Can Intravenous Lipid Emulsion Reduce Mortality Rate in Cases of Acute Aluminium Phosphide Poisoning? A Systematic Review

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ABSTRACT

Background: Acute pesticide poisoning has remained a significant public health concern for decades. Supportive care has been the mainstay of treatment. Intravenous lipid emulsion (ILE) therapy offers a potential new strategy.
Objectives: This systematic review aimed to evaluate the current research on the efficacy of ILE in treating aluminum phosphide (AlP) poisoning.
Methods: A comprehensive electronic search was conducted across various databases including PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), Campbell Systematic Reviews, Scopus, Web of Science, Springer Nature, Elsevier, Google Scholar, and regional databases encompassing Mansoura, Zagazig, Ain Shams universities, and Indian publications. Studies published in English language were considered for inclusion (from 2015 to 2023). Inclusion criteria focused on human studies evaluating the use of ILE for AlP intoxication.
Results: Five studies met the inclusion criteria, three studies were randomized controlled trials, one was observational cross sectional study**,** and one was case report encompassing a total of 224 patients. Of these, 102 patients received ILE, with all studies utilizing 20% ILE. Three studies administered ILE as a continuous intravenous infusion at a rate of 10 mL/h. Two other studies employed a bolus dose regimen, ranging from 1-3 mL/kg delivered over one minute, followed by continuous infusion. The overall mortality rate was 68.6% in the ILE group compared to 76.2% in the control group and the need for mechanical ventilation was lower in the ILE group with clinical improvement in the ILE group.
Conclusion: Intravenous lipid emulsion represents a novel therapeutic approach in toxicology with the potential to improve patient outcomes. This review suggests ILE may reduce mortality associated with AlP poisoning. Additionally, ILE use might be associated with decreased, need for mechanical ventilation, hospital stay and discharge time among survivors.
Key words: Aluminium; Phosphide; Intravenous; Emulsion; Treatment.

INTRODUCTION

For many years, acute pesticide poisoning has been regarded a significant public health issue [1]. According to the systematic review published at the year 2020 [2], 385 million unintentional acute pesticide poisonings were reported each year, resulting in 11,000 deaths globally.

Aluminium phosphide (AlP) known as wheat pill in the Egyptian market, is a well-known pesticide and rodenticide. It is used in several Asian nations, including

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Received: 04/02/2024 Accepted: 13/06/2024.
DOI: https://doi.org/10.35516/jjps.v17i4.2329

Pakistan and India, to protect wheat, rice, and other grains against rats. AlP is available in a variety of forms beyond tablets, including pellets, granules, and powders containing dark yellow crystals. Toxic phosphine (PH3) is released when AlP is exposed to moisture or water. Aluminium phosphide (AlP) acts as a pesticide to safeguard agricultural products. The matching response is as follows: AlP + 3H+ → Al3+ + PH3; AlP + 3H+ → Al (OH)3 + PH3 [3].

Exposure to phosphine triggers the production of reactive oxygen species (ROS), which are believed to be a major factor in phosphine poisoning. Studies have shown a link between phosphine treatment and lipid peroxidation, a process damaging cell fats, in all organisms tested, from plants to mammals. This damage, particularly from byproducts like 4-hydroxynonenal (4-HNE) and malondialdehyde (MDA), can disrupt various enzyme functions essential for core metabolic processes. Notably, ROS can both cause and be caused by lipid peroxidation, suggesting these two processes work together to worsen phosphine toxicity [4].

Supportive measures well known to be the main treatment of Aluminium phosphide toxicity [5]. Moreover, magnesium sulfate, melatonin, N-acetylcysteine, glutathione, sodium selenite, vitamins C and E, triiodothyronine, liothyronine, vasopressin, milrinone, Laurus nobilis L., 6-aminonicotinamide, boric acid, acetyl-L-carnitine, and coconut oil, were suggested through reported experimental and clinical studies that they can be used as antidotes by reducing the noxious oxidative characters of ALP [6].

Intralipid emulsion (ILE) has been alternatively, utilized to treat different lipophilic poisoning despite its primary application for toxicities related to local anesthetics. Infusion of ILE has been proposed by many previous studies as a method that can generate a lipid sink that would allow a toxin with lipid soluble properties, like phosphine, to be trapped inside the lipid emulsion and reduce both its toxicity and effect site concentration [7, 8]. Moreover, recent research suggests that ILE enhances cardiac cell survival and has a direct inotropic effect [9-12]. Furthermore, ILE is hypothesized to enhance mitochondria's uptake of fatty acids, permitting the restoration of ATP stores in spite of the harmful suppression of fatty acid transport systems [13-16].

In Egypt, practically little has been done to conduct scientific research on this subject and stop the continued loss of innocent lives, despite the rising number of patients who are hospitalized every year due to poisoning. Nevertheless, Egypt has paid close attention to the high number of poisoning-related deaths and to the poor survival rate after ALP poisoning.

This study aimed to provide a systematic review of the literature on the role of intravenous lipid emulsion in treating Aluminium phosphide toxicity. By identifying the drug's effective dose and ability to lower the mortality rate, this information may help develop clear guidelines for the treatment of such deadly poisoning.

METHODS

Search strategy:

An electronic search was carried out in the following databases, Pubmed, Cochrane Register of Controlled Trials (CENTRAL), Campbell Systematic Reviews, Scopus, Web of Science, Springer Nature, Elsevier, Google Scholar, Ovid, Mansoura journals, Zagazig journals, Ain Shams journals, and Indian journals. The search strategy employed a combination of Medical Subject Headings (MeSH) terms and keywords tailored to the study objectives and inclusion criteria. The following terms were used: IV lipid emulsion AND Aluminium AND phosphide AND (toxicity OR poisoning) AND (treatment OR management) were used for search in this database. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were used [17].

Study selection and data extraction:

Studies were selected based on pre-defined inclusion criteria. Two reviewers independently screened titles and

abstracts of identified studies. Full-text articles were retrieved for studies deemed potentially relevant based on initial screening. Discrepancies between reviewers were resolved through discussion or by consulting a third reviewer

Inclusion Criteria:

- Studies investigating the use of intravenous lipid emulsion (ILE) in conjunction with standard care for the treatment of aluminum phosphide (AlP) poisoning.
- Studies with a control group receiving standard treatment in the intensive care unit (ICU) setting.
- Studies enrolling patients with AlP intoxication who remained hemodynamically unstable despite receiving all supportive care measures.
- Studies reporting mortality rates as an outcome measure.

Exclusion Criteria:

- Studies solely investigating the use of ILE for other indications or AlP toxicity without incorporating ILE therapy.
- Studies published in languages other than English.
- Reviews, letters to the editor, or editorials.

Ethical Approval

Ethical approval for this study was obtained from the scientific committee of the Forensic Medicine and Clinical Toxicology department and the ethical committee of Kasr Alainy Faculty of Medicine, Cairo University (Approval number: 507-2023).

Data extraction:

To minimize bias, four researchers extracted data from the included studies, working independently of each other. Two additional researchers independently reviewed the extracted data for discrepancies, which were resolved through discussion and consensus. The following information was collected from each study:

Outcomes:

- **Primary:**
  - Changes in mortality and morbidity rates, including cardiotoxicity, hepatotoxicity, metabolic disorder, and others.
- **Secondary:**
  - Length of hospitalization for survivors and non-survivors.
  - Need for mechanical ventilation.

Evaluation of study methodological quality

To assess the risk of bias within the included studies, a methodological quality evaluation was performed. Randomized controlled trials (RCTs) were evaluated using the Cochrane risk-of-bias tool for randomized trials (Rob 2) as outlined in the Cochrane Handbook of Systematic Reviews of Interventions [18]. This tool assesses bias across five key domains:

- Selection bias: Evaluates the potential for bias introduced during the randomization process.
- Performance bias: Assesses the potential for bias introduced by deviations from the intended interventions for either the ILE or the control group.
- Detection bias: Evaluates the potential for bias introduced by incomplete or inaccurate measurement of outcomes.
- Attrition bias: Assesses the potential for bias introduced by missing outcome data due to participant dropout.
- Reporting bias: Evaluates the potential for bias introduced by selective reporting of outcomes.

For non-randomized observational studies, the Newcastle-Ottawa quality assessment scale (NOS) [19] was used to assess methodological quality. Cross-sectional and case report studies were evaluated using Joanna Briggs Institute [JBI] Critical Appraisal Checklist for case reports [20] for case reports.

Risk of bias of included studies:

The risk of bias within the included studies was evaluated using appropriate tools based on study design:

- Randomized Controlled Trials (RCTs): The Cochrane risk-of-bias tool for randomized trials (Rob 2) was employed to assess bias across key domains

according to the recommendations in the Cochrane Handbook of Systematic Reviews of Interventions [18].

- **Observational Studies:** The Newcastle-Ottawa quality assessment scale (NOS) [19] was utilized to evaluate the methodological quality of observational studies.
- **Cross-Sectional and Case Report Studies:** A relevant quality assessment tool, Joanna Briggs Institute [JBI] Critical Appraisal Checklist for case reports [20] was employed to assess the methodological quality of these studies.

The assessment revealed the following distribution of risk of bias within the included studies:

- One randomized controlled trial (RCT) exhibited a high risk of bias [21].
- One study demonstrated a medium risk of bias [22].
- The remaining studies displayed a low risk of bias [23, 24, 25].

Results

Search Methods:

A systematic search identified 461 relevant articles from PubMed, Cochrane, Scopus, Web of Science, Google Scholar, and Ovid databases. After removing duplicates and screening titles and abstracts, five studies met the inclusion criteria (Figure 1).

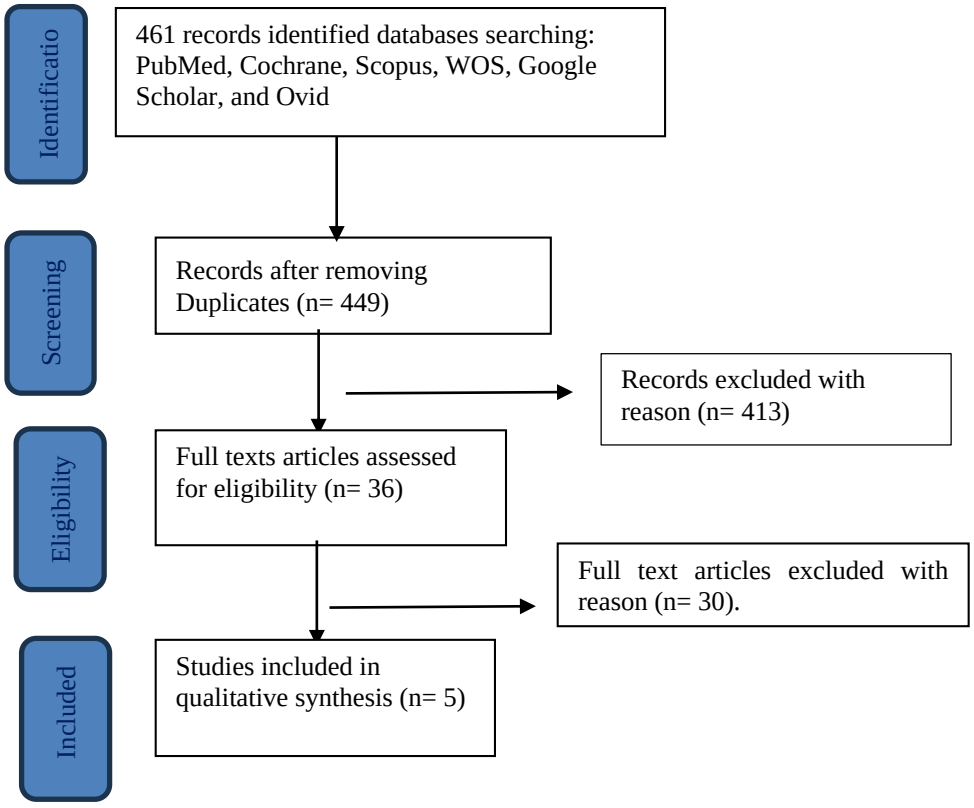

Figure 1: PRISMA flowchart of systematic review.

Study Design:

Three studies were randomized controlled trials (RCTs) [21, 23, 25], one was an observational cross-sectional study [24], and the last was a case report [22] (Table 1). The total sample size was 224 patients. The ILE group included 102 patients (59 females, 40 males), with unclear sex data for three patients in the control group [24]. Three RCTs were conducted in Egypt [21, 23, 25], with one each from Iran and India [22, 24]. The age of the majority of cases ranged from 20 to 40 years [22-25], except one study [21] the majority was <20 years (Table 2).

Table (1): General characteristics (type, duration and country) of the studies.

Authors	Country	Type of the study	Duration
Torabi et al (2023)	Iran	Cross sectional	……
Taalab et al (2022)	Egypt	Randomized Controlled Trial	January 2016 to January 2018
Hussein et al (2021)	Egypt	Randomized Controlled Trial	From the beginning of October 2020 to the end of January 2021
ELabdeen et al (2020)	Egypt	Randomized Controlled Trial	December 2016 till November 2017
Baruah (2015)	India	Case report	……

Table (2): Sample size, age and sex of patients included in each study.

Authors	Sample size (total N = 224)			Age		Sex	
Torabi et al (2023)	Total 19	Case 3	Control 16	M=31.79±10.97 years (15 – 66y)		Females = 8 (42.1%) Males = 11 (57.9%)	
Taalab et al (2022)	87	41	46	M = 28.23 ± 9.69 (13- 47y)		Females = 56 (64.4%) Males = 31 (35.6%)	
				Case ≤20 years=7 21-40 years=26 41-60y =8	Control ≤20 y=16 21-40 y=27 41-60y=3		
Hussein et al (2021)	66	31	35	……..		Case Female = 58.1% Male = 41.9%	Control 60% 40%
ELabdeen et al (2020)	50	25	25	Case <20y=14 20-30y=3 >30-50=8	Control <20y=10 20-30y=7 >30-50=8	Case Females = 17 Males = 8	Control 14 11
Baruah (2015)	2	2	------	Female =40 y Male =30 y		1 female 1 male	
Total	224	102	122				

M = Mean. N= Number.

Intravenous Lipid Emulsion Dosing:

All five studies used 20% ILE. Three used a dosage of 10 mL/hour intravenous (IV) infusion [21, 22, 24]. One study administered an initial bolus dose of 1-3 mL/kg starting 5-20 minutes after poisoning, repeated 2-3 times every 5 minutes up to 300 ml for persistent cardiovascular collapse followed by a continuous infusion (0.25 ml/kg/min) with the option to double the dose (0.5 ml/kg/min) for persistent hemodynamic instability [23]. Another study used a 1.5 ml/kg bolus over one minute followed by a continuous infusion (0.25 ml/kg/min for 30-60 minutes) and doubled to 0.5ml/kg/min permissible for

continued hemodynamic instability when Blood pressure remain low, moreover the infusion was continued for at least 10 minutes after circulatory stability [25]. In the studies, the infusion was tapered gradually with monitoring of serum triglyceride level (Table 3).

Table (3): Treatment regimen and hospitalization outcome of patients included in each study

Authors	Dose of ILE	Hospitalization outcome				Results of intervention
		Mortality rate		Intubation & mechanical ventilation	Discharge	
		Case	Control			
Torabi et al (2023)	10ml/hr of ILE 20%	100%	87%	……..	10.5% (2) of the patients were discharged, the discharged patients, the ejection fraction was 30 to 50%, while the patients who died had an ejection fraction of less than 30%.	**Survivors**: lower average number of treatment, higher systolic pressure, higher heart rate, higher percentage of oxygen saturation, higher average PH, HCO3, and pCO2
Taalab et al (2022)	**1, 2, 3 ml/kg of ILE 20%** (approximately 100 ml with average adult weight) as initial bolus dose starting 5-20 minutes after poisoning. **Repeated boluses** of the same dose were repeated 2-3 times every 5 minutes up to 300 ml for persistent cardiovascular collapse. **Continuous infusion** rate of 0.25ml/kg/min (15ml/kg/hr) followed and doubled to 0.5ml/kg/min permissible for continued hemodynamic instability when Blood pressure remain low. The infusion was continued for at least **10 minutes** after circulatory stability.	78%	58.70%	……..	28 (32.2%) survived and discharged **Survival time** **Survivors** **Non survivors** 6-24 hrs 14 (30.4%) 3 (7.3%) 25-48 hrs10 (21.7%) 14 (34.1%) 49-72 hrs 3 (6.5%) 15 (36.6)	Initial cardiac arrest rhythm Survivors Non survivors No arrest 19 (41.3%) 9 (22%) Shockable 20 (43.5%) 7 (17.1%) Non-Shockable 7 (15.2%) 25 (61%)
Hussein et al (2022)	SMOFlipid 20% : **1.5 mL/kg** over 1 minute followed by continuous infusion. **The bolus dose was repeated** every 5 minutes up to a total dose of 3 mL/kg. The bolus dose was **followed by a continuous infusion** of 0.25 ml/kg/min for 30 to 60 minutes. This **rate was increased to 0.5 mL/kg/min** in some cases if blood pressure decreased or when the clinical situation began to worsen. **A total dose** of 10 mLkg was given	61.30%	94.30%	……..	……..	**Survivors**: Systolic blood pressure, diastolic blood pressure and bicarbonate levels were significantly higher, the heart rate was significantly lower, decreases in liver enzymes (SGOT and SGPT) and bilirubin. **Improvement** of the haemodynamic compromise and metabolic acidosis caused by acute AlP poisoning. In fact, cardiogenic shock is the main cause of mortality in AlP
ELabdeen et al (2020)	**20% of ILE** at 10 mL/h, IV infusion **IV infusion continue until improvement or death**. The infusion rate was gradually tapered guided by the triglyceride level and the clinical condition	Case = 56% Control = 76%		Case = 36% Control = 92% **survivors** Case = 9.1% Control= 66.7%	Case group: median length = 58 hours Control group = median length = 12 hours. **Survivors** Case group = 60 hours Control group = 98 hours.	**There was no significant difference** in serum triglycerides, platelets count, and liver enzymes before and after ILE administration between case and control groups
Baruah (2015)	**ILE 20%** at 10ml/hr and infusion was tapered gradually with monitoring of serum triglyceride level.	0		0	Female discharged at day 5 Male discharged at day 10	Clinical improvement

Primary Outcomes:

- Mortality Rate: The overall mortality rate was 68.6% (70/102 patients) in the ILE group compared to 76.2% (93/122 patients) in the control group, with a statistically significant difference between the groups. Cardiogenic shock was the main cause of mortality in AlP [25].
- Morbidity Rate: All studies reported morbidity as cardiotoxicity, hepatotoxicity, saturation and metabolic changes. Survivors had higher systolic pressure, higher diastolic pressure, higher heart rate, and higher percentage of oxygen saturation, in addition higher average PH, HCO3, and pCO2 with clinical improvement after administration of ILE infusion [21 – 25]. Furthermore, the initial cardiac arrest rhythm was shockable in the majority of survivors [23]. While, the heart rate was significantly lower, decreases in liver enzymes (SGOT and SGPT) and bilirubin, later on the haemodynamic compromise and metabolic acidosis caused by acute AlP poisoning improved [25] (Table 3).

Secondary Outcomes:

Discharge and Survival Time:

- **ElLabdeen et al., [21]** reported an average hospital stay of 60 hours for survivors in the ILE group compared to 98 hours in the control group.
- **Talaab et al., [23]** reported varying lengths of stay for survivors (6-24 hours, 5-48 hours, and 49-72 hours).
- **Torabi et al., [24]** reported a 10.5% (2 patients) discharge rate, with survivors having an ejection fraction of 30-50%, compared to deceased patients with an ejection fraction below 30%.
- The case report **[22]** documented a female patient discharged on day 5 and a male discharged on day 10.

Need for Mechanical Ventilation:

- Only ElLabdeen et al. [21] reported this outcome. The need for intubation and mechanical ventilation was significantly lower in the ILE group (36%) compared to the control group (92%). No other studies mentioned this outcome (Table 3).

DISCUSSION

Food production and agriculture also have a significant impact on health. Since the production of staple foods like grains and vegetables is needed for growth, energy, and maintaining good health, a strong agricultural system is vital to people's well-being and health [26].

Suicidal poisoning from pesticide toxicity is a highly prevalent and difficult situation, particularly in developing countries where sales of the poison are unrestricted. In recent years, the most popular means of suicide in Egypt, particularly in rural regions, has been the ingestion of wheat/rice tablets or aluminum phosphide (AlP) [27]. Up until now, supportive interventions have been the cornerstone of treatment for ALP toxicity and have been linked to high mortality rates. Therefore, it's critical to find alternate therapeutic approaches [28]. Hindering absorption or aborting systemic effect either by creating a lipid sink in blood or using antioxidant agents are under research. The purpose of this systematic review was to assess the safety and effectiveness of intravenous lipid emulsion in reducing mortality associated acute ALP poisoning.

The studies included in this review demonstrated gender disparity ((59 females and 40 males) among cases of acute Alp poisoning received ILE). It may be attributed to the fact that women are more likely than men to self-poison at a young age, either out of genuine suicidal intent or simply to win sympathy, as noted by Khan et al. [29]. Conversely, Mathai and Bhanu's (2010) reported a higher incidence of AlP poisoning in males, potentially due to easier access to fumigants through employment and the increased stress associated with financial burdens [30]. These findings suggest potential socio-demographic factors influencing the risk of AlP intoxication, warranting further investigation.

Apart from cases of local anesthetic toxicity, the ideal

ILE dosage for acute intoxication is actually unclear. However, to best of our knowledge, the dosages utilized in the articles that are part of our analysis were regarded as safe and effective (not efficient). They were supposed to prevent potential ILE adverse effects, which are expected to manifest after a dose of 60 ml/kg and mostly impact the liver and lung tissues, which could offset the survival benefit [31].

The dosages utilized were consistent with the earlier findings by Macala and Tabrizchi (2014), which showed that doses over 1 mL/kg did not provide any extra advantages for treating lipophilic toxicity. However, ILE do not directly affect the heart at low dosages; instead, they primarily affect the pharmacokinetic profile of lipid-soluble toxins [32].

The initial intravenous bolus of 1.5 ml/kg over 1 minute is recommended by the 2015 European Resuscitation Council (ERC) Guidelines on Resuscitation, which are followed by a continuous infusion of 15 ml/kg/h. If there is ongoing circulatory collapse, the bolus should be given twice more at 5-minute intervals. The infusion ought to be maintained until the maximum dose of 12 ml/kg is reached or until hemodynamic recovery has been achieved. [31].

.Even though the observed increase in ALP poisoning survival did not reach a significant level in our systematic analysis, this might still be viewed as a positive finding because supportive care alone was insufficient to increase survival. This is corroborated by the findings of (Macala et al. (2018) that using ILE did not increase overall survival even when cardiac sodium channel blocking effect (as shown by QRS prolongation) improved [33]. In a similar way, ILE has demonstrated significant effectiveness in the resuscitation therapy of severe refractory systemic toxicity from local anesthetic drugs [34, 35]. Moreover, a recent literature review exploring novel therapies for AlP intoxication suggested a potential role for ILE in reducing mortality when combined with supportive care [3].

Comparing the effect of recently suggested antidotes on AlP poisoned patients survival, Goharbari et al. (2018) found that, as compared to control, patients who received 50 mg of liothyronine via nasogastric tube had a non-significantly lower mortality [36]. N-acetylcysteine has been recognized as a potentially beneficial modality for AlP poisoning, as evidenced by recent systematic review and meta-analysis [37, 38]. The mortality rate of AlP patients who received N-acetylcysteine was non-significantly lower than that of the control group [39, 40]. However, a significant decrease in the mortality of the rabbits treated with a combination of trimetazidine, NAC and vitamin C was observed by El Shehaby et al. (2022) [41]. According to a clinical study, taking Coenzyme Q10 orally along with liquid paraffin oil can increase the survival rate of AlP intoxicated patients [42]. However, the pure consumption of Q10 and its effect in both invivo and invitro or clinical studies has never been investigated.

This indicate that, based on the information that is now available, it is not currently advised to utilize intralipids as a sole antidote for AlP intoxication. Therefore, if there is no suspicion of a negative drug interaction, it is preferable to employ a multiple treatment regimen beside supportive measures.

In the current review, according to the pooled effect assessment of the fixed-effect model, the intravenous lipid group differed significantly from the control group in terms of the length of hospital stay among survivors (shorter).This may reflect clinical improvement of AlP poisoned patients upon use of ILE.

Conversely, a study conducted by Darwish and his colleagues (2020) found that the duration of hospital stay was significantly longer in patients received Coenzyme Q10 orally along with liquid paraffin oil (G III) followed by patients received liquid paraffin (G II) and the shortest duration was in patients received gastric lavage with Kmno4 (G I). That could be explained by the higher percentage of survivors in groups II and III while most of the cases in group I died a short time after admission [42].

The current systematic review revealed that one study

by El Labdeen et al. (2020) found that the experimental group required intubation and mechanical ventilation far less frequently than the control group (36% versus 92%, respectively) [21]. Given that endotracheal intubation was recommended in cases of AlP poisoning because of severe acidosis, significant myocardial suppression, pulmonary edema, aspiration, or disrupted sensorium, this could be a reflection of clinical improvement. Without a doubt, ILE's beneficial impacts in this regard reduce expenses, effort, and ventilation-related complications.

This is in line with Weinberg. (2012) findings that intubation for patients receiving lipid emulsion with multi- drugs overdose, including beta blockers, calcium channel blockers, tricyclic antidepressants, benzodiazepines, and other antidepressants, were shorter than those of matched controls [14].

Both traditional and modern medicine have been derived from plants all around the world. They have significantly improved human health and well-being by giving most people on the planet access to life-saving medications. Medicinal plants are used in traditional medicine, which treats more than 80% of the world's population, to treat a variety of illnesses, particularly in underdeveloped nations [43].

In the same line, Darwish et al 2020, reported high percentage (80%) of intubated patients in group I (only gastric lavage with Kmno4). This could point to the deterioration of the general condition of the patients in this group when compared to the other two groups. This denotes the relatively better outcome in these groups [42].

In the meantime, some research revealed that the production of reactive oxygen species (ROS) led to inflammation, which has been linked to the pathophysiological elements of a number of patient diseases. Therefore, this issue could be avoided by using the free radical scavenging method to scavenge ROS [44].

To our knowledge, no prior systematic review has been published on this subject. In order to gather data, we looked through four mega database websites. Upon reviewing the data from studies that contained our search terms, our systematic review estimated the mortality rate and morbidity, including the need for mechanical ventilation and hospital stays. Both are the two main consequences of ALP poisoning.

Limitations and Weakness

This review is subject to several limitations as the paucity of research on this topic and the relatively small sample size of patients in the included studies. Therefore, the data available remains insufficient to draw firm conclusions about the effectiveness of ILE and generalizability of the findings in cases of AlP poisoning. Furthermore, the majority of studies originated from developing countries, which may be attributable to the prevalence of agriculture and the ready availability of the pesticides in these regions. Also, the majority of the studies completed up to this point that made up our systematic review omitted information about the laboratory results. The timing of administration affects the outcome as well, something that was not addressed in any of the systematic review papers. Moreover, Data from in-vitro studies were excluded, in the future their analysis could reveal the pathogenic impact of ILE on isolated organs.

CONCLUSION

This systematic review investigated the current body of research on the use of intravenous lipid emulsion (ILE) therapy in treating acute aluminum phosphide (AlP) poisoning. The review identified a limited number of studies, but the available evidence suggests a potential benefit for ILE in reducing mortality rates following AlP intoxication. While the findings are promising, further well-designed studies are required to definitively establish the efficacy of ILE therapy in this patient population.

RECOMMENDATIONS

- **Future research:**
  - Conduct large-scale, well-designed randomized controlled trials (RCTs) to definitively, assess the

effectiveness of ILE therapy in reducing mortality associated with AlP poisoning.

- Standardize ILE dosing regimens within RCTs to facilitate robust comparisons and evaluation of treatment efficacy.
- Investigate the potential mechanisms by which ILE therapy may exert its beneficial effects in AlP poisoning.

- **Clinical practice:**
  - Consider the findings from this review when developing treatment protocols for AlP intoxication, particularly in settings with limited access to established therapies. However, due to the limitations of the current evidence base, ILE should not be used as a sole therapy but rather as a potential adjunct to supportive care measures.

Future Directions

The field of AlP poisoning management requires further exploration of novel therapeutic strategies. Future research should focus on developing and evaluating additional treatment modalities, alongside optimizing existing protocols, to improve patient outcomes in this life-threatening intoxication.

This systematic review identified a limited, but promising, body of research suggesting a potential role for ILE therapy in reducing mortality following AlP poisoning. Further studies are necessary to confirm these findings and establish optimal treatment protocols.

Funding: None.

Conflict of interest: Authors declare that there is no conflict of interest

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هل يمكن لمستحلب الدهون الوريدي أن يقلل معدل الوفيات في حالات التسمم الحاد بفوسفيد الألومنيوم؟ مراجعة منهجية

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ملخص

الخلفية: يعتبر التسمم الحاد بالمبيدات الحشرية مشكلة صحية عامة وخطيرة منذ عقود. يتم علاجه بشكل رئيسي من خلال الأساليب الداعمة. يوفر علاج الإنقاذ بمستحلب الدهون الوريدي استراتيجية محتملة أخرى للعلاج. تهدف هذه الدراسة إلى تقديم مراجعة منهجية للأدبيات حول دور مستحلب الدهون الوريدي في علاج سمية فوسفيد الألومنيوم.

الطرق: تم إجراء بحث إلكتروني في قواعد البيانات التالية: بيميد، سجل كوكرين للتجارب ذات الشواهد، مراجعات كامبل، سكوبس، شبكة العلوم، سبرنجر للطبيعة، إلسفير، باحث جوجل العلمي، مجلات المنصورة، مجلات الزقازيق، مجلات عين شمس، ومجلات هندية.

النتائج: حققت 5 دراسات معايير الاشتمال، كان إجمالي حجم العينة 224 مريضًا، تلقى 102 مريضًا مستحلب الدهن الوريدي، وتم استخدام مستحلب الدهن الوريدي 20٪ في جميع الدراسات؛ استخدمته ثلاث دراسات بجرعة 10 مل/ساعة بالتسريب الوريدي. بينما استخدمته دراستان أخرتان بجرعة 1، 2، 3 مل/كجم و1.5 مل/كجم على مدى دقيقة واحدة يتبعها تسريب مستمر. وكان معدل الوفيات الإجمالي 68.6٪ في مجموعة مستحلب الدهن الوريدي و76.2٪ في المجموعة الضابطة. كان وقت البقاء على قيد الحياة وخروج الناجين أقصر في مجموعة مستحلب الدهون الوريدي.

الاستنتاج: مستحلب الدهون في الوريد هو نهج جديد في علم السموم، ويمكن أن يقلل من معدل الوفيات، ووقت المستشفى وخروج الناجين.

الكلمات الدالة: فوسفيد، ألومنيوم، وريدي، مستحلب، علاج.

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تاريخ استلام البحث 2024/02/04 وتاريخ قبوله للنشر 2024/06/13.