

Handling tobacco is injurious to ocular health-A Study among workers of a Bidi Industry

Ravindra Kumar Chowdhury¹, Sarita Behera²

¹Assistant Professor, Department of Ophthalmology, Veer Surendra Sai Institute of Medical Sciences & Research, Burla, Sambalpur, Odisha, India.

²Associate Professor, Department of Anatomy, Veer Surendra Sai Institute of Medical Sciences & Research Burla, Sambalpur, Odisha, India

Abstract

Background: Handling tobacco in the bidi manufacturing industry exposes the workers to nicotine and particulate matter, which may adversely affect ocular health. Though the systemic effect of tobacco is well recognized, the impact on ocular health is still underreported. **Material and Methods:** This is a cross-sectional observational study conducted in 246 workers in a bidi industry to identify the possible effects of occupational tobacco exposure on ocular health. **Results:** Among 246 workers, 186 (75.6%) had ocular problems, which were more common in females (80.1%). The average exposure duration was 10.8 years, with each person rolling about 320,000 bidis. The common affected age group was 41-50 years. The most frequent symptoms were defective vision (61.8%), itching (65%), redness (50%), and foreign body sensation (34.9%). Major signs included superficial punctate keratitis (53.7%), cataract (51%), myopia (43.6%), inflamed pterygium (43%), pseudophakia (43%), drusen (41.9%), hypermetropia (37.6%), papillary conjunctival hyperplasia (36%), and corneal scar (25.2%). In 45.1% of workers, the best-corrected visual acuity was less than 20/20, primarily due to cataract, drusen, corneal disease, and optic atrophy. **Conclusion:** Handling of unburnt tobacco for a prolonged period in the bidi industry significantly affects ocular health. Increase in age and duration of work have a significant negative correlation with visual function in our study. Protective safety measures and regular eye screening are recommended to minimize visual morbidity among these workers.

Keywords: Bidi industry, Tobacco dust, Occupational exposure, Ocular health.

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INTRODUCTION

The tobacco industry is an important commercial enterprise around the world. The non-edible leaf of the tobacco plant (*Nicotiana tabacum*) is dried to produce cigarettes, pipe tobacco, cigars, chewing tobacco and snuff.^[1] India and other South Asian nations use bidi as an inexpensive way to consume tobacco. Another name for it is "poor man's cigarette." The tobacco flake, which weighs between 0.2 and 0.3 grams, is encased in a tendu leaf (*Diospyros melanoxylon*) and fastened at both ends with colored threads.^[2] The manufacture of bidi (a raw form of cigarette) in India employs around five million people.^[3] These individuals work in small factories in an environment laden with tobacco dust. Exposure of 6-10 hours/day increases the risk of developing ailments for which tobacco consumption is known to be a major risk factor, including Chronic obstructive pulmonary diseases, Cardiovascular abnormalities, carcinomas and premature deaths.^[4,5] Although the potential of the above diseases exists among these workers, little information is available about the adverse effect on ocular health. The objective of our study was to obtain information about the probable effects of tobacco dust on the ocular health of bidi-rollers.

at a bidi manufacturing industry located in a rural area of western Odisha. 246 workers, including 179 females and 67 males, were enrolled for the study. The subjects enrolled (n = 246) were actively involved in bidi-rolling (a process in the manufacturing of bidi where tobacco is filled manually in Tendu or Bidi leaves i.e. *Diospyros Melonoxylon*). The workers of industry who were not involved in the active bidi making and the persons who look after the administrative part of the factory were excluded from our study. After obtaining informed consent, the duration of work per day, daily hours of exposure, number of bidis rolled for day, ocular symptoms, smoking history, alcohol habits and general health were asked to each subject. Ocular examinations included visual acuity (unaided and best corrected visual acuity), color vision, slit-lamp biomicroscopy, retinoscopy and refraction, intraocular pressure (IOP) measurement, and fundus examination. The clinical features related to ocular complaints of

Address for correspondence: Dr. Ravindra Kumar Chowdhury, Assistant Professor, Department of Ophthalmology, Veer Surendra Sai Institute of Medical Sciences & Research, Burla, Sambalpur, Odisha, India. E-mail: ravindrachowdhury@gmail.com

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MATERIALS AND METHODS

This is a community-based cross-sectional study conducted

patients noticed or aggravated after involvement in bidi-rolling, were tabulated. Statistical analysis assessed the correlation between age, duration of exposure and ocular findings.

RESULTS

Out of 246 subjects, 186 (75.6%) had ocular problems, with most affected being females (80.1%). Average exposure was 10.8 years, and all patients were from poor socioeconomic backgrounds.

Table 1: Duration of exposure to bidi rolling in different age groups

Age groups in years	Number of subjects(n=246)	Duration of exposure in years
0-10	0(0%)	0
11-20	5(2%)	1
21-30	20(8.1%)	8
31-40	60(24.3%)	12
41-50	140(56.9%)	18
51-60	21(8.5%)	15

The most common age involved in bidi rolling was 41-50 years and the mean duration of exposure in them to tobacco handling is 18 years. [Table1]

Itching (65%) and defective vision (61.8%) were found to be the most common complaints among the industry workers. [Table- 2]

Table 2: Ocular symptoms in Bidi roller workers

Ocular symptoms	Number of patients	Percentage(n=186)
Itching	121	65
Redness	93	50
Defective vision	115	61.8
FB sensation	65	34.9
Dull aching headache	83	45
Watering	20	10.7
Eye pain	15	8.06

The best corrected visual acuity was less than 20/20 in 45.1% of eyes. The common causes of non-improvement of visual acuity were cataract (26.7%) and corneal scar (23.8%). Drusen (20.8%) and optic atrophy (7.1%) were the major posterior segment pathologies found among the workers.

Superficial Punctate Keratitis (53.7%) and inflamed pterygium (43%) were the common anterior segment findings. Myopia (43.0%) was found to be the common refractive error in these workers. [Table 3]

Table 3: Ocular signs in Bidi roller workers

Characteristics	Number of Patients n (%)	Number of eyes n (%)	Bilateral/ Unilateral	Eyes with BCVA<20/20 n(%)
Total	186	372	-	168(45.1%)
REFRACTIVE ERROR				
Myopia	80(43.0%)	160(43.0%)	70/10	10(5.9%)
Hypermetropia	70(37.6%)	140(37.6%)	60/10	0
Astigmatism	36(19.3%)	72(19.3%)	36/0	0
ANTERIOR SEGMENT FEATURES				
Blepharitis & Meibomitis	17(9.1%)	34(9.1%)	17/0	0
Papillary hyperplasia	67(36%)	127(34.1%)	60/7	0
Inflamed pterygium	80(43%)	140(37.6%)	60/20	0
Superficial Punctate Keratitis (SPK)	100(53.7%)	150(40.3%)	50/50	2(1.2%)
Foreign body in cornea	26(13.9%)	29(7.8%)	3/23	0
Corneal scar	47(25.2%)	54(14.5%)	7/40	40(23.8%)
Concretion	25(13.4%)	32(8.6%)	7/18	0
Cataract	95(51%)	110(29.5%)	15/80	45(26.7%)
Pseudophakia	80(43%)	115(30.9%)	35/45	2(1.2%)
POSTERIOR SEGMENT FEATURES				
Drusen	78(41.9%)	96(25.8%)	18/60	35(20.8%)
Healed choroiditis	12(6.4%)	14(3.7%)	2/10	10(5.9%)
Hypertensive retinopathy	15(8.0%)	18(4.8%)	3/12	4(2.3%)
Optic atrophy	13(6.9%)	18(4.8%)	5/8	12(7.1%)
Diabetic retinopathy	18(9.6%)	22(5.9%)	4/14	8(4.7%)

DISCUSSION

The manufacturing of bidi is the second-largest industry in India.^[6] This industry provides employment to millions of

women and children from lower socioeconomic strata. These workers, who deal with tobacco processing, are exposed to extremely high levels of inseparable particulate matter of tobacco.^[4,5] These tobacco particles contain nicotine as one of the

major chemical components. In addition to nicotine, it also contains nitrosamines, polycyclic aromatic hydrocarbons, radioactive elements, and cadmium, which are carcinogenic.^[7] The amount of nicotine present in a bidi is much higher than cigarette.^[8] So, these bidi factory workers are more liable to develop systemic illness. The ocular structures may be involved due to direct exposure of the ocular surface to these tobacco particles. These tobacco-laden environment in a closed room where these bidi workers roll bidis causes painful stimulation of conjunctival and corneal nerve endings. These result in the development of papillary conjunctival reaction, chromosomal damage, metaplastic change, death and erosion of ocular surface cells and deposition of melanin pigment on the surface.^[9,10] In our study, the common ocular surface disorders are superficial punctate keratitis and inflamed pterygium, whereas Mittal et al (2018) found papillary hyperplasia and hyperpigmentation of conjunctiva as common ocular surface findings.^[3] 6.9% of our patients had optic atrophy, whereas Mittal et al found optic disc pallor in 19.7%. This optic atrophy may be attributed to tobacco-alcohol amblyopia, though nutritional deficiency can be an etiological factor, as most of our patients belonged to a poor socioeconomic status. However, the chemicals like nicotine and other vaso-active compounds present in tobacco may induce vasoconstriction of posterior ciliary arteries and produce atherosclerotic plaques of the carotid artery system. These lesions can cause retinal ischemic attacks and anterior ischemic optic neuropathy, resulting in the occurrence of visual loss that does not recover with nutritional supplements.^[10,11]

Cataract, corneal scar and refractive errors are the common causes of defective vision in our study. Therefore, it is necessary to address this disease by creating awareness and a screening program to improve the ocular health of these workers. Further protective measures should be implemented in them to prevent complications like corneal scar, which may be attributable to tobacco dust exposure. The ocular symptoms and signs are more prevalent in the of increasing age the worker who work for the bidi factory of more duration. Therefore, it raises a concern about the potential occurrence of this disease apart from other systemic diseases present in them.

Further, an increase in age and duration of work was found to have a significant negative correlation with visual function. The findings of this study raise concerns about the potential occurrence of ocular diseases apart from systemic co-morbidities in bidi-rollers. The Indian bidi industry is an unorganized manufacturing sector, where more than 15 to 25% of employed workers are children below 15 years.^[12] The impact of tobacco on physical and ocular health in them in the future may be alarmingly high. Therefore, interventions are required to minimize tobacco exposure, create awareness of diseases and provide medical help to

minimize the deleterious effects of tobacco in bidi-rollers.

CONCLUSION

Handling of unburnt tobacco for a prolong period in the bidi industry significantly affects ocular health. Increase in age and duration of work have a significant negative correlation with visual function in our study. Protective safety measures and regular eye screening are recommended to minimize visual morbidity among these workers.

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Conflicts of interest

There are no conflicts of interest.

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