

Accidental Acetaminophen Poisoning: Case Study

¹R Sivaranjani, ²Rajathi Sakthivel, ³M Hemamalini

How to cite this article:

R Sivaranjani, Rajathi Sakthivel, M Hemamalini, Accidental Acetaminophen Poisoning: Case Study. Journal of Emergency and Trauma Nursing. 2021;2(2):51–54.

Author's Affiliations: ¹Assistant professor, ²Vice principal, ³Principal, Hindu Mission College of Nursing, Chennai 600145, Tamil Nadu, India.

Corresponding Author: Rajathi Sakthivel, Vice Principal, Hindu Mission College of Nursing, Chennai 600145, Tamil Nadu, India.

Email: rajathisakthi80@gmail.com

Abstract

Acetaminophen (Paracetamol) is one of the most commonly used drugs available in tablet and liquid form both over the counter and on prescription all over the world. The commonly available strength in liquid are 120 mg/5 ml and 250 mg/5 ml. In hectic world, even with advanced technology still accidental poisoning in children is common and current management facilities makes to increase survival rate and reduce fatality. We reported case of child with accidental ingestion of paracetamol 30ml (250mg /5ml) with clinical signs of vomiting and abdominal pain. The line of management given as per guidelines saved the life of child and instructed to come for follow-up after 14 days. The pediatric nurse and health workers should emphasis in providing adequate information related to child care, first aid management and safety makes to prevent childhood mortalities.

Keywords: Paracetamol; Accident; Ingestion; Poisoning; Child care.

Introduction

Poisoning in children is a life threatening aspect among pediatric emergencies. It is a common and preventable cause of morbidity and mortality in early and middle child hood group of children.¹ The analgesic and antipyretic properties of Acetaminophen (paracetamol) were first described in 1893.² It had been shown to be an efficient antipyretic from 1956 and since 1960, it has been widely available as a non-prescription drug, with a therapeutic profile that reflects widespread safety and efficient. The paracetamol is the foremost frequently used over-the counter medicine and well tolerated through therapeutic doses in discrimination of any age groups.³ But it's one of the foremost common drugs in infants and children accidentally can ingest. The poisoning may be intentional self-poisoning, accidental

pediatric ingestion and infusion to repeated supra therapeutic dose of paracetamol.⁴

Background

In 1984, Rumack described a cohort of 417 children, aged 5 years or younger, who had ingested potentially toxic amounts of paracetamol. Only three children had altered liver enzymes and every one recovered with treatment and no fatalities within the cohort.⁵ According to U.S. poison control centers (2019) reported that, 37.4% poison exposed children were younger than 6 years/1000 with peak frequency between in one and two year old's; although poisoning in teens and adults were more serious. Across all ages, 76.6% of poison exposures were unintentional, 18.9% intentional and 2.6% had adverse reactions. In

children younger than 6 years, majority 99.2% of exposures were unintentional, compared to 33.8% of teen and 60.8% of adult exposures. Thus, it had been accepted that young children with accidental single exposures to paracetamol overdoses were less in danger of developing toxic reactions and subsequent morbidity and mortality than adolescents or adults.⁶

Epidemiology & Prognosis

Medications were the most common type of poison involved in pediatric cases. The top query concerned with paracetamol, Ibuprofen and multivitamin products as in previous years. In 2019, totally 7,269 enquiries involved in children lesser than 14 years of age, among this the majority were under 4 years of age (6,031, 82.9%); 85% were asymptomatic and 14% had minor or moderate symptoms such as nausea, vomiting, drowsiness and 1% of child only had severe symptoms. There were no fatalities.^{7,8}

Case Introduction

Master Rohith 1 year 11 month old male baby was brought by the mother with the complaints of lethargy feeling 'cold/weak', chest pain, vomiting, no intake for more than 3 hours and decrease in conscious level of the child. On questioning, it was revealed that he had accidentally ingested 30 ml of syrup paracetamol (25mg/5ml) suspension.

A: Chief complaints

The child got admitted in the emergency care unit on 27.1.2021 with symptoms of poor alert to stimulation, episode of clear pink color vomitus in 3 times within the last 4 hours, abdominal pain, headache. Moderately dehydrated and sleepy in mood.

B: History

On questioning the mother revealed that, he was treated for fever one month back. He was prescribed with syrup paracetamol 250mg instructed to give for 4ml (every 4 to 6 hours) 4 times per day. The unfinished bottle of syrup was kept in living room. But, unexpectedly Rohith was ingested the syrup in the morning around 9-10 am and she noted only after he started vomiting in light pink color along with aroma.

C: Assessment

On examination, he was afebrile, Pulse: 112 beats/minutes, RR: 18 breaths/minutes and BP: 127/99 mm/Hg. General Appearance: Thin, pale and drowsy. Height: 86cm, weight: 12.8kg MAC: 13.5 cm. Attained normal milestone and no development delay noted.

On assessment of Head, Eyes, Ear, Nose and Throat (HEENT): Noted Dry Mucosa in mouth, Pallor conjunctiva and no abnormalities were detected. CVS: Normal, S1 & S2 sound present and no murmur. RS: No Abnormalities Detected, Abdomen: soft, vomiting and particularly upper quadrant abdominal pain is identified on the kid during the examination. CNS: no focal deficit and presence of sweating. Ingested duration was quite around 4-6 hours prior to admission.

D: Lab findings

The child under gone the following investigations were described in table 1. Here the alteration of values was mentioned in remarks.

Table 1: Biochemical & Hematological parameters.

Parameter's	Child value	Normal Range	Remarks
Total serum bilirubin conjugated	0.3 mg/dL	0.1 to 1.0 mg /	Normal
AST	38 UI/L	M : ≤ 38 UI/L F : 31 ≤ UI/L	Normal
ALT	13 UI/L	M : ≤ 40 UI/L F : 32 ≤ UI/L	Normal
Alkaline phosphate	224 UI/L	Child: 245-768 UI/L	Decreased
GGT	34 UI/L	M : ≤ 11-50 UI/L F : 7-32 ≤ UI/L	Normal
WBC	10400/mm ³	5000 - 13,000 /mm ³	Normal
Hemoglobin	11 g/dl	12 - 14 g/dl	Decreased
PCV	29.2%	36 - 44 %	Decreased
Glucose	99 mg/dl	60-100 mg/dl	Normal
S.Urea	20 mg/dl	5-18 mg/dl	Increased
Creatinine	29 pg	27 - 31 pg	Normal
Na ⁺	137 meq/l	138-145 meq/l	Decreased
K ⁺	3.8 meq/l	3.5-4.3 meq/l	Normal
Chloride	104 meq/l	118-132 meq/l	Decreased
Hco ₃	18 meq/l	16.3-23.9 meq/l	Normal
S.ca ²⁺	5 mg/dl	4.8-5.3 mg/dl	Normal

ALT- Alanine Aminotransferase, AST: Aspartate Aminotransferase and GGT: Gamma Glutamyl Transpeptidase.

According to Rumack-Matthew, this nomogram was derived from a retrospective analysis of patients with acetaminophen overdose & their clinical outcomes (Figure 1). Here, the levels in plasma were plotted against time duration of post ingestion of acetaminophen drug. The nomogram applies to an acetaminophen level obtained after a single exposure & during the window period between 4 to 16 hours of post ingestion.⁹ Master Rohith toxicology study report showed that, serum paracetamol concentration level range was 102 -153mmol/l. According to the figure 1 showed

that his value was under lowrisk range with no hepatotoxicity.

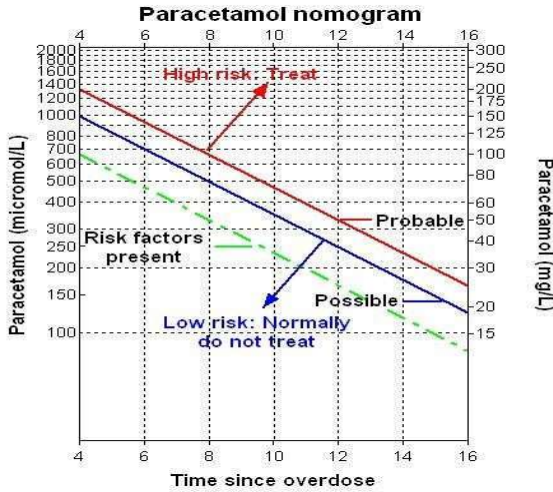


Fig. 1: Paracetamol Treatment Nomogram (source: emm -edonline - 2020).

Acetylcysteine

E: Course of Management Progress

Activated charcoal

Activated charcoal is not a lifesaving treatment but may prevent or reduce the need for treatment with acetylcysteine if used appropriately. Activated charcoal is only recommended for the cooperative patients aged greater than six years after one to two hours of postingestion.^{9,10} According to Information Centre/Clinical Toxicologist, it may be given up to four hours of post-ingestion for large overdoses but not recommended in liquid (syrup) overdose due to the fast absorption time.¹⁰

Based on the Management protocol (Figure2),the child was not treated with acetylcysteine since he was in lower risk of hepatotoxicity.^{9,10} Still biochemical values were altered, the Intravenous infusion of 0.9% DNS @ 40ml/hour was administered for first 24 hours.

N-acetylcysteine Administration of following single toxic paracetamol ingestion	
Time from ingestion	Indications for N-acetylcysteine
	2 hours Acetylcysteine will not be required for children aged less than 6 years with serum paracetamol concentration less than 150 mg/L at two hours post ingestion of liquid paracetamol. If greater than or equal to 150 mg/L do not commence acetylcysteine but repeat levels at four hours.
	4-8 hours Commence acetylcysteine if: <ul style="list-style-type: none"> • Serum paracetamol concentration levels taken at 4 hours post-ingestion are greater than or equal to 150 mg/L or • Serum paracetamol concentration levels taken 4-8 hours post-ingestion are above the nomogram treatment line. • Sustained release dosing is greater than 10g or 200mg/kg regardless of paracetamol levels. A full course of acetylcysteine is required. Await serum levels if results are expected within 8 hours of ingestion. If results are not expected within 8 hours, commence acetylcysteine and review serum levels when available. Continue acetylcysteine if levels taken within 4-8 hours of ingestion are above the nomogram treatment line. Otherwise cease infusion.
	Greater than 8 hours Commence acetylcysteine immediately if present 8 -24 hours post-ingestion. If present greater than 24 hours post-ingestion, collect bloods for further testing prior to commencing acetylcysteine (refer to Investigations). Continue acetylcysteine if serum paracetamol concentration levels above the nomogram treatment line or ALT greater than 50 U/L.
Unknown	Commence acetylcysteine immediately. Continue acetylcysteine if paracetamol concentration is greater than 10 mg/L or ALT is greater than 50 U/L.

Fig. 2: Single toxic protocol for paracetamol ingestion. (Source: Children’s Health Queensland Hospital and Health Service -2019)

After 24-32 hours of closed observations there was no fatal symptoms noted and abdominal pain was

disappeared. The liver and renal function values of S.Urea, Sodium, and chloride values were back to

near normal and discharged on the next day. On followup, the physician prescribed Syp. Tonoferon 1mg 7-10 drops once a day for 3 month, advised to continue the normal diet; come for after 14 days and next one month interval.

Discussion

In 1975, Rumack and Matthew proposed a nomogram, has been extensively utilized in the subsequent years for paracetamol overdose management and it cannot be applied if the precise time of ingestion is unknown. Still in current management, the evidence supporting that utilization of the nomogram to stratify hepatotoxic risk and guide for treatment decisions.^{5,7,11}

The present case report supported by similar retrospective study investigated in Denmark, focused on children aged 0-6 years with suspected singledose of paracetamol poisoning. The study results shown that, 221 children (58% male), with a mean age of 2.67 ± 1.05 years. Activated charcoal treatment was given in 87% of cases and 80% of the children received N-acetylcysteine treatment and only one case (0.5%) had a toxicity and management given according to the treatment protocol. Abdominal pain or vomiting was associated with higher paracetamol levels in plasma. None of the children developed liver injuries.¹²

Conclusion

Children with an acute ingestion of paracetamol overdose appear less prone to toxicity but untreated in prompt time may cause varying degrees of liver injury over the 2 to 4 days of following ingestion, including fulminant hepatic failure. Nurse play a cardinal role in child and family centered care. Hence, pediatric nurse should emphasize in educating parents and caregivers about child safety measures through health awareness programs aids to empower the knowledge and in to safety practice. The school health nurse, periodically plan to educate about child safety measures and the prevention of accidental poisoning to all children, aids knowledge transmission is highly possible to elder siblings to younger one and all family members makes to prevent fatality cases.

References

1. Tittarelli R, Pellegrini M, Scarpellini MG,

- Marinelli E, Bruti V, Di Luca NM, Busardò FP, Zaami S. Hepatotoxicity of paracetamol and related fatalities. *Eur Rev Med Pharmacol Sci.* 2017 ; 1;21(1 Suppl):95-101.
2. Majeed SK, Ramadhan MA, Monther W. Long-term toxicological effects of paracetamol in rats. *Iraqi Journal of Veterinary Sciences.* 2013 Jun 28;27(1):65-70.
3. Routledge P, Vale JA, Bateman DN, Johnston GD, Jones AL, Judd A, Thomas S, Volans G, Prescott LF, Proudfoot AT. Paracetamol (acetaminophen) poisoning: no need to change current guidelines to accident departments.
4. Penna A, Buchanan N. Paracetamol poisoning in children and hepatotoxicity. *British journal of clinical pharmacology.* 1991 Aug;32(2):143-9.
5. Rumack BH. Acetaminophen overdose in young children: treatment and effects of alcohol and other additional ingestants in 417 cases. *American Journal of Diseases of Children.* 1984 May 1;138(5):428-33.
6. Gummin DD, Mowry JB, Beuhler MC, Spyker DA, Brooks DE, Dibert KW, Rivers LJ, Pham NP, Ryan ML. 2019 Annual report of the American Association of poison control centers National Poison Data System (NPDS): 37th annual report. *Clinical Toxicology.* 2020 Dec 1;58(12):1360-541.
7. Arencibia ZB, Choonara I. Balancing the risks and benefits of the use of over-the-counter pain medications in children. *Drug safety.* 2012 Dec;35(12):1119-25.
8. Annual Report-The National Poisons Information Centre, Ireland. (2019),15-17. Available in https://www.drugsandalcohol.ie/33512/1/Poisons_centre_2019-annual-report.pdf.
9. Emmedonline, Spreading Emergency Medicine Across The Globe.2020. Available in https://emmedonline.com/toxicology/paracetamol_toxicity.p
10. Children's Health Queensland Hospital and Health service.2019 Paracetamol Overdose. Emergency management in children :(3-13)
11. Dan-Nielsen S, Bisgaard AS, Jans SR, Arianto L, Heedeland RL, Jørgensen MH. Retrospective study of paracetamol poisoning in children aged zero to six years found no cases of liver injury. *Actapaediatrica.* 2018 Oct;107(10):1775-80.
12. Bin NorAripin KN, Choonara I. The management of paracetamol poisoning. *Pediatrics and Child Health-Elsevir* -2009 Jan 1;19(11):492-7.