



ORIGINAL RESEARCH PAPER

Ophthalmology

HAZARDOUS EFFECTS OF HOLI COLOURS ON EYES

KEY WORDS: Holi, holi colours, ocular hazards, toxicities.

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ABSTRACT

Holi, the festival of colours is celebrated with grandeur in India. As it involves the throwing of colours or directly applying on one another particularly over face, accidental entry of these colours into the eyes is inevitable. Ocular exposure to these colours containing toxic substances can often lead to various ocular manifestation ranging from mild irritation or burning sensation of the eyes to severe inflammatory reaction and other related problems. **Purpose:** To describe the pattern of ocular manifestations following exposure to Holi colours in a tertiary care center in Assam. **Methods:** An observational study of 17 consecutive patients attending the Out-patient and Emergency department with ocular complains following exposure to Holi colours was conducted. **Results:** 17 consecutive patients attending the Out-patient and Emergency department with ocular complains following exposure to Holi colours was reported. Majority (11 patients) were males and 6 females. Most common presenting symptom was irritation or foreign body sensation and redness. Majority had a visual acuity of 6/18 or better during their initial presentation. Clinically, conjunctival congestion was the most common finding in this study. Other clinical signs included swollen eyelids, skin erosions, conjunctival chemosis, sub-conjunctival haemorrhage, corneal epitheliopathy and anterior chamber reaction.

INTRODUCTION:

Holi, the festival of colours, has been celebrated annually all over India since ancient times. Celebration of Holi involves applying of colours in various forms on one another. The colours used during the Holi come in different forms, including pastes or powders smeared with hand on the face or water- colours filled in long syringes called pichkaris or balloons. Over the years, natural colors has come to be replaced by inexpensive, chemically processed colours manufactured in industries. These colours can have a toxic effect on health, especially of skin, eyes and respiratory system. A number of patients visit Eye specialists over the few days immediately following Holi, for eye related problems arising out of celebration with holi colours. These colours can cause direct toxic effects and induce local inflammation affecting the ocular structures. The severity of injury related to these colours depends on their composition, amount, concentration, time since exposure, and duration of reporting to a hospital from the time of exposure.¹ The main component of holi colours is starch or flour. But, synthetic holi colours often contains chemicals like malachite green, rhodamine, gentian violet and auramine O. Other common adulterants, that are often added to impart colours to the carrier substances include lead oxide, copper sulphate, mercury sulphate, chromium iodide, silica, mica dust etc.² Fungal contamination of these colours has also been reported.³ Holi colors can cause ocular surface toxicity and patients can present with foreign body sensation, ocular pain, redness, watering. Clinically, patients may have chemical conjunctivitis, subconjunctival haemorrhage, corneal erosions and corneal ulcer.⁴ Diagnosis is mainly based on detailed history and clinical examination, including slit-lamp examination.

Although, widely recognized and discussed as an annually recurring problem, there are very few articles reporting the ocular manifestations of holi colours. Also, no previous data has been found in literature, reporting the ocular toxicities caused by holi colours in the North-eastern region of India. This study, is intended to describe the patterns of ocular manifestations in patients resulting from exposure to holi colors.

MATERIALS AND METHODS:

An observational study of 17 consecutive patients attending the Out-patient and Emergency department of a tertiary care centre in Assam, with ocular complains following exposure to Holi colours between 7th March, 2023 to 20th March, 2023 was done.

Inclusion Criteria: All patients above 10 years of age, presenting with ocular complains following exposure to Holi colours.

Exclusion Criteria:

- Patients below 10 years of age
- Patients with pre-existing ocular surface disease and other ocular disease.
- Patients who have any other type of ocular injury.
- Patients who not giving consent to be a part of this study.

A written and informed consent from each patient included in the study was taken. For patients below 18 years, consent was taken from their parents.

A thorough history was taken including demographic data, chief complaints, duration of symptoms, time interval between exposure and onset of symptoms, whether the patients washed their eyes following exposure, any primary treatment like irrigation of eyes and time interval between primary treatment and ocular exposure by holi. Vision was recorded with Snellens chart. An extensive ophthalmological examination was done in each case including slit lamp biomicroscopy. Examination of adnexa, for associated symptoms, conjunctiva, fornices and eyelids for any retained colour particles, corneal involvement along with fluorescein staining of ocular surface, anterior chamber involvement and lens was done. IOP was measured using non-contact tonometer. Fundus examination was done with indirect ophthalmoscopy and 90D lens examination in slit lamp. This study was approved by the Institutional Ethics Committee.

Treatment:

Most patients had washed their eyes with tap water following exposure. After presenting in the hospital the patients were treated as any other chemical injury patients. Irrigation of the eyes in each patient, with 1 litre of normal saline was done to remove any retained colour particles. Topical Antibiotic steroid combination was given to all patients in the form of Moxifloxacin + Loteprednol starting with 6 times daily which was tapered over 7 days. Topical Anti-histamine (olopatadin) was given to all the patients. Artificial tears/ Lubricants every 2 hourly to provide relief from the irritation and the discomfort. In addition oral Anti-inflammatory and Analgesic was given to those with pain and inflammation. Cycloplegics (Homatropine) for one week was added for the patients with mild uveitis. Those with associated skin involvement in other

parts of body were referred to a Dermatologist.

Follow up:

Patients with mild signs and symptoms with no corneal and AC involvement were reviewed at one week, and then at 2 weeks until resolution. Those with corneal involvement and AC reaction were first reviewed after 3 days followed by every one week until resolution. All of these cases showed complete resolution within 4 weeks.

RESULTS:

In this study, 17 patients reported with ocular complaints following exposure to Holi colours. Majority i.e 11 patients were male and 6 patients were female.

Table 1: Gender Distribution

Gender	Number of patients	Percentage (%)
Males	11	64.7
Females	6	35.2
Total	17	100

Majority (47%) of the patients were in between 21-35 years. The mean age group of the study population was 34 ± 11.2 years.

Table 2: Age Wise Distribution

Age	Number of patients	Percentage (%)
10- 20 years	2	11.7
21-35 years	8	47
36-50 years	5	29.4
>50 years	2	11.7
Total	17	100

Table 3: Distribution Based On Visual Acuity At The Time Of Presentation.

Vision	Number of patients	Percentage (%)
6/6- 6/9	8	47
6/12- 6/18	6	35.2
6/24- 6/60	3	17.6
Total	17	100

In majority of the patients (8/17), vision was normal between 6/6-6/9. In 6 of the patients, vision was between 6/12-6/18. Of these 6 patients, 3 patients had associated mild corneal involvement. 3 patients had vision between 6/24- 6/60, all of which had corneal involvement, and 2 of these had anterior chamber reaction.

Most patients reported within 1 day of ocular symptom onset. Mean duration of symptoms at the time of presentation was 1.9 days. All the patients came with the complain of irritation or foreign body sensation and redness. Watering was the next most common complain followed by itching, photophobia, decreased vision and pain.

Table 4: Distribution Based On Duration Of Symptoms At The Time Of Presentation

Duration	Number of patients	Percentage (%)
1 day	9	52.9
2-3days	5	29.4
≥4days	3	17.6
Total	17	100

Table 5: Distribution Based On Presenting Symptoms

Presenting symptoms	No. of patients
Irritation/FB sensation	17
Redness	17
Watering	13
Itching	10
Photophobia	7
Decreased vision	6
Pain	6

On clinical examination, congestion was the most common finding. Eyelid involvement in the form of mild swelling were

seen in 5 patients and eczema of skin of eyelids in 3 patients and skin erosions in 2 patients. Chemosis was seen in 3 of the patients and sub-conjunctival haemorrhage in 1 patient. On fluorescein staining, 5 patients showed corneal epitheliopathy, which could be due to the toxic effects of the colours or mechanical due to rubbing of the eyes. Of these 3 patients had superficial punctate epithelial erosions and 3 patients had corneal abrasion. 2 of the patients showed mild inflammatory reaction, in the anterior chamber, of which one patient had associated corneal abrasion. Lens and posterior segment was within normal limits in all the patients. Two patients had associated skin involvement in other parts of face.

Table 5: Distribution Based On Clinical Findings

Clinical findings	Number of patients	
Eyelid	Swelling	5
	Eczema	3
	Skin erosion	2
Conjunctiva	Congestion	17
	Chemosis	3
	Sub- conjunctival haemorrhage	1
Cornea Abrasion	Punctate epitheliopathy	3
	Abrasions	3
Anterior chamber	Cells and flare	2
Associated facial skin involvement	2	

All the patients showed complete resolution of signs and symptoms. Those without corneal and anterior chamber involvement showed complete resolution of signs and symptoms within 2 weeks. 5 patients with corneal involvement and 1 patient with mild anterior chamber reaction showed resolution in 3 weeks. One patient with both corneal and anterior chamber involvement showed complete resolution in 4 weeks.

Table 5: Distribution Based On Time Taken For Complete Resolution

Time taken for complete resolution	Number of patients	Percentage (%)
2 weeks	10	58.8
3 weeks	6	35.2
4 weeks	1	5.8
Total	17	100

DISCUSSION:

Holi is celebrated in India every year. Celebration of Holi involves applying and throwing of colors in various forms on one another. The colors used during the Holi come in different forms including pastes, colored powders, and watercolors. Use of contaminated colours can lead to skin or ocular inflammation and infections. Holi colours can contain up to 80 % of PM10 particles and have a pro-inflammatory and cytotoxic potential.³ These facts may account for some of the adverse health effects, including ocular manifestations, like itching, irritation, watering, conjunctival congestion and contact keratitis, in those people who come in contact with these colours, during Holi festival. In addition, the holi colour particles can rub over the ocular surface and cause microtrauma to ocular surface leading to skin erosions, congestion, sub-conjunctival haemorrhage and corneal epithelial defect.

A study reported that 28 patients of 210 patients presenting due to trauma was due to holi colour.⁵ In the present study, 17 cases presented with ocular complaints following exposure to holi colours, with a male: female ratio of 11:6 (i.e 64% patients were male). Bala et al in their study found that boys were more commonly affected than girls (63:37).⁴ In a study conducted by Pujari et al. out of the patients affected due to holi colours, over 76% affected patients were male.⁶ Dada et al reported 40 patients presenting to the casualty with ocular manifestations due to colours during Holi festival, of which majority were

males.⁷

In this study, the mean age of the population was 34±11.2 years. The mean age of the sample population was 33±10.49 years in a study conducted by Gupta et al, which was similar to our study.⁸ In our study 15 out of 17 patients had bilateral involvement. Pujari et al in their study on 'Ocular toxicity due to colours used during holi celebration in India' observed a total of 21 patients. The average age in their group was 23 years with majority, i.e 16 patients being male (76.19%). Majority patients had a bilateral ocular involvement (13 patients, 61.90%), similar to our study.⁶

Visual acuity was not much affected in majority of the patients in our study. 80.3% of the patients had a visual acuity of 6/18 or better. Bala et al in their study, reported that 77.5 % of their study population had a visual acuity better than 6/12, similar to our study.⁴

Foreign body sensation and redness was the commonest presenting symptom occurring in all the patients. Gupta et al also reported that all the patients in their study also complained of foreign body sensation.⁸ The most common symptoms observed in a study on the 'effects of Holi colours in childrens eyes' were foreign body sensation, ocular pain, redness, and watering.⁴

Conjunctival congestion was the most common ocular finding in our study population, which has also been reported by Bala et al in their study.⁴ Other clinical findings noted in our study includes chemosis, sub-conjunctival haemorrhage, eyelid swelling, eyelid skin erosion, eczema, corneal epitheliopathy and anterior chamber reaction. Corneal involvement was found in 6/17 of the patients in our study. 3 of these patients had punctate erosions and 3 had corneal abrasion. Gupta et al reported 10/13 eyes with punctate keratopathy and 3/13 had a frank epithelial defect.⁸ Pujari et al in their study reported localized punctate epitheliopathy in 12/21 patients (57.14%) and diffuse punctate epitheliopathy admixed with an epithelial defect of varying size in the other 9 patients (42.85%), following exposure to holi colours.⁶

In our study, 2/17 patients had anterior chamber involvement. Of which, one patient had associated corneal epithelial defect and the other had mild anterior chamber reaction with 2+ cells. Pujari et al reported 2/21 patients with anterior segment involvement who also had associated diffuse punctate erosions with epithelial defect.⁶ Chauhan et al reported a case of bilateral necrotizing fasciitis caused by holi colours.⁹

It is important that patients presenting with ocular complaints following exposure to holi colours, be treated promptly. Special emphasis should be given to those with corneal and anterior chamber involvement for regular follow-up, to prevent any secondary infections and complications. In our study, majority of the patients visited within 3 days of exposure. Complete resolution was noted in all patients within 4 weeks.

The limitation in this study, is the small sample size. A multi-centre study conducted over consecutive years could provide us with a more insightful information regarding the ocular hazards related to holi colours.

CONCLUSION:

Various ocular problems including conjunctivitis, corneal epitheliopathy, anterior uveitis and periorbital necrotizing fasciitis have been described to occur due to contact with Holi colours. These ocular hazards due to holi colors is not well recognized among the general population due to poor awareness and caution regarding the dangers produced by these adulterated colours. Ocular morbidity can be prevented or reduced with awareness regarding use of natural colours, personal safety measures and timely medical

intervention.

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