

HOSPITALIZATIONS DUE TO RESPIRATORY PROBLEMS DURING DIWALI FESTIVAL IN A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

BACKGROUND

The burning of firecrackers during Diwali festival produces an adverse respiratory outcome. However, there are no published articles on the impact of fireworks on hospital admission due to acute respiratory issues, hospital stay, and respiratory mortality during Diwali in India.

MATERIALS AND METHODS

This was a prospective, open label, observational study. It was conducted in patients admitted to the pulmonary emergency unit with respiratory symptoms 15 days before and after Diwali. It was conducted after the approval of ethics committee and written informed consent.

RESULTS

The number of admissions post-Diwali were significantly more compared to pre-Diwali from both rural and urban locations ($p < 0.001$). The mean duration of hospital stay was significantly less pre-Diwali (7.59 ± 0.74 days) compared to post-Diwali (9.46 ± 0.44 days). Also, significantly increased number of patients required ventilator support post Diwali.

CONCLUSION

The findings from the present study validate the deterioration of respiratory health during Diwali festival in India. There should be more awareness campaigns about the harmful effects of fire-crackers. Patients suffering from respiratory problems should be advised to avoid heavy exposure to fireworks

KEYWORDS

Respiratory health, Diwali, Hospitalization.

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INTRODUCTION: Diwali is celebrated with great enthusiasm all over India during the month of October or November. The central attraction of the festival is fireworks. Over the past few years, a lot of concerns have been raised regarding the respiratory health hazards of fireworks.^{1,2} These hazards have been attributed to the chemical components like sodium oxalate, aluminium, arsenic, sulphur, manganese, iron dust powder, potassium perchlorate, strontium nitrate, and barium nitrate etc.² The burning of firecrackers are thought to produce gaseous pollutants such as sulfur dioxide (SO₂), carbon dioxide (CO₂), carbon monoxide (CO), and particulate matter (PM).³ A good number of studies have reported associations between airborne particles, respiratory health, and a range of respiratory outcomes. The respiratory outcomes vary

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according to pulmonary function deficits to worsening of symptoms, emergency room visits, hospital admissions, and deaths.^{4,5}

Previous studies on fireworks and respiratory health have reported a 30% to 40% increase in the cases of wheezing, exacerbation of bronchial asthma, and bronchitis. Inhalation of smoke from fireworks was reported to cause cough, fever, dyspnoea, and some cases of acute eosinophilic pneumonia.^{6,7} Also, fireworks were found to decrease peak expiratory flow rate, increase in daily symptom and medication use.⁸ However, there are no published articles on the impact of fireworks on hospital admission due to acute respiratory issues, hospital stay, and respiratory mortality during Diwali in India. Hence, the present study was conducted. The parameters observed were the acute respiratory hospital admission, medications used, impact on lung function, symptom exacerbation, hospital stay, and mortality of patients during Diwali festival in a tertiary hospital in south India.

MATERIALS AND METHODS:

Study Setting: This study was undertaken at the department of pulmonary medicine, SDS TB Hospital and Sanjay Gandhi Institute of Chest Disease, Bangalore, India. This is a tertiary care hospital and state referral centre for respiratory illnesses. Patients visiting this hospital come from different geographical regions including various parts of Karnataka, Andhra Pradesh, and West Bengal, India, with a fair representation of both urban and rural populations.

Study Design: This was a prospective, open label, observational study. The study was conducted after receiving the approval from the Institutional Ethics Review Board. The duration of the study was one month from 26/10/2015 to 26/11/2015 during the festival of Diwali. The details of the patients including demographic profile, symptoms, biomass exposure, laboratory investigations, diagnosis, treatments received, disease outcome, and number of days of hospitalization were recorded in a case report form. Also, the clinical severity of pulmonary disease was assessed by the degree of forced expiratory volume in 1s (FEV1) impairment.

Study Subjects: Patients above 18 years were admitted with respiratory problems in the emergency ward. Patients who were admitted 15 days prior to and after Diwali (11/11/2015) were included in the study. The patients were included after obtaining written informed consent.

Data Analysis: All data were expressed as mean± Standard Error of Mean (SEM) and number (%). Quantitative variables between two groups were compared using the Z test. A P value of less than 0.05 was considered statistically significant. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software (version 17.0; SPSS, Chicago, IL).

RESULTS: A total of 30 patients were admitted pre-Diwali with respiratory symptoms, and 68 post Diwali. Following is the summarization of the observed results.

Patient Characteristics and Demographic Profile: Out of 30 patients in the pre-Diwali group, 20 were male and 10 were female. The mean age of the male participants was 53.75±2.86, and females 46.10±4.47 years. Whereas post Diwali, 44 were males and 24; females. The mean age of the male participants was 51.98±2.09, and females 52.67±2.96 years. There was no significant difference in the mean age of the males (p, 0.6289) and females (p, 0.2344). The number of males that were smokers and females exposed to biomass pre and post Diwali were 18(90%), 06(60%) and 42(95.45%), 18(75%) respectively. Overall, there were 56 patients from rural, and 42 from urban locations. The number of admissions were significantly more post-Diwali from both rural and urban locations (p<0.001). The results are shown in Table 1.

Pre-existing Respiratory Disease: The Pre-Diwali patents gave history of COPD, 18(60%); bronchial asthma, 2(6.66%); post TB bronchiectasis, 8(26.66%); and interstitial lung disease, 2(6.66%). The Post-Diwali patents gave history of COPD, 33(48.5%); bronchial asthma, 7 (10.29%); post TB bronchiectasis, 17(25%); carcinoma of lung: 2(2.94%); interstitial lung disease, 2(2.94%); and other 1(1.47%). The results are shown in Table 2.

	Pre Diwali	Post Diwali	P value
Number of admission	30	68	<0.0001
Male Mean age	53.75±2.86	51.98±2.09	0.6289
Female Mean age	46.10±4.47	52.67±2.96	0.2344
Patients from Rural	17	39	0.0004
Patient from Urban	13	29	0.0025
Mean duration of stay in hospital	7.59±0.74	9.46±0.44	<0.0290
Ventilation Support	04(13.33%)	38(55.88%)	0.0043
ICU admission	05(16.66%)	08(11.76%)	0.2516
Antibiotics and Nebulization	21(70%)	22(32.35%)	0.7978

Table 1

Pre-existing respiratory diseases	Pre Diwali	Post Diwali
COPD	18(60%)	33(48.5%)
Bronchial Asthma	2(6.66%)	7(10.29%)
Post Tb Bronchiectasis	8(26.66%)	17(25%)
Interstitial lung disease	2(6.66%)	2(2.94%)
Lung carcinoma	0	2(2.94 %)
Others	0	1(1.47%)

Table 2

Mean Duration of Hospital Stay: The mean duration of hospital stay was 7.59±0.74 days pre, and 9.46±0.44 days post Diwali. This was found to be statistically significant (p<0.05). The results are shown in Table 1.

Ventilator Support and ICU Admission: Out of all the patients; 4(13.33%) patients pre-Diwali and 38(55.88%) post-Diwali required ventilator support. There was a significant difference in patients requiring ventilator support pre and post-Diwali. The number of patients that required ICU admission were 05(16.66%) and 08(11.76%) pre and post Diwali respectively (p=0.2516). There were 5 deaths post Diwali (7.35%). The results are shown in Table 1.

Antibiotics, Oxygen and Nebulization: The number of patients that required antibiotics, oxygen and nebulization were 21(70%) and 22(32.35%) pre and post Diwali respectively (p=0.7978).

DISCUSSION: This prospective, observational study was initiated with the aim of finding out the impact of air pollution during Diwali festival in patients having respiratory illness. Prior epidemiological studies have implicated exposure to a variety of ambient air particles and gases to exacerbate symptoms of COPD, resulting in increased morbidity and mortality.⁴ In this study also, there was exacerbation of symptoms in patients already suffering COPD, asthma, post TB bronchiectasis, carcinoma of lung, and interstitial lung disease. A previous study had reported adverse respiratory health in people of all ages and gender in India during the Diwali festival.⁶ In this study also, there was admission irrespective of age and gender. Also, there are reports that women suffer from deleterious respiratory health due to exposure to biomass in India.⁹ In this study also it was found that majority of the women were exposed to biomass, and males to smoking. Biomass and smoking as independent risk factor for respiratory diseases are thus again proved in this study.

There are previous reports that during Diwali there is 100% increase in emergency room visit due to increase in SO₂ in the air.¹⁰ This study documented the emergency respiratory admissions. It was found out that the number of admissions were significantly more post-Diwali from both rural and urban locations. Also, there was statistically significant increase in the duration of hospital stay post Diwali, and more patients required ventilator support. But, there was no significant difference in the use of antibiotics, oxygen or nebulization.

The present study highlighted that there are acute respiratory hospital admissions, requirement for additional medication use, impaired lung function, symptom exacerbation, hospital stay, and mortality of patients during Diwali festival in India. Bursting firecrackers during Diwali thus increases the respiratory health burden in terms of patient suffering, and economics. One limitation of the study is that data on pollution could not be obtained from the Central pollution control board during this period.

Even though Bangalore showed 32% reduction in pollution in the year 2013 as compared to 2012,¹ it still requires serious strategies to control the use of firecrackers during Diwali to protect human health. The limitations of the study are that data on pollution could not be obtained from the central pollution control board during this period, and the study was conducted at only one hospital. Also, as the harmful gases require at least 4 months to dissipate from the environment, the study could have been continued for a longer period. These limitations should be addressed in future studies.

CONCLUSION: The findings from the present study validate the concerns raised in various social media about deterioration of respiratory health during Diwali festival in India. It is thus the high time that the government comes forward to implement strict laws to put brakes on the increasing pollution. There should be monitoring of the heavy metals that are emitted from crackers. Also, there should be awareness campaigns about the harmful effects of fire-crackers. Patients suffering from respiratory problems should be advised to avoid heavy exposure to fireworks. A community based, time limited celebration of Diwali, in open areas might retain the joy of the festival, and also protect public health.

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