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EVALUATION OF THE PATERN OF ORGANOPHOSPHATE POISONING, TWO YEARS ANALYSIS, 2009-2011DAMMAM POISONING CONTROL CENTRE (PCC), KSA, RETROSPECTIVE COHORT COMMUNITY STUDY

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ABSTRACT

Organophosphorus compounds (OPC) are toxic substances that are responsible for the death of thousands of people annually. Objective: The Pattern of acute Organophosphorus poisoning (OPP) in patients admitted to Al-Dammam PCC (poison Control Centre) from 2009-2011. This study was subjected to cases admitted to AL-Dammam PCC, KSA due to OPP. The patients had been divided according to their age, into three groups: below 15 years, above 15 to 40 years, and above 40 years. According to severity, patients were divided into 4 groups. For all patients all of the following parameters were assessed on admission: Pseudo choline esterase (PChE), electrolytes, glucose, and white blood cell (WBC) count . Ninety five patients had been included within this study. The commonest nationality was Saudi (n=45, 47.3%). The commonest route of poisoning was ingestion (57, 6%). The female: male ratio was: 1:2.17. The majority of cases occurred in the summer. The mean age in suicidal (n=17) cases were 22.8±18.1years with Pseudo choline esterase (PChE) level: 95.59±32.13 UKat/L, while in accidental cases (n=78) mean age was 45.8±16.7 with PChE level: 493.61±31.2. Mean PChE levels in severe cases were: 37.95±15.94 U Kat/L with age 42.3±17.7 and 437.25 ±323.92 U Kat/L in mild cases with age 41.7±16.7 years. Most of cases admitted to EMD ward n= 40(42.1%). There was a statistically negative significant correlation between the duration of hospital stay, with PChE levels on admission, (r = - 0.396), and with age (r = - 0.209). There was a strong positive relationship (P<0.001) between duration of hospital stay with severity and suicidal manner. Majority of cases associated with OPP were males and the most encountered route of poisoning was oral route whether within accidental or suicidal manner, PChE levels were significantly correlated with the severity of condition and negatively correlated with the duration of stay in hospital. Recommendation: Health education law enforcement restricting the use of pesticides will reduce OP poisoning.

KEYWORDS: Organophosphorus compounds, OPP, PChE, U Kat/L, Dammam PCC

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INTRODUCTION

Organophosphorus compounds (OPC) are toxic substances that are contributing the main manner in suicidal, accidental or occupational poisoning, and they are responsible for the death of hundreds of thousands of people annually [1, 2]. Poisonings associated with these toxic substances are frequent among those who are unemployed, uneducated or with lower socioeconomic status and among farmers [3].Most OPC are highly lipid-soluble agents that are well absorbed by many routes: gastrointestinal, respiratory and skin. OPC show their toxic effects by inhibiting acetyl cholinesterase (AChE) enzyme after entering the body. As a result of AChE enzyme inhibition, the substrate acetylcholine (ACh) accumulates at the cholinergic synapses of the central nervous system, neuromuscular junction, parasympathetic nerve endings and some sympathetic nerve endings such as sweat glands (muscarinic effects),somatic nerves and ganglionic synapses of autonomic ganglia (nicotinic synapses). The continued stimulation and eventual paralysis of the (ACh) receptors account for the clinical signs and symptoms of organophosphate poisoning (OPP) [4]. The onset of symptoms and signs occur within the first 8 hours and nearly all within the first 24 hours. OPP is generally a serious condition for patients in the emergency medicine ward or intensive care unit (ICU). Therefore, early diagnosis and appropriate treatment are often life saving. It is known that physicians should be on alert for the diagnosis and treatment of OPP [5].There are two types of Acetyl Choline esterase enzyme: True and Pseudo choline esterase. True AChE, also known as RBC cholinesterase, or erythrocyte cholinesterase, which found primarily in red blood cell membranes at neuromuscular junctions, and in neural synapses. It is an accurate method for diagnosis of OPP but delayed depressed and delayed returned to normal. The other type is Pseudo Choline esterase (PChE) which also known as *plasma cholinesterase*, that is produced in the liver and found primarily in plasma. PChE is less accurate than true AChE but early depressed and return to normal, also, easier techniques compared with true AChE[5].

The purpose of this study was
Report, a two year pattern of acute OPP in patients who seeks medical advice at Dammam PCU in the period between2009-2011.

SUBJECTS AND METHODS

This cross-sectional study was designed retrospectively for patients with OPP who were admitted to Al-Dammam Poisoning Control Centre, KSA, between the 1st January, 2009 and 1st January, 2011.

Exclusion criteria
Patients whose medical records could not be obtained, those with carbamate poisonings, those admitted after 24 hours, and 200 others with incomplete medical records were excluded from the study. The patients either admitted primarily to the Al-Dammam (PCC) or were referred from other regional hospitals. The study protocol was approved by the ethical committee of UQU, Makah, KSA. A form has been prepared on which the following information was recorded: demographic data (age, sex), complaint, pulse rate, respiratory rate, blood pressure, mental status, route of exposure (ingestion, inhalation, skin contact), manner of poisoning, duration of hospital stay, month of OPP occurrence, therapeutic options, and clinical outcomes.The Glasgow Coma Scale (GCS) was used to assess the patient's level of consciousness.

The diagnosis of acute OPP was based on the following criteria [6, 7]:
(I) History of exposure to or contact with organophosphates within the last 24 hours.
(II) Characteristic of clinical signs and symptoms of OPP.
(III) Improvement in signs and symptoms after treatment using atropine and oximes.
(IV) Serum Pseudo cholinesterase activity level.

These patients were divided into two groups according to the manner of poisoning (Group A, suicidal poisoning; Group B, accidental poisoning). Additionally, the patients were allocated into four groups according to the severity of their clinical status (Group 1, non-serious intoxication, Group 2, mild poisoning; Group 3, moderate poisoning, and Group 4, severe poisoning).The severity of clinical status was assessed on admission based on: (1) increased the severity and number of findings and symptoms; (2) decreased blood pressure; and (3) the presence of specific clinical respiratory system and central nervous system findings [7-9].

Measurement of Serum pseudo-cholinesterase (PChE) activity and other laboratory parameters

Blood samples were collected with minimal venostasis, serum were separated from each OPP case immediately at the time of admission before administration of Pralidoxime (PAM). Serum was obtained from clotted blood by centrifugation within 1 h of sampling. Serum Pseudo cholinesterase activity was determined using an assay with butyrylthiocholine as the substrate. Cholinesterase hydrolyzes butyrylthiocholine (PTC) to form butyrate and Thiocholine that reacts with 5, 5'-dithiobis-2-nitrobenzoic Acid (DTNB) to yield yellow 5-thio-2-nitrobenzoate with an absorbance maximum at 405 nm. Therefore, the rate of change in absorbance at 405 nm is directly proportional to cholinesterase activity. The analyses were carried out within 2 h of sample separation using Boehringer reagent kits (Boehringer Mannheim GmbH, Mannheim, Germany) on an Olympus AU5400 Automatic Analyzer (Olympus Ltd., Tokyo, Japan). Other parameters such as electrolytes, glucose, and white blood cell (WBC) count were measured on admission [10, 11]. Unit conversion for PChE: U/L x 0.01667 = μ katal /L. After the diagnosis, all patients received the standard treatment for OPP, including gastric lavage, and fluid resuscitation. Patients also received atropine to counteract muscarinic effects such as hypersecretion, lacrimation , and bradycardia, and also parlidoxime (PAM) to reactivate AChE enzyme inhibited by the OPP. Atropine was administered as intravenous infusion (0.02-0.08 mg/kg/h) or intermittent bolus infusions (1-3 mg per 20 minutes [min]). PAM was administered as a starting dose of 2 g daily (divided into four doses) up to 100-200 mg/h (continuous infusion) according to the clinical severity of the condition. Most of the patients were observed in the emergency medicine ward. Patients who require mechanical ventilation (MV) were observed in the ICU. The indications for endotracheal intubation and MV are as follows: a loss of consciousness; excessive secretions, which cause an inability to protect the airway; poor gas exchanges unresponsive to oxygen treatment; cardio-respiratory arrest; and severe metabolic acidosis with hemodynamic instability (systolic blood pressure <90 mmHg).

Statistical method

All statistical calculations have been made using the SPSS® for Windows 13.0 (SPSS Inc. Headquarters, Chicago, IL, USA) software programme. Data were presented as mean ± SD and frequencies. Mann-Whitney U test was used to compare the groups according to continuous variables for the data that were not distributed normally. The discrete variables were evaluated by Chi-square test. Outcomes with P values <0.05 were considered significant.

RESULTS

Data of 95 cases have been collected from medical records of the patients admitted to Regional Centre for Poison Control in Dammam, KSA. Most common nationality of patients who were admitted due to OPP was Saudi (n=45, 47.3 %) while non-Saudi patients' nationality were (n=50, 52.63%): the Indian (n=24, 25.2 %); while Pakistanian were (n=12, 12.6 %); Egyptian constituted (n=6, 6.3 %); while other nationalities like Bangladeshi, Syrian and Sudanese (n=8, 8.42%). The study group consisted of 65 (68.4 %) males and 30 (31.5 %) females' patients, F/M ratio: 1: 2.17 with a mean age of 25.02±16.93 years (25.2± 17.2 in males and 36.5±24.8 in females' P<0.05) as shown in (Table 1).

Table 1
Pattern of Sex/age distribution of OPP

Gender	Frequency	%	M±SD (y.)
Male	65	68.4%	25.2±17.2
Female	30	31.6 %	36.5±24.8
Total	95	100 %	Average: 30.85 ±21.0

Manner of poisoning were either accidental (n=78, 82.11%) or suicidal (n=17, 17.89%). For patients who attempted suicide (n=17), the route of exposure was oral in 17 cases (100%). Meanwhile, the routes of accidental exposure (n= 78) were oral, inhalation and via the skin in (n=40, 51.2 %), (n=31, 39.7 %), and (n=7, 8.9 %) patients, respectively. Thus most common route of OPP regardless their manner is ingestion (n=57, 60%). The stratified age distribution was as follows: 53 patients (55.8%) were 15-40 years, 28 (29.5%) were children i.e. below 15 years, and 14 (14.7%) were 40-70 years. The ratio of male gender was statistically higher in the 15-40 years old age group than the other groups (Table 2).

Table 2
The distribution of gender according to age groups in OPP

Age-groups (years)	Female**	Male* *	Total**	P
<15	13(13.68%)	15 (15.79 %)	28(29.5%)	
15–40	14 (14.74%)	39 (41.05 %)	53 (55.8%)	
>40	3 (3.16%)	11 (11.58%)	14 (14.7%)	P<0.01
Total*	30 (31.58%)	65 (68.42%)	95 (100%)	

**** Line percent ** Column percent***

The mean age of the patients was 25.02±16.9 years, while, according to groups were as follows: suicidal attempt group: 22.8±18.1 years, accidental exposure group: 45.8±16.7 years, clinically severe group: 42.3±17.7 years, and clinically mild group 41.7±16.7 years. While there was no statistically significant difference between the clinically severe and mild groups, the mean age of the suicidal attempt group was significantly lower than that of the accidental exposure group (P<0.01). The data between moderate and (mild or severe toxicity) were non-significant (P>0.05) in all data in (Tables 3, 4).

Table 3
The mean± SD of the findings of the study group according to manner

	Suicidal attempt (n=17)	Accidental (n=78)	P Value
Age (year)	22.8±18.1	45.8±16.7	<0.01*
P-Cholinesterase(U Kat/L)	95.59±32.13	493.61±31.21	<0.001*
WBCs(10^3/uL)	13413.9±7235.9	10764.4±4706.9	<0.01*
Glucose (mg/dL)	153.3±98.4	119.5±41.5	<0.01*
Sodium (mEq/L)	137.4±4.3	137.5±3.4	>0.05
Potassium (mEq/L)	3.2±0.6	3.9±0.4	<0.01*
Arrival time (hour)	3.3±1.0	3.6±1.1	>0.05
HR(beats/min)	53.3±23.6	83.3±17.3	<0.001*
RR(breath/min)	11.1±3.9	14.9±2.5	<0.01*
S. Bl. P.(mmHg)	69.1±12.5	71.1±15.7	>0.05
Hospital stay (day)	5.1±4.3	2.9±1.8	<0.001*

**** P Value <0.05 or less considered significant value***

Table 4
The mean± SD of the findings of the study group according to clinical severity

Variant/ Severity	Severe (n=36)	Mild (n=11)	P Value
Age (year)	42.3±17.7	41.7±16.7	>0.05
P-Cholinesterase(U Kat/L)	37.95±15.94	437.25 ±323.92	<0.001*
WBCs(103/uL)	15057.4±8650.8	11332.5±5094.8	<0.01*
Glucose (mg/dL)	201.5±132.4	119.5±41.5	<0.001*
Sodium (mEq/L)	136.4±5.1	137.8±3.4	<0.05*
Potassium (mEq/L)	3.7±0.7	3.8±0.5	>0.05
Arrival time (hour)	3.6±0.9	3.3±1.1	>0.05
HR(beats/min)	95.2±29.5	87.0±17.8	>0.05
RR(breath/min)	22.9±4.4	22.5±3.1	>0.05
S. Bl. P.(mmHg)	70.5±10.4	93.5±13.3	<0.01*
Hospital stay (day)	6.5±4.9	3.4±2.6	<0.001*

Serum pseudo-cholinesterase (PChE) activity was determined in all patients on admission. The mean serum PChE level on admission was 205.31± 75.71 UKat/L (normal range: 5400–13200 U/L = 540-1320 U Kat/L) [10]. The values in 87 (91.58%) cases were lower than the normal range. The lowest serum pseudo-cholinesterase level was 4 U Kat/L. There was a statistically significant difference between PChE level in the suicidal attempt and PChE level in accidental exposure groups (P<0.001), and also between PChE level, with the clinically severe and mild groups (P<0.001). Findings of the patients according to the manner of poisoning and clinical severity are presented in Tables 3 and 4.The mean time lapse from exposure to arrival time (hour) at the hospital according to groups was as follows: suicidal attempt group: 3.3±1.0 hours, accidental exposure group: 3.6±1.1 hours, clinically severe group: 3.6±0.9 hours, and clinically mild group: 3.3±1.1 hours. There was no statistically significant difference between groups [suicidal vs. accidental (P>0.05), severe vs. mild (P>0.05)] according to their arrival time as shown in: (Tables 3, 4). The means of systolic pressure, pulse and respiratory rate on admission of severe cases were 70.5±10.4 mmHg, 95.2±29.5/minute and 22.9±4.4/minute, respectively. On the other hand the values in mild cases were 93.5±13.3 mmHg, 87±17.8 and 22.5±3.1. There was a statistical significant relation between systolic blood pressure in severe and mild cases (Tables 4).The mean hospitalization period of the study group was 4.3±3.6 days (range: 0.7-7.9 days). The hospitalization period of the patients according to groups were as follows: Suicidal attempt group: 5.1±4.3 days, accidental exposure group: 2.9±1.8 days, clinically severe group: 6.5±4.9 days and clinically mild group: 3.4±2.6 days. There were statistically significant differences between groups [suicidal vs. accidental (P<0.001), severe vs. mild (P<0.001)] as shown in Tables 3, 4.

Table 5
Percent of cases according to Severity of OPP

Severity of poisoning	No.,	%
Non serious	8	8.42
Outpatients (mild toxicity)	11	11.58
In patient(moderate toxicity)	40	42.11
ICU(severe toxicity)	36	37.9
Total	95	100

The patients have been classified into four groups according to severity of symptoms and site of admission, where 8.42% (n=8) was found to be not in a serious cases i.e. put under observation and PChE had found to be normal; on the other hand , mild toxicity cases (outpatients) was 11.58% (n=11). Moderate OPP cases (inpatient cases admission) were 40 patients (42.11%), giving us the highest incidence between all available data, finally severe toxicity cases i.e. marked reduction of PChE, marked reduction of level of consciousness and ICU admission, were 36 cases with percentage of 37.9% (Table 5).The most common symptoms and complaints on admission were nausea, vomiting and abdominal pain (n=44, 46.32%), altered mental status (n=36, 37.89%),

dyspnea (n=14, 14.74%), drowsiness (n=2, 2.11%), weakness (n=2, 2.11%), and 2 cases (2.11%) of asymptomatic. Cases may be present by more than one symptom. The mental status of patients on admission was generally good. It has been determined that 59 patients (62.11%) were fully awake (GCS: 15), two patients (2.11%) were in stupor or drowsy (GCS: 9–14), and 34 patients (35.79%) were in coma (GCS: 3–8) as shown in (Table 6).

Table 6
General characteristics of the study group (n=95)

Characteristics	Number of patients (%)	P value
Gender		P<0.05*
Male	65 (68.42%)	
Female	30 (31.58%)	
Age (years)		
14<	28 (29.5%)	P<0.001*
15–40	53 (55.8%)	
> 40	14 (14.7%)	
Mental status		
Fully awake	59 (62.1%)	P<0.001*
Drowsy or stupor	2(2.1%)	
Coma	34 (35.8%)	
Clinical severity		
Severe	36(37.89%)	P<0.05*
Moderate	40 (42.11%)	between mild and severe toxicity
Mild	11(11.58%)	
Non serious	8(8.42%)	
Manner of poisoning		
Suicidal attempt	17(17.89%)	P<0.05*
Accidental	78 (82.11%)	
Route of poisoning		
Oral ingestion	n=57(60%)	P<0.001*
Inhalation	n=31(32.63%),	
Skin contact	n=7 (7.37%)	
Season		
Spring	50 (28.0%)	P<0.001*
Summer	55 (40.4%)	
Autumn	37 (23.4%)	
Winter	22 (10.3%)	
Care unit		
Observation	8(8.42%)	
EMD (Outpatient)	11(11.58%)	P<0.05*
EMD (Inpatient)	40(42.11%)	between outpatient and ICU admitted patients
Intensive Care Unit	36(37.89%)	
Intermediate syndrome		
Developed	2 (2.11%)	P<0.001
Not developed	93 (97.89%)	
Clinical outcomes		
Survived	88 (92.63%)	P<0.001
Death	7 (7.37%)	

The majority of intoxication cases occurred in the summer. The seasonal distribution of intoxication cases was as follows: summer (40.4%), spring (28%), autumn (23.4%), and winter (10.2%) as illustrated in (Table 6).About 59.99% of the patients admitted to the emergency medical department (EMD) either as an outpatient 11 cases (11.58%) or as an inpatient 40 cases (42.11%), while 36 cases (37.89%) to the ICU. Only 8 cases (8.42%) have been put under observation due to lack of manifestations of OP toxicity. While death occurred only on 7.37% of patients ' that had not received treatment on time due to delay arrival or severe poisoning. Intermediate syndrome (IMS) was observed on 2.11% of patients (Table 6).There was a statistically negative significant correlation between the duration of hospital stay, with PChE level on admission, and age of the patients (r= -.396 ، r = -0.209) respectively as shown in: (Tables 7). The data between PChE levels on admission with: PChE level on discharge, and age, were none significantly correlated in all the data in (Tables 7).

Table 7
Correlation between PChE level on admission with: PChE level on discharge, age, and duration of hospital stay

	PChE on admission	Age	Hospital stay	PChE level on discharge
PChE level on admission	1	- 0.176	- 0.396**	- 0.011
Age	- 0.176	1	- 0.209*	- 0.034
Hospital stay	- 0.396**	-0.209	1	0.082
PChE level on discharge	- 0.011	- 0.034	0.082	1

. Correlation is significant at the 0.01 level, * Correlation is significant at the 0.05 level

There was no statistically significant difference between the severity groups (P>0.05) with arrival time, PChE level on discharge, and sex of the patients.PChE level on admission has showed significant positive relationship (P<0.001) with severity of OP toxicity of cases (Table 8). Meanwhile, PChE level on discharge was found to have non-significant relationship with severity of cases whether not serious or serious admitted to EMD ward or ICU or even in the EMD reception (P>0.05).

Table 8
Relation between PChE levels on admission, with Severity of OP toxicity

	N	Mean ± SD	F	P
Non serious	8	113.67 ± 98.72	23.663	P<0.001
Outpatient	11	91.30±26.82		
In patient	40	12.81± 30.91		
ICU	36	6.36± 4.43		
Total	95	205.31± 75.71		

Initial treatment was given to all patients in the EMD. Thirty sex cases (37.9%), of the patients needing endotracheal intubation and MV were treated in the ICU, 40 (42.1%) patients were treated in the EMD ward. Eleven (11.6%) received treatment in EMD reception, while; only 8 cases (8.4%) had been put under observation for any manifestation link to OP toxicity. The treatment methods were as follows: 93 (97, 9 %) patients underwent gastric lavage, 3 patients (3.2%) were administered pralidoxime with atropine. While 91 patients (95.8%) were administered atropine, but no patients had been treated with administered hemodialysis as it was unavailable.

DISCUSSION

Dammam is located in the Eastern part of KSA, with a population of approximately 2.3 million people who are primarily involved in agriculture and industries. As a result, organophosphates were being widely used to increase production and raise crop quality, and there were many cases of intoxication, either with accidental exposure or with suicidal intent. Data of 95 cases have been collected from medical records of patients mean age was 25.02±16.93 years, and the majority of patients (n=53, 55.8%) were between 15-40 years old.In a small study in Crete, Greece, patients' ages ranged from 13 to 74 years, with the highest number of cases being over 44 years of age [(11).] Kang et al., 2009 [(12)] had reported that patients' ages varied between 16-91 years, and the mean age was 54.5 years. In disagreement with those results and our result: Kara et al.,2002 [(13)] have found that children below 14 years were the commonest age and explained this result by children like to explore everything strange and depend on mouthing as their basic sense. Male was the commonest gender (68.42%) as compared to female (31.58%); the overall female to male ratio in this study was 1:2.17 in this study. In agreement with our result, Batra et al., 2003 [(14)]have found that male were 71, 28% and they explained their result by the widespread use of organophosphates in industrial and agricultural application by farmers, consequently most of the farmers are males. In addition, Chataut et al., 2011[(15)] had also found that among all families affected by OPC poisoning in Nepal; 58% of them were males and 42% were females (M/F ratio of

1:1.4). In this study, the major route of toxicity was the oral one (n=57, 60%). Suicidal attempts by ingesting organophosphate compounds were high in females, and the majority of poisoning were by unintentional exposure (n=78) rather than suicidal intent (n=17). In developing third-world countries, it has been reported that young adults commit suicide using organophosphate compounds for various reasons, such as unemployment, low income, depression, single status, and for this intent, the oral route is frequently preferred [16, 17]. The results showed that the manner of poisoning were with accidental exposure (n=78, 82.11%) rather than due to suicidal intent (n=17, 17.89%). Moreover, the majority of cases in the suicidal attempt or accidental exposure groups were young males (n= 65, 68.42%). In agreement with our results is another study in developed countries, where its accidental exposures are likely to be seen more frequently [10, 18]. In agreement with our result, previous studies conducted in Turkey have reported that females that were admitted are more frequently affected by organophosphate compounds than males because of higher suicidal attempts [3,19]. Poisonings due to organophosphate compounds used as pesticide frequently occur in other developing countries as well. The frequency of poisonings due to this toxic compound varies between countries and gender. It was reported that: males are mostly affected by organophosphate compounds in Australia, Portugal and Korea [10, 12, 20], while females are more often affected in Singapore, and Jordan [21, 22]. The ratio of suicidal attempts in this study was lower than in developing countries but higher than in developed countries. We think that the high rate of accidental organophosphate compound poisoning in eastern area of KSA can be attributed to the uncontrolled trade of this material, its inappropriate conservation, and its widespread use by the public and consequent availability.Every year, patients from various age groups were poisoned due to the organophosphate exposure in both developed and developing countries with some fatal outcomes. Lee and Tai, 2001 [22] determined the clinical features of 23 patients with OPPwho required intensive care and reported that the patients' ages ranged between 19-87 years, with a mean of 40.0±18.5 years. Tsai et al., 2007 [17] reported that in serious OPP cases, this average age tends to be increasing**.** In the present study, patients with severe toxicity i.e. who were admitted to ICU were 36 cases (37.89%) with fatalityoverall the study was 7 (7.37%). Therefore, OP is a serious public health problem that must be solved.In our study conducted in KSA, it was reported that accidental and suicidal OPP were mostly seen in July (n=55; 40.4%) because of the increase in agricultural activities in this month as explained by other studies[23,24].Similarly**,** Soysal et al., 2011[25] reported that OPP was frequently seen in the summer months. They determined that poisonings were mostly seen in summer, especially in June and July due to the widely used of organophosphate compounds as pesticides both in agriculture and home especially during vacation in summer. On the other hand, Dippenaar and Diedericks, 2005[26] found that OPP were frequently seen in January in South Africa as January is in the summer months. It also happened in South Africa as South Africa is below the equator. In the present study, the duration of hospitalization after poisoning differs according to the severity of the poisoning (3.4±2.6 day in mild intoxication and 6.5±4.9 day in severe intoxication), and according to the manner of poisoning (2.9±1.8 days in accidental exposure and 5.1±4.3 days in suicidal intent). Duration of hospital stay was also found to be affected also by the presence of complications such as respiratory failure, aspiration pneumonia, IMS, the presence of accompanying diseases, and developmental levels of the country. Duration of hospital stay ranges between 0.7 – 7.9 day in developed countries, and it can ranges between 3-12 days in developing countries[22,27].The duration of hospital stay in our study was similar to other results from developed countries; as it was shorter than observed in the developing countries. Longer hospital stay was likely due to the facts that most cases of suicidal attempt ingested large amounts of organophosphate compounds and most of them require MV, and because of the possible complications that can develop in severely poisoned patients managed in the ICU. The percentage of suicidal attempts were low in our study (17.89%), and the percentage of those who required intensive care (37.89%) was lower than in developing countries. After exposure to organophosphates, the occurrence of toxic effects is dependent on the amount of the compound, and this delay until the onset of effects ranges from 30 minutes to 2 hours [28].The period between exposure and treatment i.e. arrival time affects the morbidity and mortality. An increase during this period negatively affects the morbidity and mortality rates. Thus, the early admission of poisoned

patients is crucial. In several studies, it has been reported that the time of poisoned patients admission varied between 2.4 - 9.4 hours [27, 29, and 30].The variety in arrival times may be due to the distance between hospitals and city centers; the need to refer the poisoned patients to an advanced centre with intensive care unit; delayed referral of patients under follow-up with worsening findings to an advanced centre; and suicidal versus accidental etiology. In our study, the mean arrival time to the emergency unit was 3.3±1.1 h in mild intoxication and 3.6±1.1 h in severe intoxication (average: 3.75±1 h) after the exposure. This finding is similar to that of other studies previously mentioned in literature**.** In this literature, both in case reports and clinical studies, abnormalities in laboratory findings of patients with OPP have been reported. Laboratory findings on admission to the emergency room were evaluated as mean values according to both clinical severity and intent of intake. There were statistically significant differences in WBC count, glucose, and sodium between the clinically mild and severe groups, WBC count, glucose, and potassium levels between the suicidal attempt and accidental exposure groups (Tables 3, 4). In many studies, the increase in glucose level and WBC count were defined as the most common laboratory finding abnormalities after OP. Electrolyte abnormalities such as hyponatremia and hypokalemia, were less commonly reported [3,13,19]. Amanvermez et al., 2010 [19]reported that there was a correlation between the severity of poisoning glucose and WBC count levels in their study investigating the suicidal poisoning with organophosphates. In a study involving 47 patients in the ICU, Sungur and Guven, 2001 [31] found that there is an increase in WBC count in 72.3%, and in serum glucose levelat 31.9%. Ozer et al., 2007 [3] detected hyperglycemia in 74.6%, hyponatremia in 42.8%, and hypokalemia in 41.2%. Leukocytosis in 68.7% of the patients was reported by Yurumez et al., 2007 [29]. El-Naggar et al., 2009 [27] reported that the most common electrolyte abnormalities were hyponatremia (61.7%) and hypokalemia (61.7%). In this study, IMS development had determined in 2.11% of the patients in spite of general supportive therapy and early Pralidoxime treatment on admission to the ED. The patients who developed IMS were admitted due to suicidal attempt. It has been thought that great amounts of organophosphates ingested to terminate life and the consequent prolonged inhibition of AChE can explain this result of the patients who attempted suicide. IMS first defined by Senanayake and Karaliedde, 1987 [32] as a clinical situation resulting from the neurotoxic effects of organophosphates. The frequency of IMS varies between 7.7–42.1% [33, 34]. It is characterised by respiratory paralysis, proximal muscle weakness and motor cranial nerve palsies [16, 35]. There are numerous theories about the etiology of IMS, such as the severity of poisoning, some varieties of organophosphates (methamidophos, dimethoate), inadequate or delayed initiation of oxime therapy, and the persistence of organophosphate in the body [32,34]. In our study, the possible pesticides involved for those patients who could not be identified. In this study, a significant difference was found in the serum PChE levels between groups according to both severity and intent of intake (severe group 37.95±15.94 UKat/L vs. mild group 437.25 ±323.92 U Kat/L; suicidal group 95.59±32.13 U Kat/L vs. accidental group 493.61±31.21 U Kat/L) i.e. the U Kat/L = 10 U/L. Lee and Tai, 2001 [22] investigating the clinical features of patients with acute OPP who required ICU follow-up, reported that the serum cholinesterase level was found to be less than 500 U/L in severely poisoned patients. They divided the patients into three groups according to the degree of cholinesterase activity repression for admission as mild, moderate and severe. In another retrospective study of patients with suicidal attempt [19], patients were divided into three groups as mild, moderate and severe according to their clinical and laboratory findings. It has been reported that serum cholinesterase levels in the mild, moderate and severe poisoned groups were 2892.4±2458.8 U/L, 1329.0±1250.2 U/L, 593.4±422.5 U/L, respectively, and that serum cholinesterase levels in the severe poisoned group were significantly more depressing in comparison with the other groups [19] Nouira et al., 1994 [16] reported that the mean serum cholinesterase level was 448±409 U/L in patients with life-threatening poisoning and 611±575 U/L in the mild and severe groups without life-threatening poisoning. In another study, the mean serum cholinesterase level was found to be 110.7±167.9 IU/L in patients who died, and it has stated that the cholinesterase level was an important marker in estimating prognosis and closely related with mortality [12]. Aygun et al., 2002 [6] determined that the decreased level of serum cholinesterase does not indicate the severity in

acute OP but supporting the diagnosis. In another study [30], it has been reported that the mean serum cholinesterase level in patients with OPP was 1782.5±1965.7 U/L and that serum cholinesterase levels tended to decrease inversely proportional to the severity of poisoning. Yurumez et al., 2007 [29] declared that serum cholinesterase levels on admission were more repressed in females than males (mean cholinesterase levels were 1592.6±1735 U/L and 1918±2155.4 U/L in females and males, respectively). In the present study, treatment methods were as follows: 93 (97, 89%) patients underwent gastric lavage, 3 patients (3.16%) were administered Pralidoxime with atropine. While 91 patients (95.79%) were administered atropine, but no patients had been underwent with administered hemodialysis as it was unavailable. Current therapy in other studies for OP consists of airway control, intensive respiratory support, general supportive measures, decontamination, prevention of absorption, and the administration of antidotes, which are in the same lines as suggested by Eddleston and Clark, 2011 and Robey and Meggs, 2011 [4,5]. In addition, hemoperfusion would be considered in the treatment of severe OP; however, its effectiveness is controversial [7, 12].

CONCLUSION

OPP is a public health problem that threatens many lives especially in developing countries. Early and appropriate treatment of ED may prevents the development of IMS and also reduce mortality and morbidity. The role of cholinesterase level in estimating prognosis was previously considered controversial, but the results of this study are supporting the idea that it may be a good marker in determining the clinical severity. It is believed that: as in all poisonings, economical and cultural development of countries may reduce the number of OPP cases.

RECOMMENDATIONS

The best way to prevent OPP is to raise people awareness about this product and make the necessary legal arrangements towards suicidal attempts of OPP. Interventions directed towards health education, counseling, and the enforcement of laws restricting the availability and use of harmful pesticides may help in reducing such events in future. People have to join training courses in first aid to be able to deal with any toxin in generally and OPP specifically. Finally, it is important as recommended always, to buy a self-protective mask to be used when using pesticides.

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