesticides in Member States. Actions needed by countries include improvement of legislation and regulation, and procurement and quality control; judicious use of pesticides and implementation of IVM; pesticide resistance prevention and management; surveillance for pesticide exposure and incidents; disposal of pesticide waste and containers; and strengthening the capacity of decision-makers of vector control programmes. WHO will support countries in developing legislation and national policy for management of public health, as well as national action plans for IVM and careful use of pesticides. In collaboration with FAO and the United Nations Environment Programme, WHO will mobilize resources and support capacity-building in countries for life-cycle management of public health pesticides. WHO will facilitate other regional collaboration on management of public health pesticides, including harmonization of registration requirements and procedures, quality control, information exchange and work-sharing

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