Case report

Suicide by para-phenylenediamine Poisoning

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Abstract

Twenty three cases of acute para-phenylenediamine poisoning were examined clinically at emergency ward of Rama Medical College Hospital, Kanpur (Uttar Pradesh) irrespective of age, sex and socio-economic strata along with route and manner of administration of the poison.

Albuminuria, anaemia, hypocalcemia, leucocytosis, thrombocytopenia, increased serum bilirubin, prolonged bleeding and clotting time along with increased levels of liver enzymes and serum creatinine were observed as significant biochemical parameters; on investigation in respect to complete haemogram, liver function test, renal function test, serum electrolytes, serum CPK levels and arterial blood gas analysis.

The para-phenylenediamine is the ingredient of a traditional cosmetic hair dye available with the trade name Godrej expert powder hair dye, which is orally administered mainly with an intention to commit suicide, sometimes accidentally and very rarely as homicidal poison by hair dye users. The suicidal poisoning is more common in females as compared to males. The systemic toxicity of PPD has serious consequences which may eventually lead to death.

The cases are reported with the advice “public education and strict control over the sale and distribution of para-phenylenediamine should be done to reduce poisoning by this agent”.

Key Words: Para-Phenylenediamine, Suicidal Poisoning, Traditional Cosmetic, Hair Dye

Introduction:

Para-phenylenediamine is a poison, semi-permanent dye has smaller molecule and is therefore able to penetrate the hair shaft. This Colour will survive repeated washings.

Godrej hair dye, supervasmol 33, Para-phenylenediamine, are used for colouring of hair, P-phenylenediamine (PPD) is an organic compound. This derivative of aniline aromatic amine, is a colourless solid when pure. This compound is used in almost every hair dye marketed regardless of brands. The darker the colour, usually, the higher the concentration, some of the so-called ‘Natural’ and ‘herbal’ hair colours, while ammonia free contains PPD. Some product sold as henna also contains PPD. Particularly black henna.

Short exposure to high level of PPD may cause severe dermatitis, eye irritation and tearing, Asthma, renal failure, vertigo tremors, convulsions and coma.

Ingestion of PPD produces rapid developments of edema of face, neck, pharynx tongue and larynx with respiratory distress which often needs tracheostomy.

In the later stages Rhabdomyolysis and acute tubular necrosis with acute renal failure and hepatic failure develops. Bleeding tendency (bleeding from gums), sub-conjunctival hemorrhage and bleeding from mucus membrane also occur.

Material and Method:

Twenty three cases of acute Para-phenylenediamine poisoning admitted to Rama Medical College & Hospital Mandhana Kanpur U.P. were examined irrespective of age, sex, socioeconomic strata Profession along with manner of administration of the poison.

Following investigations were done:

1. CBC, BT, CT
2. Renal function tests:
   a. S. creatinine
   b. Blood urea
   c. Urine: Routine and Microscopic
3. Liver function test
   i. S. Bilirubin
   ii. SGPT, SGOT
4. Serum electrolytes:
   a. Serum Sodium
   b. Serum Potassium
   c. Serum Calcium
5. CPK
6. Arterial blood gas analysis
Results:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Biochemical Parameter</th>
<th>Percentage of cases shown derangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raised total Leucocyte counts</td>
<td>78.125</td>
</tr>
<tr>
<td>2</td>
<td>Raised Liver enzymes: SGPT, SGOT</td>
<td>62.5</td>
</tr>
<tr>
<td>3</td>
<td>Raised serum creatinine</td>
<td>46.88</td>
</tr>
<tr>
<td>4</td>
<td>Hypocalcemia</td>
<td>37.5</td>
</tr>
<tr>
<td>5</td>
<td>Raised Bilirubin</td>
<td>68.75</td>
</tr>
<tr>
<td>6</td>
<td>Reduced Hemoglobin</td>
<td>31.25</td>
</tr>
<tr>
<td>7</td>
<td>Prolonged BT and CT</td>
<td>18.75</td>
</tr>
<tr>
<td>8</td>
<td>Thrombocytopenia</td>
<td>31.25</td>
</tr>
<tr>
<td>9</td>
<td>Blood urea</td>
<td>46.8</td>
</tr>
<tr>
<td>10</td>
<td>ABG Derangement</td>
<td>46.8</td>
</tr>
<tr>
<td>11</td>
<td>Albuminuria</td>
<td>50</td>
</tr>
</tbody>
</table>

Discussion:

Hair dye containing PPD is used for hair colouration and is added to Henna to accentuate the colour when used on the skin. Over-doses with this chemical is common, and can be fatal if taken in large quantities.

Death is usually caused by angioneurotic edema or arrhythmias due to direct cardiotoxicity of PPD cases of poisoning of PPD which develops renal failure require dialysis. The cause of renal injury is probably direct nephrotoxicity of compound. Rhabdomyolysis caused by PPD is also a cause of ARF in these patients.

The lethal dose of PPD is not known; estimates vary from 7-10 grams. The characteristic chocolate brown colour of the urine could be confirmative evidence of hair dye poisoning in individual with the poisoning of PPD (Presence of hair dye in urine can be confirmed by this layer chromatography in the lab). First case of systemic toxicity with PPD was described by the Nott in 1924 in the owner of a hair salon. [7] A report from Sudan described a series of 18 cases of acute hair dye poisoning. Sood et al and Chug et al have reported hair dye poisoning from India. [8, 9]


In our study entire poisoning was by Ingestion. The toxic effects of PPD are many. The most explainable in the combined effect to kidney resulting from hypoxia, dehydration, intravascular hemolysis, methemoglobinemia and a direct toxic effect of the chemical or its by products on the renal tubules. Rhabdomyolysis may also contribute to renal failure. [10, 11] In our study total leucocutes count was raised in 78.125 percent cases 62.5 cases were raised liver enzymes, S. creatinine and blood urea was raised in 46.88 percent cases, these patients also have deranged ABG. Albumunaria seen in 50 percent case prolonged BT, CT in 18.75 percent cases, thrombocytopenia in 31.25 percent cases. 6 cases were Referred for dialysis were expired, mortality was 18.75%. mortality was 21.1% is study by Ayoub et al [4, 6] and 41.9 in study by M, Sir Hasim et al and 22% in study by Yagi et al. [6] The mortality was less in our study probably because of ingestion of low amount of dye, and early treatment of patient.

Conclusion:

The systemic effects of PPD poisoning have serious consequences which may eventually lead to death. The Lethal dose of PPD is not known; estimates from 7-10 grams. The mechanisms of acute tubular necrosis are many. The most of the injuries resulting from hypoxia dehydration, intravascular haemolysis, Methaemoglobinemia and direct toxic actions of chemical or it’s by products on the renal tubules. This study showed that PPD poisoning was fatal in about 18.75 percent cases. The poisoning of PPD was not more common in this region previously.

Previously cases of Celphos poisoning were more but due to the strict control of sale of Celphos, poisoning of hair dye (PPD) is more common these days. The controlled supervision over selling of hair dye is necessary to stop PPD poisoning. We recommend that the selling of hair dye containing PPD should be banned and public education programme should be initiated in this regard so that mortality from PPD may be prevented, because availability of PPD in home causes easy accessibility of this poison.

References: