

Filicide and suicide in a family by paraphenylene diamine poisoning: A mother who committed suicide and poisoned her four children of which one died

Mohamed Babikir Abdelraheem, Mohamed Elbushra, El-Tigani Ali, Rashid A Ellidir, Amna I Bushara, Waleed B Abdelraheem and Eduard E Zijlstra

Toxicol Ind Health 2014 30: 679 originally published online 6 December 2012

DOI: 10.1177/0748233712448118

The online version of this article can be found at:

<http://tih.sagepub.com/content/30/8/679>

Published by:



<http://www.sagepublications.com>

Additional services and information for *Toxicology and Industrial Health* can be found at:

Email Alerts: <http://tih.sagepub.com/cgi/alerts>

Subscriptions: <http://tih.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations: <http://tih.sagepub.com/content/30/8/679.refs.html>

>> [Version of Record](#) - Sep 2, 2014

[OnlineFirst Version of Record](#) - Dec 6, 2012

[What is This?](#)

Filicide and suicide in a family by paraphenylene diamine poisoning: A mother who committed suicide and poisoned her four children of which one died

Toxicology and Industrial Health
2014, Vol. 30(8) 679–682
© The Author(s) 2012
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/0748233712448118
tih.sagepub.com



Mohamed Babikir Abdelraheem¹, Mohamed Elbushra¹,
El-Tigani Ali¹, Rashid A Ellidir¹, Amna I Bushara¹,
Waleed B Abdelraheem² and Eduard E Zijlstra³

Abstract

Paraphenylene diamine (PPD) hair dye poisoning is a common health problem in the Middle East and Indian subcontinent. It is the most common cause of suicide intent especially among females. We hereby present a 27-year-old female who presented with a clinical feature of PPD poisoning due to a suicidal attempt, and she died soon after arrival. She had survived a previous suicide attempt with PPD 4 years before. This time she also intentionally tried to kill her four children using PPD. One child died, one recovered after dialysis for acute kidney injury and the other two survived without any further intervention. This case illustrates that PPD poisoning may be used in filicide and suicide intent and that all patients who committed suicide should be reviewed and assessed by clinical psychiatrist.

Keywords

Filicide, suicide, PPD, AKI, poisoning

Introduction

Paraphenylene diamine (PPD) is an aromatic amine with many industrial and cosmetic applications (Singla et al., 2005). However, its main use is in hair dyes. PPD is the most common primary intermediate used in hair dye formulations; it is also used for colour enhancement (Ashraf et al., 1994; Nethercott et al., 1986). It has no Food and Drug Administration approval, and the Centers for Disease Control in the United States cite PPD as a contact allergen and its use directly to the skin should be avoided.

In Sudan, Morocco and India, PPD in different concentrations is commonly used by women either alone or added to henna (*Lawsonia alba*) to decorate their hands and feet in special social events such as wedding ceremonies (Abdelraheem et al., 2009; Anuradha et al., 2004; Filali et al., 2006; Sampathkumar et al., 2007). PPD in its pure form is available in the local market and its toxicity is well known; therefore, it has been used by many people for suicide or

homicide attempts. Ingestion of PPD causes characteristic severe oedema of the face and neck, often requiring tracheostomy, a swollen, dry, hard tongue and chocolate-brown urine (Hamdoun et al., 2008). It is a multisystem poison that can cause rhabdomyolysis and acute kidney injury, flaccid paralysis, severe gastrointestinal manifestations, cardiotoxicity and arrhythmias (Hamdoun et al., 2008; Sampathkumar et al., 2007). In adults, 70–90% of episodes of PPD

¹Department of Paediatrics, Soba University Hospital, University of Khartoum, Sudan

²Department of Medical Laboratories, Soba University Hospital, University of Khartoum, Sudan

³Rotterdam Centre for Tropical Medicine, Rotterdam, The Netherlands

Corresponding author:

Mohamed Babikir Abdelraheem, Department of Paediatrics, Soba University Hospital, University of Khartoum 11111, Sudan.
Email: elfakky@hotmail.com

poisoning are attempts at suicide, while homicide and accidental poisoning are less common. The reported mortality rates range between 11 and 39%. There is no specific antidote, and treatment is mainly supportive (Hamdouk et al., 2008).

We report a family with PPD poisoning due to filicide (the mother killing her children) and suicide.

Case report

A 27-year-old female (housewife) was admitted to the emergency department of the Ear Nose and Throat Hospital (ENT Hospital) with a short history of shortness of breath, difficulty in speaking and inability to walk. Before that she had been quite well. However, the family mentioned that 4 years ago she attempted suicide using PPD and was admitted to the same hospital for few days and discharged in a good general condition but no follow-up was carried out. At presentation she was ill, dyspnoeic, with a respiratory rate of 40 breaths per min, a pulse rate of 120 beats min and with a blood pressure of 110/90 mmHg. There was facial swelling and increased swelling of the neck. The tongue was black, swollen and protruding. The remainder of the physical examination was normal apart from flaccid paraparesis and pain and tenderness of the lower limbs. An immediate tracheostomy tube was carried out to secure the airway and the patient received supportive oxygen. A urinary catheter was inserted and 500 ml of black coloured urine drained in the urine bag. While still in the emergency department, she suddenly collapsed and died. The electrocardiogram (ECG) carried out at that time showed ventricular arrhythmia.

A few hours' later four children were admitted to the ENT hospital with a similar presentation, and it was noticed that they were from the same family and that the woman who had just died was their mother.

Child 1

This 5-year-old female presented with dyspnoea, angioedema of the neck and inability to walk. She had been quite well and playing around when she suddenly became ill after ingestion of fruit juice given to her by her mother. At presentation she was ill, with a respiratory rate of 56 breaths min, a pulse rate of 110 beats min and a blood pressure of 100/60 mmHg. There was a swelling of the neck. Examination of the chest, cardiovascular system and abdomen was normal. There was weakness in both upper and lower limbs. It was noted that she passed black coloured

urine. Her weight was 15 kg (between 10th and 25th percentile) and her height is 107 cm (at the 50th percentile). An emergency tracheostomy was carried out, and she was referred immediately to the paediatric emergency department. She then received antihistamine, hydrocortisone and forced alkaline diuresis as per protocol for presumed PPD poisoning. After stabilization, she was admitted to the Pediatric Intensive Care Unit at Soba University Hospital the next day. Initial investigations were as follows: urine analysis: black coloured, albumin+ and uncountable red blood cells (RBCs); blood urea: 44 mg/dl, creatinine: 0.9 mg/dl, Na: 138 mmol/l, K: 3.8 mmol/l, Ca: 7.5 mg/dl and uric acid: 3.5 mg/dl; serum albumin: 3.5 gm/dl, globulin: 2.9 gm/dl and total bilirubin: 0.3 mg/dl (direct 0.1 mg/dl). All liver and muscle enzymes were elevated: aspartate aminotransferase (AST): 2067 u/l, alanine aminotransferase (ALT): 390 u/l and alkaline phosphatase (ALP): 190.6 u/l; creatine kinase (CPK): 45183 u/l; lactate dehydrogenase (LDH): 3292 u/l.

Initially, she showed some improvement; the size of the neck and tongue swelling started to decrease and her urine output increased to 1100 ml/24 h, but the urine remained dark coloured. After 36 h, she developed tachycardia, severe dyspnoea and cyanosis with a diagnosis of cardiac arrhythmia; she died despite attempts to resuscitate. A few days later, the result of a urine test for PPD was reported positive.

Child 2

This 7-year-old male child presented with a history of mild neck and tongue swelling and difficulty in walking. He had pain in lower limbs, especially during walking. He had also been offered fruit juice by his mother. On examination, he was unwell. The respiratory rate was 20 breaths min, the pulse rate was 100 beats per min and the blood pressure was normal. His weight was 23 kg (at the 75th percentile) and his height was 136 cm (at the 90th percentile). There was mild neck swelling not causing any respiratory compromise. Examination of the cardiovascular system, chest and abdomen was normal. There was swelling and tenderness in both the calf muscles. Repeated ECGs were normal. Investigations were as follows: urine analysis: black coloured, albumin+++ and uncountable RBCs. Complete blood count was normal. Blood urea: 15 mg/dl, creatinine 0.7 mg/dl, Na: 139 mmol/l, K: 4.9 mmol/l, Ca: 7.8 mg/dl and uric acid: 4.3 mg/dl; serum albumin: 3.7 gm/dl, globulin: 3.7 gm/dl and total bilirubin: 0.3 mg/dl (direct

0.1 mg/dl). All liver and muscle enzymes were elevated: AST: 2084 u/l, ALT: 444 u/l and ALP: 225.5 u/l, CPK: 48397 u/l and LDH: 2975 u/l. A urine sample for PPD was positive.

He received intravenous fluids and forced diuresis using frusemide. Antihistamine and hydrocortisone were also given. Urine output continued to decline till day 3, when it became <0.5 ml/kg/h despite all conservative measures and he became fluid overloaded. The urine colour did not change from its black colour, and blood urea and creatinine rose to 123 mg/dl and 1.9 mg/dl, respectively. Haemodialysis was started and continued for 2 weeks with remarkable improvement of his renal function. He was then discharged in a good general condition.

Child 3 and child 4

Child 3 and child 4 were females of 3 years and 18 months old, respectively. They presented in a good general condition and have no complain, but the major concern was that they could have been given the same fruit juice. They were kept in hospital under observation for 24 h and discharged home with close observation, which revealed no manifestations of PPD toxicity.

Discussion

PPD is a common cause of suicide intent. In Sudan, it is cheap and its potential for suicidal attempts is well known to the public. It is available in the local market in its pure form and until recently there were no restrictions for its use or trade. Although its trade was restricted by legislation, these laws are rarely observed and there are strong social and cultural factors that permit its use in special events. An average of 287 cases with PPD poisoning is seen yearly at the ENT hospital, Sudan (Hamdouk et al., 2008). Many cases in the literature including adults and children has been reported as a suicide intent, homicide or accidental poisoning due to PPD (Anuradha et al., 2004; Ashraf et al., 1994; Sawsan et al., 2010), while others reported PPD intoxication in children within the context of child abuse (Salah et al., 2009). To our knowledge, this is the first report of filicide and suicide intent with PPD in a family committed by their mother. Maternal filicide is defined as a child killed by the mother. The mothers frequently tend to be psychotic and depressed with an intention towards suicide; others may have preexisting personality disorders (Resnick, 1969). It has been reported that

16–29% of cases of filicide are followed by successful suicide by the mother (Nock and Marzuk, 1999). When mothers of young children commit suicide, about 5% also kill at least one of their children (Appleby, 1996; Schalekamp, 2005). In our family report, the mother herself died with one of her children, while three other children survived. In our report, the mother was quite well till the date of the event; however, 4 years ago she survived a previous suicide intent using PPD. She was discharged from the ENT hospital without follow-up or referral to psychiatric care. It is well known that patients with a prior history of suicide attempts are five to six times more likely to commit another attempt and up to 50% of those who are successful have made a prior attempt (Pokorny, 1983).

The risk of intention to commit suicide increases among mothers who are poor, socially isolated, who are full-time caregivers, who were victims of domestic violence or who had other relationship problems (Gunnell et al., 2005; Varnik et al., 2005). Further evaluation of our family report revealed that the mother was poor and was subjected to severe domestic violence by her husband and often in front of her children.

We feel that this family did not receive adequate care after the earlier suicidal attempt of the mother and that the serious domestic problems that were not noted by relatives, health care workers or community workers led the woman to commit filicide-suicide attempt. This shows that there is a need for further development of community medicine in Sudan to provide a medical and a social network in which those in need can receive appropriate care without having to rely on hospital-based services.

Conclusion

Acute PPD poisoning continues to be a common and potentially lethal intoxication especially among adolescents and children. The vast majority of childhood PPD poisonings are unintentional, but sometimes may be inflicted by the parents. Education of the public, community awareness and attention in the media may all help to prevent PPD poisoning. In addition, health workers need to be educated about PPD poisoning and underlying factors. Finally, maternal filicide motives provide another framework for working towards PPD prevention, which should include involvement of psychiatrists and community workers.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Abderlaheem MB, El-Tigani MA, Hassan EG, Ali MA, Mohamed IA and Nazik AE (2009) Acute renal failure owing to paraphenylenediamine hair dye poisoning in Sudanese children. *Annals of Tropical Paediatrics* 29(3): 191–196.
- Anuradha S, Arora S, Mehrotra S, Arora A and Kar P (2004) Acute renal failure following paraphenylenediamine (PPD) poisoning: a case report and review. *Renal Failure* 26(3): 329–332.
- Appleby L (1996) Suicidal behaviour in childbearing women. *International Review of Psychiatry* 8: 107–115.
- Ashraf W, Dawling S and Farrow LJ (1994) Systemic paraphenylenediamine (PPD) poisoning: a case report and review. *Human and Experimental Toxicology* 13(3): 167–170.
- Filali A, Semlali I, Ottaviano V, Fumari C, Corradini D and Soulaymani R (2006) A retrospective study of acute systemic poisoning of paraphenylenediamine (occidental takawt) in Morocco. *The African Journal of Traditional* 3(1): 142–149.
- Gunnell D, Magnusson PK and Rasmussen F (2005) Low intelligence test scores in 18 year old men and risk of suicide: cohort study. *BMJ* 330: 167.
- Hamdoun MI, Abdelraheem MB, Taha AA, Benghanem M and De Broe ME (2008) Paraphenylenediamine hair dye poisoning. In: De Broe ME, Porter GA, Bennett WM and Deray G (eds) *Clinical Nephrotoxins: Renal Injury from Drugs and Chemicals*. 3rd ed. New York: Springer, pp. 671–679.
- Nethercott JR, MacPherson M, Choi BC and Nixon P (1986) Contact dermatitis in hairdressers. *Contact Dermatitis* 14(2): 73–79.
- Nock MK, Marzuk PM (1999) Murder-suicide: phenomenology and clinical implications. In: Jacobs DG (ed) *Guide to Suicide Assessment and Intervention*. San Francisco: Jossey-Bass, pp. 188–209.
- Pokorny AD (1983) Prediction of suicide in psychiatric patients: a report of a prospective study. *Archives of General Psychiatry* 40: 249.
- Resnick PJ (1969) Child murder by parents: a psychiatric review of filicide. *The American Journal of Psychiatry* 126: 73–82.
- Salah AI, Zeinab MG, Mohamed A, Huda S and Mohammed E (2009) Child abuse: under reported, under diagnosed and under treated; case report and literature review. *Khartoum Medical Journal* 2(2): 222–225.
- Sampathkumar K, Soraj YS, Ajeshkumar RP, Mahaldar AR and Muthiah R (2007) Rhabdomyolysis due to hair dye poisoning: an emerging threat. *Indian Journal of Critical Care Medicine* 11: 212–214.
- Sawsan AS, Mohy KE, Amany EA-E, Manal AA-E and Zeinab AA-E (2010) Clinical profile of acute paraphenylenediamine intoxication in Egypt. *Toxicology and Industrial Health* 26: 81.
- Schalekamp RJ (2005) Maternal filicide-suicide from a suicide perspective: assessing ideation. Available at: www.ojp.usdoj.gov/bjs/homicide/children.htm (accessed 14 March 2012).
- Singla S, Miglani S, Gupta P, Lai AK and Agarwal AK (2005) Paraphenylenediamine (PPD) poisoning. *Journal of Indian Academy of Clinical Medicine* 6: 236–238.
- Varnik A, Kolves K and Wasserman D (2005) Suicide among Russians in Estonia: database study before and after independence. *BMJ* 330: 176.