

# Tracheostomy in Hair Dye Poisoning - Indications and Clinical Outcome.

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## ABSTRACT

**Background:** Hair dye ingestion is an attractive means of deliberate self harm because of its low cost and unrestricted availability and is common in rural south India. Patients present with compromised airway due to upper respiratory tract edema, facial and neck edema. Aim: To determine the criteria for managing airway by tracheostomy in patients with hair dye poisoning. **Methods:** This study was conducted in Tirunelveli medical college and patients with alleged history of consuming hair dye were included in study. Patients who mixed other poisons with hair dye were excluded from study. ENT examination to identify edema of oral cavity, pharynx, larynx and neck and facial edema was routinely performed. If the patient had edema with fall in SpO<sub>2</sub> and breathing difficulty, tracheostomy was done. **Results:** The mean duration between consumption of hair dye to development of symptoms was 3.0 ± 1.5 hours and the same to tracheostomy was 5 ± 2.2 hrs. Tracheostomy increased the need for hospitalization 16.4 ± 9.4 days. Patients had swallowing problems due to pharyngeal edema and tracheostomy further delayed the initiation of oral feeds 8.3 ± 5.3 days. **Conclusion:** The amount of hair dye consumed and time of presentation to the hospital are an important risk factor for developing oropharyngeal edema, which in turn determines the risk of mortality.

**Keywords:** PPD (Paraphenylenediamine), Tracheostomy, hair dye poison.

## INTRODUCTION

Hair dye ingestion as a means of suicide is an emerging problem in India. The active component in most of the hair dyes in India is PPD (Paraphenylenediamine).<sup>[1]</sup> PPD is a skin irritant and its systemic effects include angio edema in the face and neck, rhabdomyolysis, cardiac and renal toxicity. The concentration of PPD in different hair dyes varies. The amount of PPD that can cause systemic toxicity is only three grams while the lethal dose is 7-10 grams.<sup>[2]</sup> The systemic toxicity occurs in two phases. Phase 1 occurs within four to six hours and the symptoms are paraesthesia, burning sensation of mouth angioedema leading to airway compromise, dysphagia. Rare manifestations include proptosis, optic neuritis and permanent blindness. Phase 2 occurs after days or weeks and symptoms include dark cola colored urine, oliguria or anuria due to renal failure, myalgia rhabdomyolysis,

Intravascular hemolysis.<sup>[3]</sup> The management of patient requires multidisciplinary approach and the most important immediate necessity is securing the airway.<sup>[4]</sup> Tracheostomy is commonly used in most of the institutions to secure the airway. Airway may also be maintained by endotracheal intubation and some centers use prophylactic intubation even before development of edema.<sup>[5]</sup>

### Aim

To determine the criteria for managing airway by tracheostomy in patients with hair dye poisoning.

## MATERIALS AND METHODS

This prospective observational study was conducted in Department of Otorhinolaryngology. All patients admitted with alleged history of hair dye consumption are included in the study. Patient were evaluated for any features of air way compromise and examined for edema in oral cavity, pharynx, larynx and neck and face. Patients without edema and respiratory distress were observed. If the patient had respiratory distress with edema and fall in Spo<sub>2</sub> level airway was secured with tracheostomy. After treating the other medical complications due to hair dye consumption patient was evaluated for clinical

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outcomes like time taken for decannulation, time taken to start oral feeds, swallowing problems, duration of hospital stay etc.

## RESULTS

In this study the majority of the persons 75% were females and 25% were males. The mean age of hair dye consumption was 27.4±7.4 years in males and 23± 6.4 years in females. [Table 1]

**Table 1: Age and gender distribution.**

Gender	Male	Female
Number of Patients	25	75
Mean Age in years	27.4±7.4	23± 6.4

**Table 2: Analysis of duration for development of symptoms, timing of tracheostomy, & duration of hospitalization.**

Category- duration	Mean	SD	No	%
Consumption to development of symptoms (hours)	3.0	1.5	43	43.0
Consumption to time of tracheostomy (hours)	5.0	2.2	43	43.0
Hospital stay of patients who underwent tracheostomy (days)	16.4	9.4	43	43.0
Hospital stay of patients who did not undergo tracheostomy (days)	2.5	1.1	57	57.0
Oral feed started after tracheostomy (days)	8.3	5.3	43	43.0

It was also noted that out of the 43 patients who underwent tracheostomy 14 patients were decannulated within 2 weeks of tracheostomy. [Table 2]

**Table 3: Prediction of quantity of hair dye poison for development of symptoms and tracheostomy.**

Amount (ml)	Tracheostomy done	Tracheostomy not done	Total	Sensitivity	Specificity	PPV	NPV
60+	40	2	42	93.0 %	95.8 %	95.2 %	93.9 %
<60	3	46	49				
Total	43	48	91				

Among 100 patients 91 had consumed a particular brand which is commonly available and they were taken into analysis. The quantity of hair dye necessary to produce significant symptoms warranting tracheostomy was predicted by ROC curve analysis. The area under the curve is the maximum (99.2).The prediction was very highly significant(P<0.0001).The cut point was 60 ml with sensitivity of 93%,specificity of 95.8%,positive predictive value of 95.2 % and negative predictive value of 93.9%. [Table 3]

It was also found that there was no significant association between sex with onset of symptoms, outcome and decannulation.

**Table 4: Association between outcome and cardiac arrest, ventilator support.**

S.No	Outcome	N	Tracheostomy	Intra-operative cardiac arrest	Ventilator support
1	Survived	91	34	2	5
2	Expired	9	9	4	8

It was found that there was no significant association of outcome with intraoperative cardiac arrest (P>0.05).However when the symptoms were severe enough to require ventilator support it adversely affected the survival of the patient (P>0.01). The mortality rate was 9per 100 in this study. [Table 4]

## DISCUSSION

In this study hair dye ingestion were more in the age group of 20- 29 years. The age incidence was significantly earlier in females 23±6.4 when compared to males P (<0.01). Except for a study in sudan by Sir Hashim M et al., ere children were mostly intoxicated hair dye poison is usually common in young adults.<sup>[6]</sup>

The mean time to reach the hospital in our study was 3 hours 20 minutes. It was as high as 32hours in a study conducted by Anugrah cristpal et al.<sup>[7]</sup>

The predicted quantity of hair dye consumed for development of symptoms and to undertake tracheostomy was 60 ml. The mean volume of poison consumed varies from 300 ml in study done by Bhargava P et al.,<sup>[8]</sup> and 100 ml in study done by Verma et al.<sup>[9]</sup> The mean volume consumed in this study was 84.6ml. The first clinical manifestation was usually cervico facial edema. Cervico facial edema as a common symptom was reported in most of the studies and it may mimic Ludwig's angina Lifshits M et al.<sup>[10]</sup> In this study 43% of patients developed cervico facial edema. The reason for cervico facial edema is still studied. The pathophysiology is still unclear. Many had postulated angioneurotic edema or a result of direct injury. The clinical symptoms are usually manifest within 6 hours Suliman SM et al.<sup>[11]</sup> In this study it was 3.0 ±1.5 hours.

The mean duration after consumption to development of symptoms was 3±1.5 hours and consumption to tracheostomy was 5±2.2 hours. The mean duration of hospitalization after tracheostomy was 16±9.4 days when compared to 2.5±1.1 days in patients who did not undergo tracheostomy and the difference was statistically significant.

Sex did not have significant association with symptoms or outcome. Intra operative cardiac arrest did not alter the outcome but when the symptoms were severe enough to require ventilator support it adversely affected the survival of the patient.

Apart from respiratory symptoms renal, hematological, neurological and cardiac manifestations are also reported in hair dye poisoning Suliman SM et al.,<sup>[11]</sup> Krishnaswamy et al.,<sup>[12]</sup> and Verma R et al.<sup>[9]</sup> The respiratory distress is secondary to inflammatory edema involving the oropharynx, oral cavity and larynx. The toxic compound can cause angioneurotic edema, stridor. Throat pain, Change of voice and aphonia were also reported.

PPD ingestion is a medical emergency. There is no specific antidote. Hence supportive care is the prime management Anugrah C et al.<sup>[7]</sup> Controlled trials are needed to evaluate the treatment protocols. There are no therapeutic trials till date.

In this study out of 100 patients 43 developed cervico facial edema and all 43 patients underwent tracheostomy. All patients suspected should be meticulously monitored for respiratory distress and air way secured as early as possible. Krishnasamy et al.,<sup>[12]</sup> has suggested securing the air way before development of laryngeal edema.

Morbidity and mortality are directly proportional to renal failure. It was as high as 41% in study by Hashim et al.<sup>[6]</sup> The mortality rate was 9 per 100 and 8 out of 9 deaths occurred in patients with renal failure.

## CONCLUSION

There is a marked surge in the incidence of hair dye ingestion as a means of self harm. It is more common in females. The clinical features are due to airway obstruction, cardiac and renal toxicity. The amount of volume consumed, time delay in reaching the hospital, the onset of airway obstruction determine the clinical course of the patient. Meticulous treatment and collaboration between different specialties is essential. The most immediate threat is airway obstruction and securing the airway is a prime priority. In our study tracheostomy was used to secure the airway in all patients with significant airway obstruction. Even though tracheostomy is a safe and effective method of securing the airway it increases the morbidity and duration of hospital stay. The fact that a significant number of patients could be decannulated within 2 weeks of tracheostomy urges us to consider nasotracheal or orotracheal intubation to secure the airway whenever possible in selected patients. This will avoid the problems due to tracheostomy and definitely reduce the duration of hospital stay.

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