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Original Article

Childhood accidental poisoning in western Iraq: Pattern and risk factors

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1. Introduction

Poison is anything that is harmful if used in the wrong way, wrong person or the wrong amount. Some poisons are toxic if swallowed or inhaled while others are harmful when they come in contact with the eyes or the skin.¹ Old infants and young children are more prone to AP because they are more keen to explore their world and things by putting everything in their mouths.² The World Health Organization estimated that 0.3 million people die every year due to various poisoning types.³ In developed countries, about 2% of accidental deaths were due to the AP compared to about 5% in developing countries.⁴ It affects more boys than girls, and more children less than 5 years than other age groups. Older children usually are involved more when they are developmentally delayed.^{5,6} More than 90% of AP cases occurs inside homes, and mostly caused by a single poisoning substance.⁷ The types of poisoning are different according to the patient's age. In the first year of life, the main poisons are usually medications given either wrongly or as an overdose by parents or caretakers.^{8,9} After the first year, various modes and types of poisonings occur, and after 5 years of age, poisoning becomes much less common and involves only 6% of all reported pediatric exposures.⁷ In adolescence, poisoning becomes primarily more intentional in type in the form of suicide, abuse, or misuse of substances, and often result in more severe morbidities and mortalities.⁷ The types of poisoning are also different according to the standard income of the countries. In high-income countries, the most common agents are pharmaceuticals, household products, pesticides, and poisonous plants while in low and middle-income countries, the most common poisons are fuels such as the kerosene & paraffin, pharmaceuticals, and household products.¹⁰

In Iraq, poisoning is one of the chronic public health problems and caused by different poisoning agents. The most common agents were the hydrocarbons especially kerosene, then medications, household products, organophosphates, and heavy metals. Heavy metal poisoning is one of the chronic health problems in the country. Between 1956 and 1971, three outbreaks of mercury

poisoning happened, all were through un-intentional consumption of wheat imported for agriculture purposes and treated by methyl mercury compounds as a fungicide.¹¹ The first was in 1956 in northern Iraq, the second was in 1960,¹¹ and the third was in 1971 and was the most severe and disastrous outbreak in the world following Minamata and Niigata-Minamata mercury outbreaks in Japan in 1956 and 1965 respectively.^{11–13} In 2013, the Poisoning Consultation Center (PCC) which is the main toxicology center of the country that receives only referred severe cases from all the country reported that metal poisoning was the most common referred poisoning type in Baghdad (82.2%), and Copper was the most common heavy metal poison.¹⁴

There is very little known about the incidence and types of poisoning agents causing accidental poisoning in Al-Anbar Governorate. Therefore this study was conducted to determine the incidence, types, mode of presentation, and risk factors of AP in Al-Ramadi Maternity and Children's Teaching Hospital (MCTH) in Al-Ramadi city, Al-Anbar Governorate, western Iraq.

2. Methodology

This is a retrospective hospital based case-control study applied to find out the percentage, types, clinical presentation and risk factors of AP in children admitted to the EU of AL-Ramadi MCTH from the 1st of January to the 1st of October 2012. The research was approved by the Research Scientific Committee of the College of Medicine, Al-Anbar University. Family consent was required and signed by one of the parents before data collection. AL-Ramadi MCTH is the only tertiary pediatrics & gynecology hospital in Al-Anbar governorate (the western governorate of Iraq, 1,450,000 populations, 138,500 Km², 1/3 of the total land area of the country), located in Al-Ramadi city (the capital of the governorate, 550,000 populations, 110 km west of Baghdad). It caters the pediatric cases from Al-Ramadi city and its peripheries, and the referred cases from the other districts of the governorate. General examination, vital signs, level of consciousness, and some required investigations were done in the hospital. Supportive symptomatic therapy as the gastric lavage, antidotes, intravenous fluids, oxygen, anti-venom for scorpion sting or snake bites were applied when indicated. Collected data included the patient's age (<1, 1–3, 4–6, 7–9, 10–12 years), gender, residence (rural, urban), type of poisons, route of poisoning (ingestion, inhalation, transcutaneous, snake bites or scorpion stings), vaccination history as a parameter of

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the parent's care (full vaccination, partial vaccination, no vaccination), time between poisoning and reaching the hospital (<1, 1–3, >3 h), time of the stay in the hospital (<24 h, 1–3 days, >3 days), the outcome of AP (no complications, with complications, death), and any previous history or family history of poisoning before. Recorded parent's data included their age (<20, 20–30, 31–40, >40 years), job (employed, non-employed), education (illiterate, primary school, secondary school, higher education), number of siblings (<3, 3–5, >5 siblings), and the number of families living together in the same house (1, 2, ≥3 families). A detailed history was taken from parents or attendants on the basis of their knowledge about the route, name, shape, color and smell of the taken poison, the presenting manifestations, and the time from poisoning until reaching the hospital. Bottles, wrappers or packing were requested when available for identification of the poison's type. Since many poisonings were asymptomatic during presentation, a child was regarded as having AP when brought urgently to the EU and reported by the parents or attendant that he took or was exposed to a poison whether he was symptomatic or asymptomatic on reaching the hospital. Due to the absence of serum testing of the type of poisons in the hospital, the agent was regarded as the cause of poisoning when it was found within the hand or mouth of the child or there was a reduction in the number of tablet in the tablet sheet or the volume of syrup in the syrup's bottle with the presence of spoiling or smell of the drug in the mouth or the clothes or the vomitus or the gastric lavage content of the child. Cases excluded from the study included children with chronic Lead or mercury poisoning as those are un-accidental poisoning types, cases above 12 years as those should be treated in hospitals for adults, and cases of Munchhausen by Proxy Syndrome as those were intentional child abuse done by an ill-behavior mothers or caregivers.

For every AP case, two age and sex individually matched patients were selected as controls from the same EU. Selected controls were the acute conditions with no previous history or family history of poisoning before. Statistical analysis was performed using EPI Info System version 5.3.1 2008. Data were presented as frequency and percentages with testing of significance between different proportions using the Pearson chi-squared test at $P < .05$ level of significance. Odds ratio was calculated as an estimate of the risk of AP, and 95% confidence interval was used for significance assessment of the risk factors.

3. Results

During the study period, 8366 different conditions were admitted to the EU composed of 5021 males and 3345 females. From those, the recorded number of AP cases were 122 (1.46% of the EU patients), all were less than 12 years old except a 15 years old patient who received his first aid management and then referred to the adult's hospital to complete his management. The 122 cases composed of 73 (60%) males and 49 (40%) females with m/f ratio of 1.5/1. Their difference was statistically not significant ($P = .967$). The ages of the AP cases were from 1 month to 12 years (mean = 3.29 ± 0.75 years). Sixty-seven (55%) of recorded cases were from rural and 55 (45%) were from urban residences. All recorded cases were from Al-Ramadi city and peripheries except two cases were referred from the other districts of the governorate. None of the recorded cases had a previous history of poisoning. Three of the cases (2.5%) had a family history of AP. In this study, each recorded case was poisoned by a single poisoning agent except two cases were poisoned by two agents stored together in the same place. The first was through ingestion of contraceptive pills and diazepam tablets, and the second was a mentally retarded child who ingested hair shampoo and Dettol. Both cases were brought early to the EU.

Table 1
Age and gender distribution of accidental poisoning.

Age group (year)	Male no. (%)	Female no. (%)	Total no. (%)
≤1	3 (2.5)	2 (1.6)	5(4)
1–<3	45(37)	22(18)	67 (55)
3–<5	20 (16.4)	18 (14.8)	38 (31.2)
≥5	5 (4.1)	7 (5.7)	12 (9.8)
Total	73(60)	49(40)	122(100)

Table 2
The presenting clinical manifestations of the 122 accidental poisoning cases.

Signs & symptoms	No. (%)
Vomiting	73 (28.5)
Cough	61 (23.8)
Tachypnea	37 (14.5)
Fever	17 (6.64)
Diarrhea	15 (5.85)
Drowsiness	12 (4.68)
Asymptomatic	9 (3.51)
Dyspnea	7 (2.73)
Irritability	5 (1.95)
Skin redness & swelling	3 (1.17)
Flushing of face	3 (1.17)
Unconsciousness	2 (0.78)
Skin itching	2 (0.78)
Mydriasis	2 (0.78)
Meiosis	2 (0.78)
Shock	1 (0.39)
Cyanosis	1 (0.39)
Tachycardia	1 (0.39)
Hematuria	1 (0.39)
Oculogyric spasm	1 (0.39)
Hypotension	1 (0.39)
Total	256 (100)

The first case was improved from the drowsiness and discharged on the second day of admission without complications, while the second was discharged without complications in the same day of poisoning.

The number of selected controls were 244 composed of 146 males and 98 females. All admitted to the EU for acute non-poisoning conditions as follows: 84 cases with acute gastroenteritis, 79 cases with bronchiolitis, 37 with asthmatic attacks, 19 with pneumonia, 6 with Favism, 3 with acute Kala-azar, and 16 with others.

In this study, ingestion was the most common route of poisoning and involved 118 cases (97%). The remaining 4 cases were poisoned through the skin route by scorpion stings. No recorded case was poisoned by inhalation, skin absorption, or snake bite.

The highest incidence of cases was recorded in March and April, while July was the month of the lowest poisoning rates.

Table 1 shows the age and gender distribution of the AP cases. The under 5 years old cases composed about 90% of the cases (110 cases). The highest number of cases was between 1–3 years (56 cases, 55%), while the cases less than 1 year old were the least recorded number (5 cases, 4%). In all the studied groups, males were found more affected than females except in ages above 5 years where females were found more affected than males.

Table 2 shows the details of the presenting clinical manifestations. Although many cases had multiple manifestations, vomiting was the most common presenting clinical manifestation (28.5%) followed by cough and tachypnea. The asymptomatic presentation composed about 3.5% of the total cases.

Table 3 shows the distribution of the poisoning types according to the patient's age and gender. Kerosene poisoning (KP) was the most common recorded type (45%) followed by the drugs and household products. The KP incidence was about double in the

Table 3
Age distribution according to the type of accidental poisoning.

Causative agent	≤1 yr*	1–<3 yr	3–<5 yr	≥5 yr	Total (%)
Kerosene	0	35	20	0	55 (45.0)
Drugs	2	8	11	5	26 (21.3)
Household products	0	14	2	0	16 (13.1)
Food poisoning	0	2	2	6	10 (8.2)
Herbals and Sagwa	3	3	0	0	6 (5.0)
Scorpion bites	0	1	2	1	4 (3.3)
Rodenticide	0	2	1	0	3 (2.5)
Poisonous plants	0	2	0	0	2(1.6)
Total	5 (4%)	67(55%)	38(31.2%)	12(9.8%)	122(100)

* yr: year.

Table 4
Types of the drugs causing the poisoning (26 cases).

Poisoning drugs	No. of cases	(%)
Unknown drugs	7	(26.9)
Contraceptive pills	6	(23.1)
Paracetamol	5	(19.3)
Cyproheptadine	3	(11.6)
Salbutamol	1	(3.85)
Diclofenac	1	(3.85)
Metoclopramide	1	(3.85)
Captopril	1	(3.85)
Clonidine	1	(3.85)
Total	26	(100%)

Table 5
Time of hospital arrival, period of hospital stay and outcomes of accidental poisoning.

Hospital arrival	No. (%)
<1 h	17 (14)
1–3 h	91 (74.6)
>3 h	14 (11.4)
<i>Stay in hospital</i>	
<24 h	91 (74.6)
1–≤3 days	26 (21.3)
>3 days	5 (4.1)
<i>Outcome</i>	
No complications	106 (87)
With complications	14 (11.4)
Died	2 (1.6)
Total	122 (100)

males than in females (65.5% in males, 34.5% in females), all were poisoned by unintentional drinking of kerosene stored in domestic bottles. No recorded cases were poisoned by siphoning (aspiration by rubber tube) or other mechanisms (e.g. drowning in a kerosene tank). The number of KP cases was more in March and February.

Drugs were the second recorded poisoning types. The unknown drugs were the most common types followed by contraceptive pills and paracetamol syrup, Table 4. All these cases were poisoned by self-poisoning except two infants who were unintentionally poisoned by an over-dosage medication given by their parents.

Household products were the third recorded cause of AP. They included bleaching agents in 8 cases (6.5%), Shampoo in 5 cases (4%), and Dettol in 3 cases (2.5%). All were poisoned by accidental drinking of the products.

Three cases of rodenticide poisoning were recorded. One of these cases developed hematuria and was treated by parenteral vitamin K as an antidote.

Table 5 shows the time before reaching the hospital, the period of the stay in the hospital, and the outcome of the conditions. The

majority of cases (74.6%) reached the hospital within less than 3 h, and the same percentage (74.6%) stayed less than 24 h in the EU before discharge from the hospital.

Regarding the outcome of AP, about 87% of the cases developed no complications and were discharged within the first 24 h of admission. The rest of cases developed single or multiple complications as persistent vomiting, coma, acute renal failure, hematuria, pneumonia, and pneumothorax and were kept in the hospital.

Two of the cases (1.6%) died in the hospital. The first was secondary to a Sagwa poisoning given to treat diarrhea and the second was following a scorpion sting. The first child died because of progressive acute renal failure and metabolic acidosis and the second because of shock state and hemolytic anemia following the scorpion sting.

Table 6 shows the risk factors of AP when cases were compared with controls. Paternal illiteracy and maternal age less than 20 were found risk factors significantly increasing AP, and paternal age more than 40 was found a protective factor significantly decreasing AP when both the parental ages less than 20 and that above 40 were compared with the 20–40 years age group (the reference group). The other variables were found not associated with the increasing of AP as the family residence, parental employment, child vaccination as a parameter of the parental care, the parental education, and the house crowding whether due to the increased family size or the number of families living together in the same house. All these variables were unexpectedly found unassociated with the development of AP.

4. Discussion

Accidental poisoning is a continuously increasing global problem that contributes to the morbidities and mortalities even in the most developed countries as the United States.¹⁵ In Iraq, poisoning is a chronic clinical and public health problem because of its frequency, variability, severity, and the still frequent use of the toxic traditional medications to treat diarrhea and other conditions especially in rural areas. In Al-Ramadi MCTH, the difficulty in diagnosing the unknown drugs, chemicals, Sagwa and other herbal poisonings was creating a problem in the management of these cases. This was due to the absence of the serum level testing or immunoassay screening techniques in the hospital. Accordingly, some poisoning agents could not be identified and the proper antidote could not be used and the symptomatic supportive treatment would be the only available treatment method in these cases in spite of the presence of a poisoning center in the hospital. As a poisoning control program, the Iraqi Ministry of Health established a poisoning center in most of the tertiary hospitals of the country. Every center was supplied with most of the listed antidotes, anti-snake venom, anti-scorpion venom, activated charcoal and others, and with toxicology textbooks as a reference for the management of different poisoning types. In Al-Ramadi MCTH, the unknown or

Table 6
Risk factors between accidental poisoning cases and controls.

Risk factors	Cases (1 2 2)No. (%)	Control (2 4 4)No.(%)	OR (95% CI) [†]	P. value
<i>Child residence</i>				
Rural	67(55)	156(64)	0.69 (0.43–1.10)	0.0960
Urban	55(45)	88(36)	–	
<i>Child vaccination</i>				
Full vaccination	81 (66.4)	151 (61.8)	Reference group	
Partial vaccination	32 (26.2)	67 (27.5)	0.89 (0.53–1.46)	0.327
No vaccination	9 (7.4)	26 (10.7)	0.64 (0.28–1.44)	0.145
<i>Mother age</i>				
<20 yr	4 (3.3)	1(0.4)	7.9 (0.87–71.4) [*]	0.048
20–30 yr	92(75.4)	177 (72.5)	Reference group	
31–40 yr	23(18.8)	50(20.5)		
>40 yr	3 (2.5)	16(6.6)	0.37 (0.10–1.29)	0.081
<i>Mother education</i>				
Illiterate	27(22.1)	64(26.2)	0.79 (0.47–1.33)	0.197
Primary	75(61.5)	136(55.7)	Reference group	
Secondary	15(12.3)	34(14)		
High education	5(4.1)	10(4.1)	0.94 (0.31–2.84)	0.470
<i>Mother occupation</i>				
Unemployed	120 (98.4)	239(98)	1.25 (0.24–6.56)	0.570
Employed	2(1.6)	5(2)	–	–
<i>Father age</i>				
<20 yr	1(0.8)	3(1.2)	0.61 (0.06–5.98)	0.562
20–30 yr	69(56.5)	162(66.4)	Reference group	
31–40 yr	49(40.2)	56(23)		
> 40 yr	3(2.5)	23(9.4)	0.24 (0.07–0.81) [†]	0.008
<i>Father education</i>				
Illiterate	20(16.4)	63(26)	0.55 (0.31–0.98) [†]	0.020
Primary	44(36.0)	96(39.3)	Reference group	
Secondary	41(33.6)	53(21.7)		
High education	17(14)	32(13)	0.93 (0.48–1.77)	0.419
<i>Father occupation</i>				
Employed	42(34.4)	77(31.6)	1.38 (0.71–1.80)	0.290
Unemployed	80(65.6)	167(68.4)	–	–
<i>Number of siblings</i>				
<3	44(36)	83(34)	1.08 (0.67–1.75)	0.366
3–5	60(49)	123(50.4)	Reference group	
>5	18(15)	38(15.6)	0.97 (0.51–1.84)	0.468
<i>Number of house families</i>				
1 family	44(36)	95(39)	Reference group	
2 families	45 (37)	72 (29.5)	0.74 (0.44–1.24)	0.129
≥3 families	33 (27)	77 (31.5)	0.68 (0.39–1.19)	0.091

[†] OR: Odd's ratio, CI: Confidence interval.

^{*} Significant.

the difficult poisoning cases were supposed to be referred to the PCC in Baghdad for management through a medical referral system but this was difficult because of the chronic loss of security conditions and the long transportation time to the center.

In this study, the AP cases accounted for 1.46% of the EU admissions. This was lower than the incidence recorded in Iran (2.31%),⁸ but was higher than incidences recorded in Baghdad (0.82%)¹⁶ & Kerbala (1.1%)¹⁷ in Iraq, and incidences recorded in Karachi (0.58%),¹⁸ Kuwait (1.33%),⁸ Spain,¹⁹ and Saudi Arabia.²⁰ The high dependence of kerosene for heating and other home purposes in Al-Ramadi city as with other parts of Iraq due to the chronic poor supply of electricity, and the poor health education of peoples in the tribal highly populated peripheries of Al-Ramadi city may be behind the high incidence of AP in this study.

In the present study, the first 5 years of life involved about 90% of the studied cases and the majority of these cases (65.5% of the 90%) occurred during the first three years of life. The curiosity to discover everything by opening, mouthing and destruction, and the hyperactivity and interest with colors, shapes and taste, make this age group more prone to the poisoning than the other age groups. This result was consistent with the other Iraqi results

recorded in Kerbala,¹⁷ Basrah²¹ and Baghdad,²² and with other studies recorded in New Delhi²³ Pakistan,²⁴ and United States.²⁵

Males were found more affected than females. Males are well known of being more exploratory, active and restless in nature than females,²³ and so, they become more prone to the accidents and AP than females. The same male predominance was noticed by other studies in Iraq^{14–17,21} and studies in other countries.^{23–25}

Variable results were reported about whether AP is more in rural or urban areas. Studies that reported AP more in urban areas justified this result depending on the higher availability and use of toxic substances in the urban than the rural residences.²⁶ In the present study, AP was found more in rural than urban areas. This may be due to the high dependence of rural areas on kerosene for cooking, baking or lighting, the high use of Sagwa and herbal mixtures to treat diarrhea and other medical conditions, and the high rate of scorpion stings in the rural than urban areas of Al-Ramadi city.

Ingestion was the most common route of AP in this study and also was the most common route recorded in New Delhi²³ and Pakistan,²⁴ while in Oman,²⁷ the skin through the skin bites was the most common recorded poisoning route. Route difference may be

due to the variation in the environmental and demographic status or the type of substances used by different populations.

Higher AP incidence was recorded in March and April in the present study. This was consistent with the results recorded in Basrah in south of Iraq²¹ and in Turkey,²⁸ but was different from result recorded in Keshmir.²⁹ Temperate weather in March and April usually attracts children to play and spend more time outside their homes and become more exposed to the scorpion stings or the kerosene and insecticide poisons unsafely stored outside the homes.

KP was the most common recorded poison (45%) by this study and was also the most common poison recorded by other studies in Iraq,^{14–18} Pakistan²⁴ and India.²⁹ In Iraq, kerosene is evenly distributed to the families according to the food ration. Usually it is stored outside the homes in different plastic or metal tank containers. For the daily domestic home use, a small amount of kerosene is usually stored in plastic glasses or beverage bottles which are the usual cause of poisoning when children accidentally reaches the container and drinks the fluid and develops the poisoning.

Several studies recorded drugs as the first cause of AP.^{8,9,16,29} Drugs were the second cause of AP in the present study and in the other studies in Iraq,^{14–18} and Pakistan.²⁴ Regarding the type of the drugs, the highest recorded drug poisoning was the unknown type (27%), followed by the contraceptive pills (23.1%), then the paracetamol (19.3%). This result was consistent with what was recorded in Basrah in the south of Iraq.²¹ In Iran,⁸ antidepressant was the most common poisoning drug, while in Oman,²⁷ the most common poisoning drug was the paracetamol. This drug variation may be due to the difference in the local diseases, used medications, type of contraceptive methods, level of health education, and the methods of the studies. The high rate of contraceptive pills poisoning in this study may be due to their small size, attractive shapes and taste, and their usual storage in bedrooms within the hand-reach of young children.

Three cases of rodenticide poisoning were recorded in this study. Some rodenticides are sold as pinkish particles like mashed meat containing warfarin that kills the rats by causing internal bleeding. Poisoning occurs when the young child accidentally ingest the substance. In this study, one of the three rodenticide poisoning cases developed hematuria in the hospital and improved after receiving a parenteral vitamin K as an antidote. The warfarin-containing rodenticides composed only 4.2% of the rodenticide poisoning cases that were referred to the PCC from Baghdad in 2013 while that containing Zinc Phosphide composed about 42% of these referred cases. Zinc phosphide is a dark gray powder mixed with food to form a bait or sold as a ready bait paste to be used as a rodenticide. It kills the rodents by the production of the highly toxic phosphine gas in the stomach through its acidic medium. AP in children or suicide poisoning in adults leads to the absorption of the phosphine gas to the blood circulation. No antidote is available and the mortality may reach 37–100%.³⁰

In this study, the majority of AP cases (87%) developed no complications. The same result was recorded in Basrah²¹ and in Pakistan.²⁴ Complications usually depend on the dose, type, and route of poisoning and the application of early proper management.

In this study, the vast majority (88.6%) of cases reached the hospital and received management in less than 3 h of poisoning which gave a less chance for the development of complications. One of the explanations is the extensive modern cars importation in Iraq in the last 10 years and their wide availability in most of families in Al-Ramadi city which shortened the time for reaching the hospital and reduced the complications.

Mortality was recorded in 1.6% of the AP cases. This was comparable to the result recorded in Saudi Arabia (1.8%),²⁰ but was higher than mortality recorded in Baghdad (0.9%)²⁵ and Iran (0.3%).³¹ In

the Baghdad study,²⁵ the mortality was one child who died due to drowning in a kerosene-storage tank filled with kerosene. In the present study, the two recorded deaths were one case who died due to a scorpion sting and the second by Sagwa poisoning.

Studying the risk factors of AP is important to plan the preventive methods of these factors to reduce the occurrence of morbidities and mortalities. Paternal illiteracy and maternal age less than 20 years were found risk factors significantly increasing AP, and paternal age >40 years was found a protective factor significantly decreasing AP when compared with the 20–40 years parental age group. Young and illiterate parents have a limited knowledge and supervision of their children and a little experience about the dangers of toxic materials and their mode of storage than the old, educated, and experienced parents. Also, old fathers have more life experience and knowledge about the poisoning substances and their mode of storage than young fathers. These results were found consistent with the result recorded in Karachi,²⁶ while in Baghdad,²² the result was different, and AP cases were found significantly more common in children of mothers above 35 years than younger age group. The other factors as the parental residence, employment, house crowding whether through the number of siblings or the number of families living together, and the child's vaccination as a parameter of the parental care, all these were found unexpectedly not significant risk factors for the development of AP. These results were found different from what recorded by other studies. In the Egypt study,³² non-employed mothers (housewife) was found a risk factor for AP, while in this study, housewife mothers was not found associated with the development of AP. In the Baghdad study,²² increased family size was found a risk factor for the development of AP, while in this study, family size whether due to the increased family siblings or the number of families living together was not found a risk factor for the development of AP. Although all these are case-control studies and their controls were selected from the EU of the hospitals, the variation in their results may be due to the types of patients selected as controls. When controls are selected from acute conditions that contain the same confounding factors of the AP cases, the statistical result will be negative, and the result will have no relation of these risk factors with the development of AP. Example is studying the risk of house crowding on the development of AP. House crowding may increase the incidence of AP in the AP cases and also the incidence of bronchiolitis in controls selected with bronchiolitis. This will give a statistically false negative relation of AP with the house crowding. When a minimal lesion nephrotic syndrome or acute lymphoblastic leukemia were selected as controls, house crowding will have little effect on the development of these conditions, but it can reduce the incidence of poisoning in the AP cases and accordingly, the result will be a statistically significant relation of the house crowding with the development of AP. To reduce the effects of these confounding factors, selection of controls must be from the healthy children in kindergartens or in health centers visiting for vaccination to give a more real estimation of the risk factors related with the development of AP.

5. Limitations and recommendation

This is a hospital based study which can't represent the real incidence of AP in Al-Ramadi city or Al-Anbar governorate since some simple AP cases may take their treatment from the other residential health centers in Al-Ramadi peripheries. Also, the wide land area of the governorate (1/3 of the land area of Iraq) and the long distances from the Ramadi MCTH to the other districts of the governorate may prevent referral of these urgent cases and reduce the sample size and limit the study of the other types and causes of AP.

The study period was only 10 months. If the study was longer, it may permit the tracing of more different cases and give a more real estimation of the risk factors, types, seasonal variation, and the outcomes of AP.

The absence of immunoassay screening or serum level testing of the unknown drugs or chemical poisonings in Al-Ramadi MCTH will miss the diagnosis of these conditions and the content of the Sagwa and other toxic medications and limit their management due to the difficulty in the selection of their proper antidote. This will complicate the problem of management and lead to more morbidities or mortalities.

To control the confounding factors that may cause the false negative results of the AP risk factors of this study, a multivariate analysis for confounding factors is indicated to prove the real association of these factors with the development of AP. Unfortunately, this becomes impossible since the study was done 5 years ago and most required original questionnaire data were lost in the hospital through the last 2014–2016 conflicts in Al-Ramadi city.

Social health education through TV, journals, magazines and group discussion with parents is required to clarify the mechanisms, causes, and modes of prevention of the KP and other AP types, and alerting people to the dangers of the use of Sagwa and other toxic traditional medications, and to alert people about the urgent notification about the persons who prepare or sell these toxic materials.

Obligation of the drug factories to produce the childproof drug products and limiting the importation of any non-childproof forms is important to reduce the incidence of the childhood AP.

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