

## ORIGINAL ARTICLE

# Role of the Poison Control Centre of Morocco in the Improvement of Public Health

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## Abstract

**Background:** Poison Control Centre of Morocco (MPCC) plays a key role in promoting health. This study was aimed to demonstrate the role of the MPCC in improving public health and poisoning management.

**Methods:** This was a retrospective study of poisoning cases reported to the MPCC between 1980 and 2011. The collected data included number of poisoning cases, profession of interlocutor who called the poison centre, time of poisoning (year), gender of poisoned patient, age of poisoned patient, toxic agent and intention of poisoning. Data were analyzed using Epi Info software. The activities of MPCC were evaluated by three indicators including structural indicators, process indicators and impact indicators

**Results:** Between 1980 and 2011, the MPCC received 401148 notifications which 73.1% of them involved scorpion stings and 26.9% were about other toxic agents. The main causes of poisoning, excluding scorpion stings, were pharmaceuticals (6.1%) followed by food (5.9%) and carbon monoxide (4.5%) poisoning. The MPCC devised five protocols through a consensual method and distributed to practitioners in hospitals around the country considering gastric emptying, management of PPD poisoning, management of scorpion stings, management of carbon monoxide poisoning and the management of snakebite. Gastric emptying decreased from 45% to 4% of cases during this period. A national strategy was set up for the management of scorpion stings leading to a decrease in mortality from 1.54% to 0.22%.

**Conclusion:** During the period of more than two decades, the achievements of the MPCC have not been limited to providing toxicological information, but also activating a proper toxicovigilance system. In fact, a poison control centre is not a luxury structure. It is an integral part of every health system. Its impact on reducing morbidity and mortality is no longer discussed and its observatory role on poisonings should be strengthened.

**Keywords:** Morocco; Poison Control Centre; Poisoning; Scorpion

## INTRODUCTION

Poisoning is a major problem in all countries, while it imposes relatively considerable healthcare costs. In fact, 25-33% of the global burden of disease (43% are children less than 5 years old) is due to toxicant exposures (1), and 3% of all hospital admissions are due to poisonings (2,3). An estimate by the U.S. Medical Expenditure Panel Survey in 1992 showed that the poisoning related healthcare costs was about 3 billion dollars (4). Besides, it has been shown in several studies that the cost of services rendered by the toxicological information is invaluable. In fact, for every dollar spent on a poison centre, 6.5 dollars are saved in health care expenses associated with the management of poisoning (4,5).

In Morocco, the laboratory of toxicology and forensic research was established in 1930 under supervision of the National Hygiene Institute, Ministry of Health and

occasionally provided some information on toxicology for physicians. In 1974, unifying the information on toxicants and constitution of the Moroccan database on poisoning were started. Information on drugs, agricultural, industrial and domestic products has been collected from industries and some European Poison Control Centres in Zurich, Paris, Tours and Lyon. Organophosphate compounds are commonly used for fighting against locust invasions in Morocco. Since 1980, reporting the poisoned patients due to the exposure to these compounds has become mandatory by a ministry circular (No. 19 829DR / BF / MM). This was the starting point for the development of toxicovigilance system. In 1989, the Moroccan Poison Control Centre (MPCC) was set up under the name of "Centre Anti Poison du Maroc" according to the directives of the International Programme on Chemical Safety and included pharmacovigilance and health alert activities ([www.capm.ma](http://www.capm.ma)).

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In 1990, an information service for health professionals and public was established 24 hours a day, 7 days a week which has been directed by 10 qualified physicians such as toxicologists and poisoning information specialists (economic number: 0801000180). In 1994, the laboratory of toxicology and pharmacology was founded. It was the first Arab and African centre being confirmed by the World Health Organization (WHO). In 1995, the MPCC launched a course in Pharmacology- Toxicology and became a training centre. In 2000, a "Communication / Information" process was developed within the centre. In 2002, the Centre was listed in the WHO report as a reference centre for the region of the Eastern Mediterranean (Wr. MOR/02/45RB/na). In 2004, a diploma course in toxicology and pharmacovigilance was offered in collaboration with the Moroccan Society of Clinical and Analytical Toxicology (www.smtca.ma). In 2006, the centre was designated as a Pharmacovigilance training centre for Francophone countries. Since 2007, the MPCC has been the coordinator of the "detection of medication errors" component of the WHO "patient safety" project (6), and in 2011; it has been designated as the WHO Collaborating Centre for pharmacovigilance. Currently, the MPCC is directed by a versatile staff of fifty administrative employees and medical experts including physicians, pharmacists, epidemiologists, statisticians and laboratory technicians.

The role of poison centres in public health has been widely discussed (7,8). To measure the impact of the activities of a PCC and compare them with other PCCs or other institutions, adoption of assessment indicators is needed (9). The aim of this study was to evaluate and demonstrate the role of the MPCC in improving the management of intoxications and risk assessment by a set of indicators selected by the centre.

## METHODS

To evaluate the activities of MPCC, we adopted the measurement indicators of pharmacovigilance centres established by the WHO (10). These indicators are based on evaluation of structures, process and impact:

1. Structural indicators; qualitatively assess key structures, systems and mechanisms.
2. Process indicators; assess the degree of centre activities including reports received by the various information systems including mails, calls and the register of scorpion stings and envenomation between 1980 and 2011.
3. Impact indicators; measures the effects (results and changes) of centre activities.

Using the Poisoning Severity Score (PSS), the severity of cases was evaluated (Table 1) (11). Age groups were defined according to IPCS instructions (Table 2) (12).

The MPCC receives three different forms and reports: (a) Intoxication Declaration Forms (IDF) of poisoning cases received from health delegations through the kingdom of Morocco (b) scorpion specific information system forms which include the data of scorpion stings and envenomed cases admitted to all hospitals and emergency departments in the kingdom of Morocco (c) Information Toxicological Forms (ITF) which are filled using phone calls from both public and health professionals through the toxicological

Table 1. Poisoning severity grading

None (0)	No symptoms or signs related to poisoning
Minor (1)	Mild, transient and spontaneously resolving symptoms
Moderate (2)	Pronounced or prolonged symptoms
Severe (3)	Severe or life-threatening symptoms
Fatal (4)	Death due to poisoning

information departments.

Inquiries and statements received by the pharmacovigilance unit are subjected to a separate report. Only inquiries related to poisoning are presented in this study.

In this study, we especially evaluated the profile of poisoning cases in 2011. The collected data were entered into a checklist that was comprised of profession of interlocutor who called the poison centre, time of poisoning (year), gender of poisoned patient, age of poisoned patient, toxic agent and intention of poisoning. Data were analyzed using Epi Info software (CDC, Atlanta, GA, USA).

Table 2. Definition of age groups according to IPCS instructions

Neonate	<4 weeks
Infant	4 weeks-11.99 months
Toddler	1-4.99 years
Child	5-14.99 years
Adolescent	15-19 years
Adult	19.01-74 years
Elderly person	≥75 years

## RESULTS

### Structural indicators

The establishment of the MPCC started in 1989, call information unit was founded in 1990 and the laboratory in 1994. The MPCC funding is based on the state budget and international collaborations. The performances of the centre concerning its different roles are:

1. Toxicological information (call centre): this system recorded 22289 inquiries from 1990 to 2011
2. Toxicovigilance system recorded 85427 notifications from 1980 to 2011
3. Scorpion specific information system recorded 293432 notifications from 2000 to 2011
4. The antidote stockpile distributed 12600 vials of antidotes and 14000 scorpion sting kits
5. Toxicology and drug monitoring laboratory recorded 7354 cases of poisoning from 1994 to 2011
6. Public education and specialized training programs for healthcare professionals about the management of

common poisonings

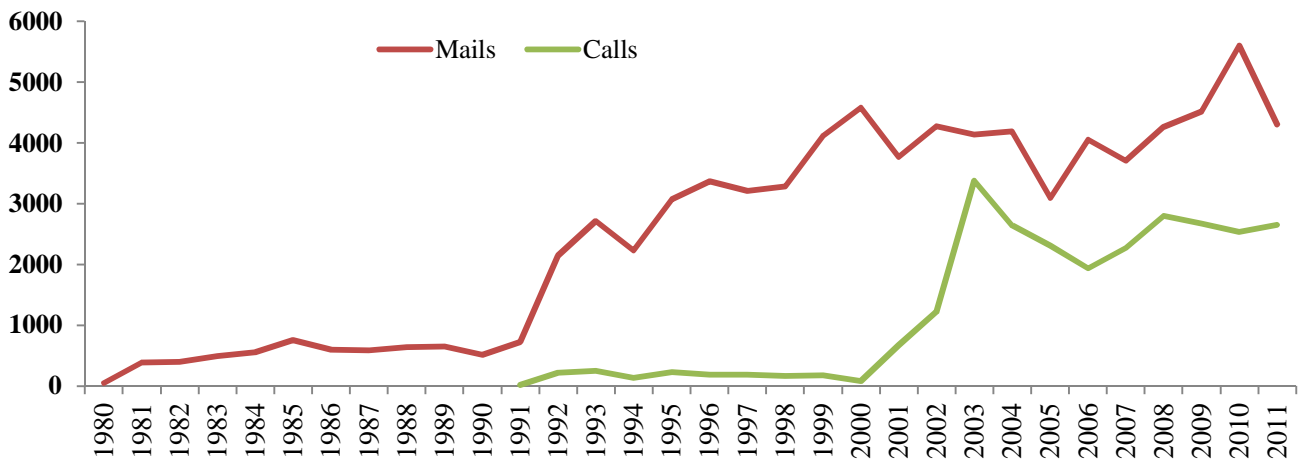
- The quality assurance service by conducting two surveys; the first one was in the public which showed an overall satisfaction of 96.7 %, and the second one among healthcare professionals who were 88% satisfied.

*Process indicators*

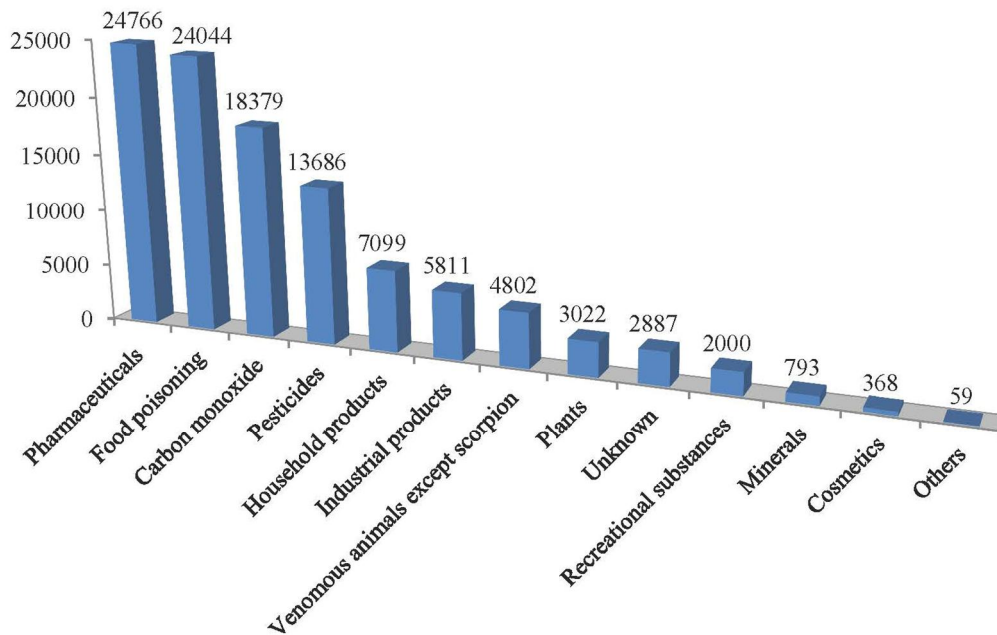
The MPCC database includes 401148 inquiries about poisoning from 1980 to 2011 (even if the MPCC was officially created in 1989, the data has been available since 1980), of which 293432 (73.2%) were due to scorpion stings and 107716 (26.9%) were due to other toxic substances. The trend of acute

poisonings according to methods of reporting is represented in figure 1. The main cause of poisoning, excluding scorpion stings, was pharmaceuticals (6.1%) followed by food (5.9%) and carbon monoxide (4.5%) poisoning (Figure 2). Scorpion sting inquiries increased annually after initiating the national strategy against scorpion stings in 2001 (Figure 3).

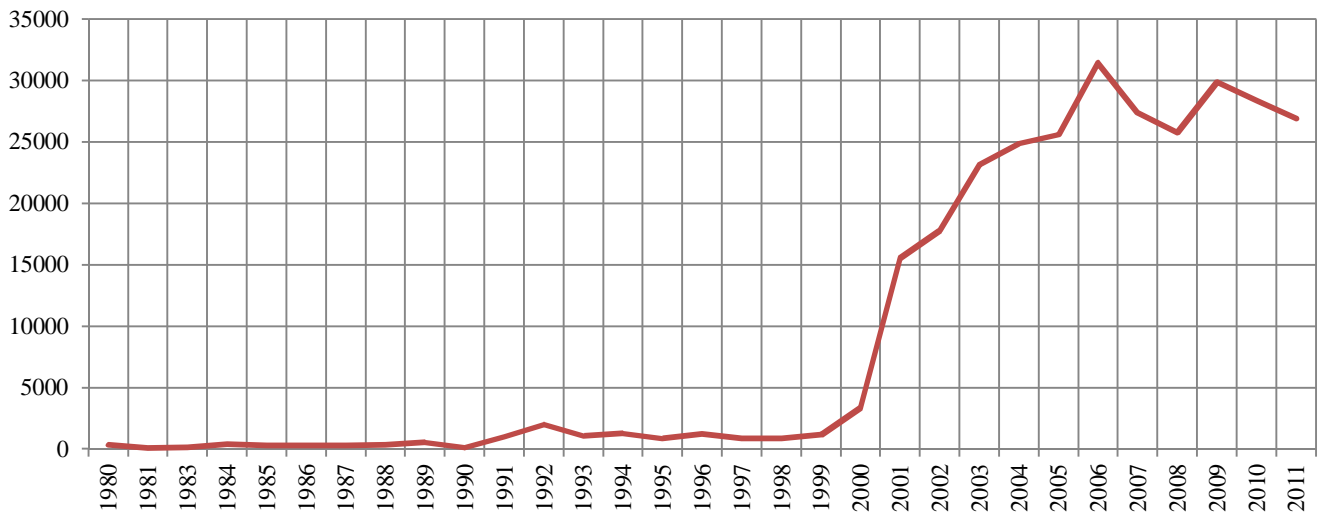
During 2011, the inquiries were mostly reported by healthcare professionals (90%). The rate was 658.4/1000 of healthcare professionals. The mean (SD) age of patients was 26.3 (24.5) years. The most vulnerable age group was adults (19-75 years old) with 48.4%, followed by children less than



**Figure 1.** Frequency of poisoning cases reported to the MPCC from 1980 to 2011



**Figure 2.** Causes of poisoning excluding scorpion stings reported to the MPCC from 1980 to 2011



**Figure 3.** Frequency of cases with scorpion sting reported to the MPCC from 1980 to 2011

15 years with 23.4%. The male to female ratio was 0.89. Inquiries were mostly about poisonings (96.5%) and occurred at home in 86.4% of cases. Most poisoning cases occurred under unintentional circumstances (83.7%).

#### *Impact indicators*

Since 1994, the MPCC has triggered several alerts including poisoning with mussels, botulism, methanol, parafenylendiamine (PPD), methyl ergometrine, metoclopramide, a cream with hydroquinone, hydrogen sulfide, puzzle mats, and corticosteroid for gaining weight. Moreover, our centre devised five protocols through a consensual method and distributed to practitioners in hospitals around the country considering gastric emptying, management of PPD poisoning, management of scorpion stings, management of carbon monoxide intoxication and the management of snakebite. Moreover, the MPCC established a stockpile for 7 antidotes and a kit for scorpion envenomation in 2007. The distribution to all hospitals and the assessment of utilization are assured by the centre.

Consequently, the overall scorpion stings mortality rate decreased from 1.5% before the implementation of the strategy to 0.14% in 2011. Among children this rate decreased from 4.2 to 0.5%. Advertising about a hydroquinone contained cream was stopped. A circular regarding the prescription of ergotamine was distributed to health professionals and the packaging of the drug was changed in 2011. Puzzle mats were removed from the sale. After warning about PPD poisoning in 2004, its frequency decreased and the intoxication cases disappeared. The use of modality of gastric emptying following advice from the MPCC has decreased from 45 to 4%. This shows the role of the MPCC in changing practice of healthcare professionals.

## **DISCUSSION**

The MPCC data system is a national near real-time surveillance system that improves awareness considering poison exposures. This database has allowed us to trace the epidemiological profile of poisonings, determine priorities and

develop a roadmap for poisoning management and prevention.

In this study, we described the epidemiological profile of poisoning cases over a period of 21 years. We found that scorpion stings and other envenomations occurred in high rates in Morocco. This is probably because most parts of Morocco, especially southern areas, have an arid climate. In order to control the number of scorpion sting incidents, a national strategy against bites and scorpion envenomation has been started from 2001 (13-15). This strategy was mainly constituted of improving support for patients, establishment of a specific information system, and also training healthcare professionals and the public about scorpion characteristics, habitats and treatment of envenomation (13-15).

Excluding scorpion stings, pharmaceutical products were the commonest cause of poisoning in Morocco. This resembles the reports of other PCCs in different parts of the world (16-19). Moreover, food poisoning (infection and toxic contamination) was the second cause of poisoning which can be due to non-compliance with the cold chain at home, mode of preparation such as leaving raw milk in the open air for a long time, and the increase of the uncertified ready meal selling sectors. Ghane et al. in a study in Iran (16), showed food poisoning as an uncommon cause of poisoning (6.7% in 2011) which is similar to the rates of this kind of poisoning in this study.

In Morocco, inquiries and notifications were mostly made by healthcare professionals (90%). However, reports from other countries show that the most important part of inquiries came from the public (17,18). This may show that the MPCC is not well introduced by media to the public. The primary mission of a poison control centre has always been to improve poisoned patients' care and to prevent poisoning cases; however, to fulfill this mission, important steps including public awareness must be taken (20,21). Therefore, the MPCC has launched several alerts since 1994. In 2004, an alert against PPD, called "Takkaout roumia", was triggered. PPD is an industrial substance which was widely used in suicidal attempts between 2003

and 2004 with a high mortality rate (30-50%) (13-15). The frequency of PPD poisoning and mortality rate were clearly reduced after the MPCC alerts among the public and especially herbalists who sell this product and among authorities responsible for control. The MPCC has triggered several other alerts that have often led to restrictions on sale or aggressive controls for illicit products or raising awareness of the public. Indeed, these alerts are published on the official journal of the MPCC "Toxicologie Maroc" and are systematically picked up by the media (13-15).

Another way to promote health is to develop guidelines and standardized protocols for health professionals. In order to follow standardized recommendations, a protocol for gastric emptying was established in the MPCC according to international consensus and considering local conditions (22). This protocol has reduced the frequency of gastric emptying.

## CONCLUSION

During the period of more than two decades, the achievements of the MPCC is not only limited to providing toxicological information, but also activating a proper toxicovigilance system. Additionally, the MPCC has identified several challenges and the future holds many other tests. In fact, a poison control centre is not a luxury structure. It is an integral part of every health system. Its impact on reducing morbidity and mortality is no longer discussed and its observatory role on poisonings should be strengthened.

## LIMITATIONS

Due to lack of regional centres and also because the MPCC is the only national one, we have an under-reporting of poisoning cases. Furthermore, comparing our data with other international centres is difficult because we have three information systems (as described in the methods).

Declaration forms received by mail are often incomplete because the healthcare professionals often do not have much time, so all demographic features of patients were not available.

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