

Poisonings by plants in the Taza-Al Hoceima-Taounate region in Morocco

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Abstract

To better understand the severity of poisoning by plants in Taza-Al Hoceima-Taounate region in Morocco, a descriptive retrospective-study was carried out on poisoning cases of plants reported between 1984 and 2007 to the Poison control and pharmacovigilance center of Morocco. During this period, 104 cases of poisoning were collected. The *Atractylis gummifera* is the most incriminated plant. The average age of poisoned patients was 11 ± 7.8 years. The sex ratio (M/F) was 0.9. According to the data, poisoning by plants was primarily responsible for gastrointestinal system disorders, nervous system attacks, visual disorders and heart failure. A lethality rate of 34% was recorded, with a total of thirty-five deaths.

Key words: Poisonings; Plants; *Atractylis gummifera*; Morocco.

Introduction

According to WHO, 80% of the population in some countries of Asia and Africa use traditional medication for their basic health care (Bagnis, 2004). In the economically disadvantaged countries, consumption of wild plants is part of diet habits, which are also used in traditional medicine (Lengani, 2009). According to the 2003 annual report of the American Association of Poison Control Centers, the plants are the cause of 3.2% of all poisonings in the United States of America. A study was conducted in the poison control center of Strasbourg between 1989 and 2003; it revealed 4808 poisonings by plants, counting for 5% of all recorded cases (Flesch, 2005). The Mediterranean countries are well known for their significant plant biodiversity, most particularly Morocco. From 1980 to 2007, the Poison Control and Pharmacovigilance center of Morocco has recorded 2558 cases of poisonings by plants, counting for 3.3% of all poisoning cases reported in Morocco, with a lethality rate of 7%. In the Taza-Al Hoceima-Taounate region, this poisoning has been the subject of several declarations and a significant number of lethality cases (Ouammi, 2009). The aim of this study is to describe the characteristics of poisoned patients and poisoning by plants in the Taza-Al Hoceima-Taounate region in Morocco.

Data and methods

A descriptive retrospective-study covering all cases of poisonings recorded between 1984 and 2007 in health services in the Taza-Al Hoceima-Taounate region was conducted. The Taza-Al Hoceima-Taounate region is located north of Morocco along the Mediterranean coast between 34°00' and 35°30' of latitude and 03°00' and 04°30' longitude. Its area is 24155 km². In 2007, the population of this region was 1 828 897 inhabitants according to the General Population and Habitat Census (RGPH). The population density was 74.81 inhab/km² (Figure1). Data on poisonings reported between 1984 and 2007 are collected on declaration forms by health professionals in charge of patients (doctors or nurses). The study included all patients who appeared intoxicated at a health structure of the study area. Poisoned patients by more than one product and those who appeared at a health structure other than that of the ministry of health were not taken into account.

The forms data were entered into Excel and the statistical analyse was performed using Epi-Info software. Analyses concerned patient characteristics (age, sex, origin) and poisoning (year, month, place and circumstances of poisoning, symptoms, treatment and vital prognosis). The influence of different factors on the evolution of poisoned patients were analyzed and discussed in this work by calculating the relative risk (RR).

Results

During the study period, 104 cases of poisonings by plants have been collected. The sex ratio (M / F) was in favor of females (0.9).

The average age of poisoned patients was of 10.9 ± 7.8 ranging from 2 to 43 years. Distribution data of poisoning cases according to age are grouped in table 1. The age group between 5-14 years was the most affected (see table 1). According to the distribution results of the poisoning cases based on provinces, Taza is the province, which declared most of poisonings (45.2%), then the province of Taounate (42.3%) and the province of Al Hoceima (12.5%). The statement was important in rural areas (93%) and only 7% in urban area. The distribution of poisoning by years shows that the majority of statements were recorded in 1993 (20 cases) and 1996 (35 cases) (Figure 2a). The results show a high frequency of poisonings during the months of May (15 cases), June (14 cases) and July (15 cases). This corresponds with the spring season, a cool period where the flowering is at its pic (Figure 2b). The *Atractylis gummifera* (Figure 3a), with 71 cases, was the most incriminated plant and caused maximum deaths (30 cases). *Euphorbia resinifera* and *Artemisia absinthium* are two other species (Figure 3b) each of which caused one death (Table 2).

The symptoms presented by patients were essentially of gastrointestinal (86 cases), neurological (28 cases), visual (22 cases) and cardiac (17 cases) nature (Table 3).

The poisoning was most often accidental; however, 6 cases of suicidal attempts (2 men and 4 adult females) were noted. These cases concerned the use of *Carthamus tinctorius* (1 case), *Pelargum Hamala* (2 cases), *Ricinus Commins* (1 case), *warioria saharea Benth & Coss* (1 case) and another case in which the name of the plant was not mentioned. Most of patients received an evacuator and symptomatic treatment (gastric pump), with a case of therapeutic abstention.

The status of 67 patients was known. The prognosis was fatal in 35 cases, with a lethality rate of 34%. The number of poisoned children below 15 years was 78 cases, including 31 deaths. The specific lethality rate was of 40%. The effect results of different factors (gender, age (≤ 15 or > 15 years), circumstances (accidental or voluntary), clinical status (symptomatic or asymptomatic), type of poisoning (isolated or collective) and origin of patients (urban or rural)) on the evolution of patients showed that only the origin of the patients has a significant association with unfavorable patients. Rural origin may increase the risk of evolution into the death (RR = 0.217, 95% CI [0.100 to 0.472] (table 4).

Discussion

Plants are used for both their therapeutic and nutritional properties throughout the world. They rated as the fifth cause of morbidity and were classified first among the most lethal poisons in the period of 1984-2007 in the Taza-Al Hoceima-Taounate region. According to the reported data, poisoning by plants has affected many more children whose age is less than 15 years. This is in accordance with results found in France by Meyer (1989) and Harry (1993). Statements of poisoning were higher in rural areas and are more frequent during cool periods that promote development and flowering of plants (Charnot, 1945; Soulaymani, 2006). The majority of poisoned patients showed disorders of gastrointestinal and central and peripheral nervous systems. Similar results were noted by Hami (2011). Another clinical study showed that symptoms of poisoning by *Atractylis gummifera* were mainly diarrhea, vomiting, pain and abdominal bloating. The most serious forms were identified as neurological disorders (profound coma), thermoregulation disorders (hypothermia initial), cardiovascular disorders (rapid heartbeat, irregular blood pressure, terminal collapsus), respiratory disorders, severe hepatic dysfunction and renal failure (Masri, 2009). In this work, *Atractylis gummifera* was responsible for 68% of poisoning cases and has caused 30 deaths in the area covered by this study. Several cases have been reported in Tunisia (Hamouda, 2004) and in other regions of Morocco (Hami, 2011).

Isolated cases were also reported in Italy (Santi, 1955), Spain (Salas, 1985) and Greece (Kairi, 1996). The *Atractylis gummifera* is used in the dried form, in traditional medicine for its healing properties for local application (syphilis, furuncle, abscess), in the form of herbal as a diuretic, purgative, antipyretic, abortive and emetic (Skalli, 2002; Chardon, 1964). All parts of the plant contain toxic compounds, but at decreasing concentrations from root to leaf, and in between, through the stalk, the bracts, the flower and the seed (Benkirane, 1994). The toxic compounds are the atractyloside (atractylate of potassium) and carboxyatractyloside (gummiferine), which are inhibitors of oxidative phosphorylation, acting as antagonists of ATP production from ADP through the mitochondrial membrane. This can cause increased consumption of glucose and inhibition of the glycogen genesis. The atractyloside, a toxic reagent, was revealed by analysis of urine and gastric pump liquid using silica gel thin layer chromatography (Masri, 2009). The high frequency of poisonings among children can be explained by the similarity of *Atractylis gummifera* in wild artichoke (*Cynara humitas*), or edible Asteraceae (*Cartina acautis*) or the thistle of Spain (*Scolymus hispanicus*) (Meguedden, 2002; Bellakhdar, 1997). This confusion was highlighted by a study in the province of Badajoz in Spain over the last 10 years, which showed that only 5% of the population was able to recognize the plant (Vallejo, 2008). In this study, two other plants, namely *Euphorbia resinifera* and *Artemisia absinthium*, caused each, one death. The first plant is an abundant plant in the Moroccan Anti-Atlas region. Everywhere in Morocco, the resin of euphorbia is used as a revulsive in combination with the resin canal (resiniferatoxin), for local applications, kneaded with flour or semolina and egg white, in the treatment of rheumatisms, paralysis and in the care of stings and venomous bites (Bellakhdar, 1997). Resiniferatoxin is a strong irritant diterpene present in the latex of the plant, which reduces toothache or chronic pain; it interacts with a specific site of recognition sites of the membrane (vanilloid receptor) (Appendino, 1997). The latex of this plant, either fresh or dried, is a dangerous product. Accidents happen especially to resin collectors or to people who have used the resin as a medicine or as an abortive. Ingestion of 0.5 g of the resin causes serious inflammation of the mucous membranes of the digestive tract with gastroenteritis. At higher doses, it causes generalized digestive inflammation with gastrointestinal ulcers, arrhythmia, convulsions, hematuria and in very severe cases, death by asphyxiation (Bellakhdar, 1997). *Artemisia absinthium* is frequently used in Morocco as an infusion with tea, especially in winter. This plant is considered, vermifuge, antiseptic, antimalarial, aperitif, eupeptic, diuretic, vulnerary, and also as an active ingredient against amenorrhoea and leucorrhoea (Cazin, 1876; Fournier, 1947). The liquor extract made from the plant (absinthism) induces clinical effects where the nervous disorders dominate. Toxicity was especially attributed to the compounds present in the thuyone of the essential oils of the plant (Vogt, 1981). Bonkovsky and others have shown that thuyone, like α -pinene and camphor, present in the essential oil of absinthe, can be hepatotoxic (Bonkovsky, 1992). The performed analysis allowed us to acquire a general understanding of this kind of poisoning. We also determined the most concerned age group, the symptoms presented by poisoned patients and various species of plants involved in these poisonings. This study highlights the high number of poisonings by plants in the Taza-Al Hoceima-Taounate region. A significant percentage of these poisonings could be prevented by a better awareness building among the population, especially about the danger of consumption of some plant species, more particularly for children.

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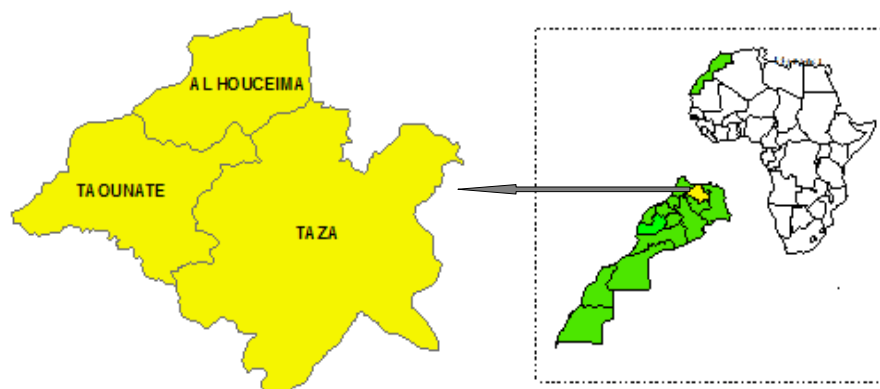


Fig. 1: Geographic location of the Taza-Al Hoceima-Taounate region, Morocco.

Table 1: Distribution of poisonings cases according to the age of patients.

Age groups in years	Number of declaration (%)
[1-5[	11 (10,6)
[5-15[	67 (64,4)
[15-20[	7 (6,7)
[20-75]	13 (12,5)
Unknown	6 (5,8)
Total	104 (100)

n=104

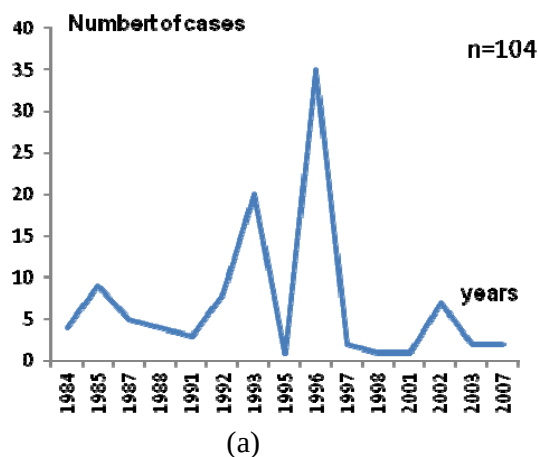


Fig. 2: Distribution of poisonings in time (a: years; b: months)

Table 2: Incriminated plants, number of poisonings and deaths

Species	Number of poisonings	Number of deaths
<i>Euphorbia resinifera</i>	1	1
<i>Warionia saharae</i> Benth & Coss	1	-
<i>Rosmarinus officinalis</i>	1	-
<i>Ricinus communis</i>	1	-
<i>Madrangora automnalis</i>	2	-
<i>Carthamus tinctorius</i>	3	-
<i>Peganum harmala</i>	3	-
<i>Artemia absinthium</i>	4	1
<i>Atractylis gummifera</i>	71	30
Unknown	17	3
Total	104	35

Table 3: Distribution of poisonings cases according to clinical signs.

Clinical signs	Number of cases (%)
Gastrointestinal system affections	80 (48)
Central and peripheral nervous system disorders	28 (17)
Visual system disorders	22 (13)
Disorders of rate and cardiac rhythm	17 (10)
Affections of respiratory system	7 (4)
Affections of musculoskeletal system	6 (4)
General health disorders	4 (2)
Affections of platelets, bleeding and clotting	2 (1)
Urinary system disorders	1 (1)
Total	167 (100)

Table 4: Influence of some factors on evolution of patients

Characteristics	Healing	Deaths	RR	95% CI
Age				
Child	27	31	2,296	0,390-13,536
Adult	4	2		
Sex				
Female	16	19	1,357	0,510-3,609
Male	16	14		
Clinic				
Symptomatic	21	29	2,532	0,808-7,934
Asymptomatic	11	6		
Poisoning type				
Isolated	26	29	1,115	0,320-3,890
Collective	6	6		
Origin				
Rural	5	18	0,217	0,100-0,472
Urban	1	0		



(a) Photo El Bazzaoui, 2009



(b) Photo Toilabiya, 2011

Figure 3 : *Atractylis gummiifera* (a) ; *Artemia absinthium* (b)