

Severe childhood poisoning caused by Ferraga practices. *Data from the Moroccan Poison Control and Pharmacovigilance Centre*

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ABSTRACT

**Objectives:** To highlight the complications associated with the products and practice of healers “Ferraga” who treat young children using traditional Moroccan pharmacopoeia.

**Methods:** This is a retrospective analysis of cases of products and practice of “Ferraga” intoxication in young children reported to the Moroccan Poison Control and Pharmacovigilance Center (MPCPC), Rabat, Morocco, from 2010-2020.

**Results:** During the study period, 24 cases of products and practice of “Ferraga” poisoning were reported to MPCPC, Rabat, Morocco. The average age of the patients was 2.48 years. The oral route was noted in 21 cases. The vast majority of patients (23 cases) exhibited symptoms upon admission, predominantly of digestive (16 cases), respiratory (3 cases), and neurological (4 cases). However, 29.16% of patients presented with both digestive and respiratory symptoms, 20.83% had digestive and neurological symptoms, and 4 cases manifested all 3 types of symptoms. The outcome was positive in 18 patients and fatal in 2 infants.

**Conclusion:** Products and practice of “Ferraga” poisoning in children remains a major health problem. It is crucial to implement a strategy to combat this type of practice in order to reduce the prevalence of such poisoning.

**Keywords:** intoxications, Ferragua, children, Morocco

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Traditional healing practices are still widespread in Moroccan culture.<sup>1</sup> Despite many advances in modern medicine, there is a marked revival of interest with respect to folk medicine. Indeed, traditional pharmacopoeia continues to rely heavily on the use of herbal medicine, as an important source of remedy for primary health care. The main reasons in the survival of traditional medicine in this society are linked to socio-cultural, especially in rural areas.<sup>2</sup> One example is the use of “Ferraga” usually elderly women, who provide a variety of treatments for multiple pathologies, especially for children.<sup>3</sup>

The “Ferraga” is a well-established presence throughout the country.<sup>3</sup> They provide services to patients at their place of residence or at the weekly market, with fees typically set at 30 dirhams (approximately 3 Euros), which covers both consultation and treatment.<sup>4</sup> They typically utilize traditional pharmacopoeia-based mixtures, which they administer orally or topically, particularly to newborns and young children. These practices may pose significant health risks for children.<sup>5</sup> They can result in adverse effects on the digestive, respiratory, neurological, renal, or hepatic systems, which could potentially lead to fatal outcomes.<sup>6</sup>

Nevertheless, the impact of “Ferraga” practices on child intoxication remains inadequately assessed. The paucity of literature on this topic indicates that these forms of poisoning are rarely discussed in medical publications.

This study aimed to highlight cases of intoxication in children linked to products and practices used by “Ferraga”, as reported to the Moroccan Poison control and Pharmacovigilance Centre (MPCPC), Rabat, Morocco, between January 2010 and December 2020, and to shed light on this relatively unexplored subject in written communication.

**Methods.** This was a retrospective study with a descriptive aim, examining cases of poisoning by products and practice of “Ferraga” over a period of 11 years, reported between January 2010 and December 2020. The data was collected by the Toxicovigilance Unit of the MPCPC, Rabat, Morocco.

Although “Ferraga” is locally classified as a traditional practitioner, the term is derived from the Moroccan dialect and lacks an equivalent in either English or Arabic. Consequently, it is enclosed in quotation marks.

The term “mixture” is used to describe herbal preparations and pharmacopoeia products (PTMPs) that have been pulverised or combined with honey or oil.

The inclusion criteria were based on cases of intoxication mentioning a “mixture” of plants and

traditional pharmacopoeia products accompanied by the word “Ferraga” as well as individuals under the age of 15. The age groups selected for analysis were newborn, infant, baby walker, and child.

The exclusion criteria were as follows: only mixtures were considered, as these can be used by other traditional practitioners, and age was restricted to under 15 or undetermined.

The analysis encompassed an investigation into the frequency, spatial distribution (environment), characteristics of the poisoned individual (gender and age), the circumstances, location, symptoms, severity assessment, and evolution.

The age groups employed are those delineated by the World Health Organization (WHO) International Programme on Chemical Safety: I) neonate (less than 4 weeks); II) infant (4 weeks - less than 12 months); III) toddler (1-4 years); IV) child (5-14 years); V) adolescent (15-19 years); VI) adult (20-74 years); and VII) elderly (>75 years).<sup>7</sup>

The severity of the poisoning was evaluated according to the poisoning severity score scale.<sup>8</sup> The grading system employed was as follows: Grade 0 (no signs or signs not related to intoxication); Grade 1 (signs resolved spontaneously); Grade 2 (signs marked or moderate, treatment needed); Grade 3 (severe poisoning with life-threatening potential), and Grade 4 (fatal poisoning).<sup>9</sup>

The symptomatology was classified in accordance with the WHO adverse reaction terminology.<sup>10</sup>

**Statistical analysis.** The data on Ferraga poisoning in children under 15 years of age were statistically analyzed to identify significant trends. First, a proportion analysis was carried out to assess the proportion of Ferraga poisoning cases among documented pediatric poisoning cases. Next, a mean test was carried out to compare the average age of the poisoned patients with a hypothetical reference value of 7 years. Finally, a gender distribution analysis was carried out using a Chi-square test to determine if there was a significant difference in the distribution of poisoning cases by gender.

**Results.** During the study period, the MPCPC, Rabat, Morocco, documented 24 instances of pediatric intoxication by “Ferraga” products, accounting for 3.05% (787 cases) of all intoxications involving PTMPs during the same period. This test revealed a significant difference, with the proportion of Ferraga poisonings being significantly higher than a reference hypothesis of 50% ( $p < 0.001$ ).

This particular form of intoxication has been documented in 4 regions within the kingdom. The majority of cases have been identified in the Marrakech-

**Table 1 -** Distribution of cases of intoxication by Ferraga practices according to the Moroccan Poison and Pharmacovigilance Centre, 2010-2020.

Variables	n (%)
<b>Circumstance</b>	
Accidental	24 (100)
<b>Type of poisoning</b>	
Isolated	24 (100)
<b>Poisoning environment</b>	
Urban	2 (8.3)
Rural	20 (83.3)
Unspecified	2 (8.3)
<b>Place of poisoning</b>	
Home	18 (75.0)
Public place	3 (12.5)
Unspecified	3 (12.5)
<b>Grade</b>	
<b>Initial grading</b>	
0: no signs	0 (0.0)
1: spontaneously regressive signs	0 (0.0)
2: pronounced signs	0 (0.0)
3: severe intoxication	1 (4.2)
4: fatal poisoning	0 (0.0)
Unclassifiable	23 (95.8)
<b>Final grading</b>	
0: no signs	1 (4.2)
1: spontaneously regressive signs	0 (0.0)
2: pronounced signs	10 (41.6)
3: severe intoxication	9 (37.5)
4: fatal poisoning	2 (8.3)
Unclassifiable	2 (8.3)
<b>Route of administration</b>	
Oral	21 (87.0)
Dermal	1 (4.2)
Unspecified	2 (8.3)
<b>Symptomatology</b>	
Asymptomatic	1 (4.2)
Symptomatic	23 (95.8)
<b>Symptoms</b>	
Unspecified	1 (4.2)
Digestive	16 (66.7)
Respiratory	3 (12.5)
Neurological	4 (16.7)
Digestive and respiratory	7 (29.2)
Digestive and neurological	5 (20.8)
Digestive, respiratory, and neurological	4 (16.7)
Others	3 (12.5)
<b>Evolution</b>	
Favorable	18 (75.0)
Death	2 (8.3)
Unknown	4 (16.7)

Values are presented as numbers and percentages (%).

Safi region, with 21 cases recorded; while the Rabat-Sale-Kenitra, Souss-Massa, and Laayoune-Sakia El Hamra regions each recorded one case.

The mean age of patients was 2.48 years, with a range of one month to 11 years and the test confirmed a

significant difference from the reference age ( $p < 0.001$ ), indicating a marked trend toward younger age groups. The baby walker age group exhibiting the highest level of exposure (12 cases), the number of cases recorded for the newborn age group was one, 7 cases for the infant age group, and 4 cases for the child age group. The results showed no significant difference between genders ( $p = 1$ ), suggesting uniform exposure between males and females in this sample.

As illustrated in **Table 1**, all poisoning cases were unintentional and isolated. Most occurred in urban areas (20 cases) and at home (18 cases). Oral mixtures were administered in 21 (87%) cases, and one infant was treated dermally.

The proportion of cases classified as severity grade 3 (severe intoxication with vital risk) increased from initial rate of 4.17-37.5% and unclassifiable increased from initial rate of 95.83-8.33% after the intoxication period. Two cases were recorded as grade 4 (death).

The vast majority of patients (95.83%) exhibited symptoms upon admission, predominantly of digestive (66.67%), respiratory (12.5%), and neurological (4 cases). However, 29.16% of patients presented with both digestive and respiratory symptoms, 20.83% had digestive and neurological symptoms, and 4 cases manifested all 3 types of symptoms. A total of 18 cases had a favorable outcome, but 2 infants died.

**Discussion.** The present study revealed that the majority of products and practice of “Ferraga” poisoning cases occurred in the Marrakech-Safi region, Morocco. Data from Draïss et al,<sup>3</sup> specific to the Marrakech region, Morocco, indicate a higher incidence of intoxication due to “Ferraga” practices compared to other forms of intoxication in this region of the kingdom. Additionally, serious intoxications due to these practices have been documented in the Fes, Rabat, and Casablanca regions in Morocco.<sup>3</sup>

The products used by “Ferraga” are generally plants and products from the traditional pharmacopoeia. These plants used for remedial purposes are noted to have a potential toxic impact.<sup>11</sup>

Furthermore, children who were poisoned by products manufactured by “Ferraga” constituted 3.05% of all cases of plant and PTPM poisoning. Nejmeddine<sup>4</sup> reported that the products and practices of the “ferraga” leading to neonatal poisoning accounted for 2% of all admissions to neonatal intensive care units, with 52 newborns requiring hospitalization in the intensive care unit.

The “Ferraga” practice entails the oral ingestion of herbal mixtures. The precise composition of

these mixtures remains undetermined. The plants’ mixture is toxic to body organs such as the liver and the hematopoietic system.<sup>12</sup> Products and practice of “Ferraga”s frequently comprise harmel seeds (*Peganum harmala* L.), which contain toxic compounds such as harmine, harmaline, harmol, and harmane. One study reported that the ingestion of harmel can cause a variety of adverse effects, including visual disturbances, motor disorders, convulsions, hallucinations, circulation problems, respiratory arrest, and acute renal failure due to tubular lesions after consuming harmel; unfortunately, 7 of 200 cases of harmel intoxication were fatal, contributing to a case-fatality rate of 6.2%.<sup>13</sup>

Another common practice is the oral administration of drops of cade oil (*Juniperus oxycedrus* L. extract) its application to various parts of the newborn or infant’s body. Cade oil has demonstrated considerable toxicity in numerous studies. Such effects may manifest as psychiatric disorders, including agitation, delirium, drowsiness, and tremors, as well as central and peripheral nervous system disorders, such as coma, involuntary movements, and renal problems, including acute renal failure.<sup>6</sup>

Abourazzak<sup>12</sup> also reports that “Ferraga” utilizes a variety of plants and PTMPs, including animal hair and vertebrae, in addition to other ingredients. These include cinnamon (*Cinnamomum cassia* Blume), fenugreek (*Trigonella foenum graecum* L), black cumin (*Nigella sativa* L), fennel (*Foeniculum vulgare*), clove (*Eugenia caryophyllata* Thun.), and watercress (*Lepidium sativum* L).<sup>12</sup> In addition, Nejmeddine<sup>4</sup> states that products and practice of “Ferraga”s comprise henna (*Lawsonia inermis* L), kohl (a mineral powder traditionally composed of lead sulfide, antimony sulfide, or stibine, which has been replaced by a mixture of lead in the form of galena, sulfur, and animal fat, or even burnt wood or bitumen), nutmeg (*Myristica fragrans*), and wormwood (*Artemisia herba alba* L).<sup>4</sup> The results of the study indicate that some medicinal plants can cause acute intoxication, which may result in serious complications such as liver and kidney failure in children.<sup>6</sup>

The use of plants and products by the “Ferraga” caused numerous symptoms, including digestive, respiratory and neurological disorders, and even death. Oulmaati et al<sup>14</sup> had emphasized the seriousness of plant intoxication, causing neurological clinical signs, respiratory distress, renal failure, physiological disturbances well above the normal range, and recorded cases of death.

Knowing that the traditional phytotherapy sector is excluded from the national health system in Morocco,

products and practice of “Ferraga” use remains a potential danger that threatens public health.<sup>15</sup>

**Study limitations.** Primarily, it was a retrospective study reliant on data sourced from MPCPC records. But, accurate products and practice of “Ferraga” poisoning data is often under-reported, and our sample does not truly reflect the extent of this “healer’s” practice. Furthermore, due to the nature of our retrospective data collection, some information might be absent. This is particularly the case since we excluded intoxications from plant mixtures that lacked any mention of “Ferraga”.

In conclusion, adopting the practices of the “Ferraga” can often prove dangerous. Indeed, intoxication by the procedures used by this ‘healer’ can lead to sometimes fatal poisoning. This form of poisoning should be a public health priority, warranting serious action.

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