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The Patterns of Poisoning Exposure in Different Ages in Duhok Governate: A three Years Study (2016, 2017, 2018)

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Abstract:

Poisoning with toxic substances accidently or deliberately can be life threatening and especially in some countries that lack the essential tests and facilities to identify the types and causes of these toxic substances. In Iraq, as many other countries, poisoning is one of the chronic public health problems. However, very little literature about the pattern of poisoning cases, types and age is available in Duhok Governorate. Therefore, this study was conducted to determine the most common patterns of poisoning and the related age and gender in Duhok Governorate from 2016-2018, which would possibly contribute to the early diagnosis and treatment of poisoning. The present study was conducted for three years, started from 1st of January 2016 until31st of December 2018. Data were collected from Duhok General Directorate of Health database, based on the data collected from all Duhok Governorate hospitals and health care centers concerning poisoning types, patient's age and gender. Descriptive statistic was used to analyze the data including (frequency, mean and percentage). A total of 27831 poisoned patients admitted to Duhok city and their districts health centers. Thirteen separated pattern cases of poisoning were recorded. The most common pattern of poisoning cases was food poisoning (61%) in 2016, (75%) in 2017, and dropped to 48% in 2018. In addition to other types of poisoning such as (herbals, sagwa, allergies, metals, organophosphate, rat poising and others) (11.7% in 2016, 4.8% in 2017 and 19.7% in 2018) and scorpion bites (5% in 2016, 5.7% in 2017 and 11.5% in 2018). Poisoning by drugs was the highest in 2018 (667 cases 9.6%) compared to 2017 (574 cases 5.7%) and 2016 (476 cases 4.3%). All other poisoning pattern (insect bite, soaps and other detergents, snake bits, animal's bits and insecticide) were about or less than 1%. No recorded cases were poisoned by illegal addictive drugs during the period of study. Out of 27831 cases of poisoning, females were much prone to be poisoned than males during the three years 2018, 2017 and 2016. Females were affected by food poisoning (80%) as compared to male (70%). The age between 15-48 years old composed about 43.8% of the total cases, which is the highest % ration among other age groups. In Duhok Governorate, patterns of poisoning in the present study were the first to be documented. The study concludes that the majority of victims were female and food poisons were the most common type. It also seems that less effort is taken from the Committee of Health and Safety Issues. Our study suggests that establishment of specialist poison health centers, and raising awareness among people help effectively to resolve this public problem.

Key words: Age, Duhok-Iraq, Gender, Poisoning, Toxic substance.

Introduction:

Poison is a substance such as (solid, liquid or gas) which would produce harmful effects, diseases or even death if introduced to living body in the wrong amount or wrong way. Poisoning with such substances accidently or deliberately can be life threatening, especially in some countries that lack the essential test and facilities to identify the types, causes of these toxic substance [1] .According to the World Health Organization (WHO) record, poisoning is ranked 45th in total mortality worldwide , about 0.3 million people die every year due to various poisoning types and substances and can cause 220000 people to die every year[3,4]. In 2015, unintentional poisoning causes the loss of over 10.8 million of healthy life worldwide [4]. 99 % of theses fatal poisoning occurs in developing countries such as India, south Africa and Sri lanka [3,5].The poisoning cases are increased day by day as

these toxic substances are being used in industries, agriculture and in most of household works; a person can be exposed to more than 100 chemicals a day [6].

In Iraq, as many other countries [7,11] poisoning is one of the chronic public health problems and Iraq has passed many poisoning disaster outbreaks between 1956- 1988 [12,13]. Kurdistan region of Iraq is exposed to many toxic chemicals such as sarin, sulphur, mustard gas and many other nerve agents [14]. The pattern of poisoning in each country depends on various factors such as geographic distribution , surrounding environment, cultural practices, socioeconomic state, patients (family) occupation and awareness and many others [3,7,10,11].In Duhok city, with the average number population of 391,497, many hospitals and health centers have their own poisoning cases record including (poisoning types, gender and age) for each patient and the Duhok General Directorate of Health is responsible of collecting all the data at the end of each year, and makes the final total record for the whole year. However, very little literature about the pattern of poisoning cases, types and age are available in Duhok city. Therefore this study was conducted to determine the most common patterns of poisoning and the related age and gender in Duhok city and the related districts health centers from 2016-2018, which would possibly contribute to the early diagnosis and treatment of poisoning.

Methodology

An epidemiology study was conducted for three years starting from 1st of January 2016 to 31st of December 2018). A total of 27831 poisoned patients admitted to Duhok city. Duhok Governorate is divided into seven districts, including (Amedi District, Dohuk District, Semel District, Zakho District, Akre District, Shekhan District, Bardarash District)) and the related districts health centers.

Data were collected from Duhok General Directorate of Health database, based on the data collected from all Duhok Governorate hospitals and health care centers concerning poisoning types, patient's age and gender (male and female). Descriptive statistic was used to analyze the data including (frequency, mean and percentage) concerning poisoning types, patient's age and gender (male and female), the research was approved by the Research Scientific Committee of Collage of Science, Biology Department. Data were statistically analyzed using the frequency, mean and percentage by sigma plot 12. Program.

Results:

During the period of 36 months from 2016 to 2018, 27831 different cases of poisoning were recorded by Duhok General Directorate of Health. From those (10870, 10035 and 6926) were reported in 2016, 2017 and 2018 respectively. The data will be analyzed according to the patterns of the poisoning (Food, scorpion bite, drugs, alcohol, petroleum and it is derivatives, insect bite, soap and detergents, snake bite, insecticide, animal's bites, other chemicals and other types of poisoning and Illegal addictive Drugs) for each year separately, the gender distribution (male and female) for the study years (2016, 2017, 2018)is also taken into consideration. Five groups of age were recorded (≤ 1 year, 1-4 year, 5-14 year, 15-49 and 50 & over) and analyzed as shown below.

Patterns of poisoning

Thirteen separated pattern cases of poisoning were recorded in each year (Food, scorpion bite, drugs, alcohol, petroleum and it is derivatives, insect bite, soap and detergents, snake bite, insecticide, animal's bites, other chemicals and other types of poisoning such as (herbals, sagwa, allergies, metals, organophosphate, rat poising and others) and Illegal addictive Drugs. In general, the highest number of poisoning was reported in 2016 (10870) compared to both other years 2017 (10035) and 2018 (6926), however, during these 3 years the most common pattern of poisoning cases was food (61%) in 2016, (75%) in 2017 and dropped to 48% in 2018. Then, it was followed by other types of poisoning such as (herbals, sagwa, allergies, metals, organophosphate, rat poising and others) (11.7% in 2016, 4.8% in 2017 and 19.7% in 2018) and scorpion bites (5% in 2016, 5.7 % in 2017 and 11.5% in 2018) (Figs. 1, 2 and 3).

Poisoning by drugs was the highest in 2018 (667 cases 9.6%) compared to 2017 (574 cases 5.7%) and 2016 (476 cases 4.3%). All other poisoning patterns (insect bite, soaps and other detergents, snake bits, animal's bits and insecticide) were about or less than 1%, except other chemicals pattern was about 7.4% in 2016 and less than 0.7% in both other years. No recorded cases were poisoned by illegal addictive drugs during these 3 years period of study.

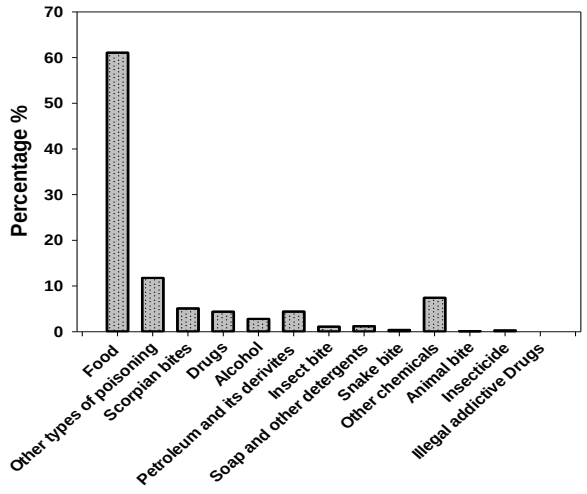

Figure 1. pattern of poisoning in 2016 based on Duhok General Directorate of Health record

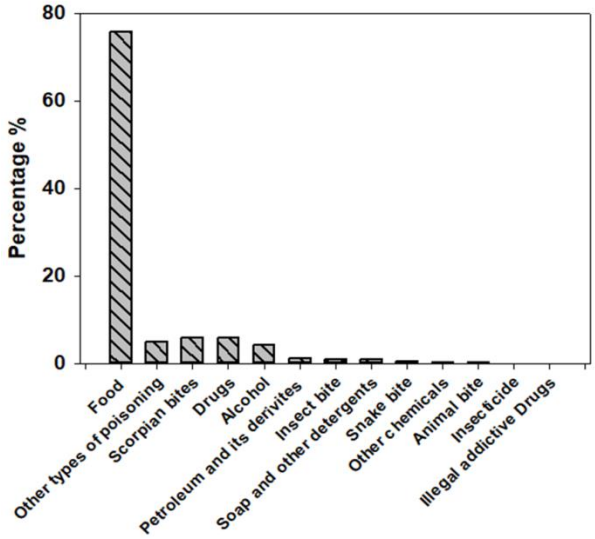

Figure 2. Pattern of poisoning in 2017 based on Duhok General Directorate of Health record

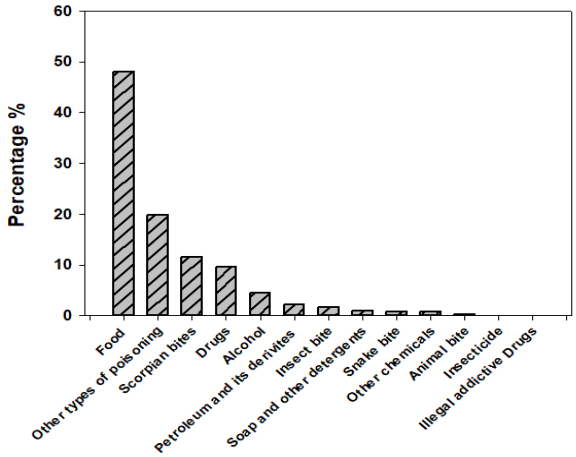

Figure 3. Pattern of poisoning in 2018 based on Duhok General Directorate of Health record

Gender distribution according to the types of poisoning

Table 1 shows the gender distribution of the all-poisoning cases from 2016 to 2018. Out of 27831 cases of poisoning, 5578, 5185 and 3686, were females while, 5292, 4850 and 3240, were males for three years 2016, 2017 and 2018, respectively. Out of these, the highest cases to effect females, were food (80%) followed by other types of poising such as (herbals, sagwa, allergies, metals, organophosphate, rat poising and others) (20.6%) and scorpion bites (10.4%).A point was found; no cases were observed within female in the use of alcohol in 2017 as compare to male with 9% in the same year.

Among the other patterns, females were less affected by snake bites, animal's bites and insecticide, with percentage ration less than 0.5%. In contrast, the majority of males (70%) were also poisoned by food, followed by other types of poisoning (18.8%) and scorpion bites (12.7). These also shows the same frequently poisoning cases as female on the other pattern as well, except, one point was observed, alcohol was more common in males than females during the whole periods of study (5.4 % in 2016, , 9 % in 2017 and 9.7% in 2018) while females records only 0.025% in 2016 as the highest % ratio.

Table 1. Gender distribution according to the types of poisoning

	2018		2017		2016	
Pattern of poisoning	**Male no. (%)**	**Female no.(%)**	**Male no. (%)**	**Female no.(%)**	**Male no.(%)**	**Female no.(%)**
Food	57.12	64.8	70	80	41.5	53.74
Other types of poising	12.24	11.3	4.4	5.1	18.8	20.6
Scorpion bites	5.3	5	6.4	5.1	12.7	10.4
Drugs	3.8	5	5.3	6	9.4	9.8
Alcohol	5.4	0.25	9	0	9.7	0.02
Petroleum and its derivites	4.91	3.9	1.4	1.08	2.6	1.75
Insect bite	1.13	1.05	1	1	2	1.46
Soap and other detergents	1.2	1.25	0.8	1	1.01	1.04
Snake bite	0.5	0.25	1	0.43	1.2	0.46
Other chemicals	7.9	6.9	0.3	0.23	0.7	0.7
Animal bite	0.25	0.04	0.35	0.05	0.3	0.01
Insecticide	0.25	0.26	0.05	0.01	0.09	0.02
Illegal addictive Drugs	0	0	0	0	0	0
Total	100	100	100	100	100	100

Age distribution according to the types of accidental poisoning

For the purpose of preventive strategies, the distribution of poisoning patterns by age for the 3 years is summarized in Table 2. The age between 15-49 y composed about 43.8% of the total cases, which is the highest % ration among other age groups. By contrast, age less than 1 y was the least recorded cases (2.64%), which also makes that obvious on most of the poisoning cases pattern. However, the other studied groups, over 50 and 5-14-years old categories still recorded high ratio 21.5% and 18.9%, respectively.

Among all the group age studies, food was responsible for the majority of cases, followed by other types of poisoning, except 15-48 years old group, drugs and scorpion bites were second causes of poisoning 5% and 4.61%, respectively. Noticeably, 0.0% of alcohol poisoning cases were recorded in these groups age (≤ 1, 1-4, and 5-14 years) as compared to the highest % ratio in group age 15-48 years (4 %).

Table 2. Age distribution according to the types of accidental poisoning.

Pattern of poisoning	≤ 1 y	1-4 y	5-14 y	15-49 y	50 & over
Food	2.32%	7.00%	13%	22.61%	15%
Other types of poisoning	0.08%	3.00%	4.00%	2.61%	2.20%
Scorpian bites	0.02%	0.34%	1.08%	4.61%	1.09%
Drugs	0.06%	1.00%	0.20%	5.00%	1.00%
Alcohol	0.00%	0.00%	0.00%	4.00%	0.04%
Petroleum and its derivites	0.07%	1%	0.10%	1.00%	1.00%
Insect bite	0.01%	0.10%	0.30%	1.00%	0.06%
Soap and other detergents	0.05%	0.40%	0.11%	0.42%	0.01%
Snake bite	0.00%	0.02%	0.07%	0.40%	0.05%
Other chemicals	0.03%	0.13%	0.05%	2.00%	1.08%
Animal bite	0.00%	0.03%	0.03%	0.08%	0.01%
Insecticide	0.00%	0.02%	0.00%	0.10%	0%
illegal addictive Drugs	0.00%	0.00%	0.00%	0.00%	0.00%
Total	2.64%	13.04%	18.95%	43.83%	21.54%

Discussion:

Poisoning as a global problem, is continuously increasing in many countries and contributes to the morbidity and mortality in these countries [15]. In Iraq poisoning is still counted one of the most chronic health problems, in the western part of Iraq, Al-Khfajy and Al-Ani and many others have reported many intentional and non-intentional poisoning cases occurring in different age patients [16–18], ;however, In Duhok city and surrounding districts, this is the first study to document the frequency and the pattern of

poisoning in this city. During the three year of studies, food was the first cause of poisoning in the whole periods of the studies, which extensively decreased in 2018 (48%) compared to both other years (75.6% in 2017 and 61% in 2016). These high poisoning food ratios could be due to many different factors, such as frequently eating fast food or unhealthy food from public restaurant and markets. It is obvious that the seasonal variation has contributed in the occurrence of food poisoning, during the summer month [19], a period when families spend most of their time out of their homes and therefore take their food from restaurants and canteens or other fast food outlets. In addition, some patterns were quite difficult and especially in many other parts of Iraq, food poisoning was mostly excluded from the studies as separate poisoning categories

However, according to many local studies in Duhok city, eggs [20], ice cream [21], chicken meat [22], restaurant workers [23,] and many other items [24], were responsible for transferring many pathogen bacteria such as (Salmonella species, Psychrotrophs bacteria and staphylococcus) which might cause consumer food poisoning. In addition, lack of awareness [25], inadequate storage, and use of raw ingredients in the preparing food might have been additional risk factors in increasing food poisoning case. Some other studies also show that many import daily food items from surrounding countries, such as rice, were contaminated with toxic heavy metals [26], which is one of the biggest causes of food poisoning. The results of the present study conflict with others part of Iraq and other countries, they have shown that kerosene [8,16] medication [9,11,27], Agrochemical [24,] insecticide [3,7], Alcohol [27] house hold cleaning substance [10], are the first causes of poisoning in their countries.

Other types of poisoning were the second recorded poisoning types, which include any other causes of poisoning, such as herbal and sagwa, allergies, poisoning plant, metals, organophosphate, rat poisoning and others). The expected overlap between this group and others were possibly created a high percentage proportion, as a result of limited categories and available assay for identification and diagnosis.

The third pattern of poisoning during these three years were scorpion bites, this finding contrast with data from other studies from other part of Iraq [8,16] . This can be explained that Duhok city and the surrounded villages have many agricultural lands and people practice planting and cropping in spring and summer season, adding to that people are used to have frequent picnics in such areas. It is worth to mention that hot season are responsible for high scorpion bits as result of scorpion lifecycles activity [28,29] However, scorpion bits are considered the 6th category to cause poisoning in childhood in western Iraq [16]. The results of both male sand females poisoning cases, majority of recorded cases were noted in females, this may be due to high female: male (F:M) ratio, which also supported by other studies [18]. However, in all other poisoning patterns males were found more affected than females, this male predominance is due to the fact that males are exposed to occupational hazards and they are in charge of handling the agrichemicals often during the agricultural practices, adding to that male are more actively involved in dealing with social family life; therefore, they are more prone to poisoning than females.

Regarding the age distribution of poisoning exposure circumstances, the lowest frequency (2.64%) of total poisoning cases was observed in babies' $\leq$ 1year, this pattern of accidental poisoning appears to contrast with other data [8,16], when they found that 4% of poisoning cases affect babies in this age. This low ratio in babies' exposure can be related to the fact that these babies are cared and supervised by their mothers and hence they do have limited access to many available poisoning chemicals. The results of the present study also showed that babies in this age, in our city, are mainly poisoned by food (2.32%), while in other parts of Iraq drugs, herbals and sagwa were the most poisoning cases [16.] In addition, food poisoning is still the highest ratio in the other groups (1-4 year 7%, 5-14 year 13% and 50 & over 15%) followed by other types of poisoning (3% , 4% and 2.2%) respectively.

In contrast, the highest ratio of poisoning cases was found in the group age $\leq$ 15-49 year , specially effected by food, this was consistent with results recorded in many other studies [3,7,10,11.] These age group are the most active age and they do spend most of their time outside the house and tries to consume the food from fast food suppliers. In addition, poising by drugs was the second and highest ratio in this age group (except food ratio), this can be related to the easy access to over counter drugs and this age may suffer from failure in career, unemployment, occupational issues or family problem, which may lead to intentionally exposure to drug poisoning [30].

Finally, it is worth mentioning that this study is based on one database which belongs to Duhok General Directorate of Health Database; therefore, it may not represent the real patterns of poisoning in Duhok city due to the fact that many cases of people's exposure to some pattern of poisoning prefer to stay at home. This may reduce

the sample size and limit the study of some types of poisoning and their causes.

Conclusions:

This study is the first to be done in Duhok Governate, therefore discussing the reasons of some cases and ratios is quite difficult. In conclusion, the absence of special poisoning center or hospital in Duhok city, provided with immunoassay screening or serum level tests and all require antidotes, has missed the diagnosis of poising patterns and limited their management.

Finally, scientists must focus their research on the main causes of this massive ratio of food poisoning and others, with the help of government and public workers which would help to decrease this ratio. In addition, health education, children and parents' awareness through school, TV, journals and magazines are necessary to clarify the causes and prevention of such accidental or purposed poisoning cases.

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Author's declaration:

- Conflicts of Interest: None.
- I hereby confirm that all the Figures and Tables in the manuscript are mine. Besides, the Figures and images, which are not mine, have been given the permission for re-publication attached with the manuscript.
- The author has signed an animal welfare statement.
- Author sign on ethical consideration's approval
- Ethical Clearance: The project was approved by the local ethical committee in University of Duhok.

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أنماط التعرض للتسمم في مختلف الأعمار بمحافظة دهوك: دراسة للاعوام (2016,2017,2018)

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قسم علوم الحياة، كلية العلوم، جامعة دهوك، دهوك، العراق.

الخلاصة:

التسمم باحدى المواد السامة سواء بشكل مباشر أو غير مباشر يسبب تهديدا لحياة المريض، خاصة في بعض الدول التي تفتقر للمستلزمات والفحوصات اللازمة لتشخيص نوع وسبب التسمم.في العراق كباقي الدول الاخرى يعتبر التسمم من المشاكل الصحية المزمنة وعليه هناك قلة كبيرة (شحة) في المصادر التي تلخص نوع التسمم وحالاته واسبابه،والاعمار المعرضة للتسمم في محافظة دهوك ونواحيها .لذلك اجريت هذه الدراسة لتحديد أنماط التعرض للتسمم من خلال تحديد انواع السموم والعمر والجنس الأكثر عرضة للتسمم في محافظة دهوك لفترة زمنية مابين (2016-2018) والتي بدورها تساهم في عميلة تشخيص العلاج المبكر لحالات التسمم المحتملة.اجريت الدراسة ابتداء من الاول من شهر كانون الثاني لسنة 2016 لغاية نهاية شهر الكانون الاول من سنة (2018) تم جمع البيانات من مديرية صحة دهوك والتى بنيت على البيانات الماخوذة من المستشفيات والمراكز الصحيه التابعه لمديرية صحة دهوك والتي تضمنت انواع التسمم والعمروالجنس لكل نوع. تم استخدام المقايس الوصفية الممثلة بالتكرارات والنسب المئويه والاوساط الحسابية في مناقشة نتائج التحليل والرسوم البيانية. سجلت2781 حالة تسمم في محافظة دهوك والاقضية التابعة لها.اظهرت نتائج البحث ان هناك اكثر من 13 نوعا من التسمم يتعرض لها سكان محافظة دهوك وأقضيتها . وان اكثر الانواع شيوعا هو (التسمم الغذائي) والذي بلغ 61% في عام 2016، 75% في عام 2017 ، 48% في عام 2018. تلتها انواع اخرى من التسمم مثل (الاعشاب،المواد المسببة للحساسية، المعادن، الفوسفات العضوي،سم الفئران،ومواد اخرى)، والتي بلغت 11.7% في عام2016، 4.8% عام 2017 و 19.7% في عام 2018وثالث اكثر نوع تسمم كان التسمم بلدغة العقرب 5% في عام 2016و 5.7% عام 2017 و 11.5% في 2018. التسمم الناتج من الادوية كان اعلى نسبة في عام 2018 (667 حالة 9.6%) مقارنة بلسنوات 2017 (574 حالة 5.7%) و 2016 (476 حالة 4.3%).جميع انواع التسمم الاخرى (لدغة الحشرات. مساحيق التنظيف،لدغة الحية،لدغة الحيوانات و المبيدات الحشرية) سجلت نسب ما يقارب او اقل من 1% .لم يتم تسجيل اي حالة تسمم بادوية الادمان خلال سنوات الدراسة. اظهرت الدراسة ايضا ان نسبة الاناث كانت اكثر من نسبة الذكور المعرضين للتسمم. خلال سنوات الدراسة. كما وجدت الدراسة ان نسبة الاناث التي تعرضت للتسمم الغذائي كانت 80% مقارنة بنسبة الذكور 70%. النتائج اظهرت انه الاعمار مابين 15 و 48 سنة هم اكثر فئة عمرية معرضة للتسمم مقارنة بالفئات العمرية الاخرى. بنسبة 43.8% من جميع الحالات. نستنتج من الدراسة الحالية ان الاناث هم الاكثر عرضة للتسمم وأن التسمم الغذائي هو الاكثر شيوعا في محافظة دهوك ونواحيها. وقد يعزى سبب ذلك الى قلة الرقابة الصحية وانعدام الوعي الصحي والثقافي لدى شريحة معينة من المجتمع ساهمت في زيادة معدلات التعرض للتسمم بكل أنواعه.

الكلمات المفتاحية: العمر، محافظة دهوك، الجنس، التسمم، المواد السامة.