Review

Bidi smoking and lung cancer

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Summary **This article discusses the role of bidi smoking as a risk factor for lung cancer. A review of the documented evidence is presented. The literature from Pubmed has been searched using the key words 'beedi smoking', 'bidi smoking' and 'lung cancer'. The bibliographies of all papers found were further searched for additional relevant articles. After this thorough search, eight studies were found. The evidence suggests that bidi smoking poses a higher risk for lung cancer than cigarette smoking and risk further increases with both the length of time and amount of bidi smoking. The focus of tobacco control programs should be expanded to all types of tobacco use, including bidis, to reduce the increasing problem of lung cancer.**

Keywords: Smoking, bidi, cigarette, lung cancer, India

1. Introduction

The "epidemic" of lung cancer mortality has been identified as a major health issue confronting both developed and developing countries. It is the leading cause of cancer deaths in developed countries and is also rising at alarming rates in developing countries. Almost half (49.9%) of the cases occur in the developing countries of the World – a big change since 1980, when it was estimated that 69% were in developed countries (*1*). Worldwide, it is by far the most common cancer in men.

In India, lung cancer has been considered to be an infrequent entity, but an increased rate of diagnosis of bronchogenic carcinoma was recognized in the early 1960s by Vishvanathan *et al*. (*2*). Population-based as well as hospital-based data from the Cancer Registry of the Indian Council of Medical Research (ICMR) and the Cancer Atlas Programme of the ICMR revealed that lung cancer has increased in India during the last few years (*3-5*).

Tobacco smoking is the most important etiologic factor for the development of lung cancer. 90% of all lung cancers in men and 79% in women are directly attributed to smoking (*6*). Smoking habits in India differ from other countries like USA. In India out of total tobacco consumption, smoking accounts for 72% of the total, 73% is related to bidi and the other 27% is due to cigarettes (*7*). Reports of an increase in prevalence of bidi consumption have also emerged from other countries in Asia, as well as other parts of the world, such as USA, France, Canada and Australia (*8-13*).

In India, tobacco smoking in general and bidi smoking in particular have long enjoyed social acceptance and respectability in some parts of the culture like wedding ceremonies in the rural area (*14*). The leaf-wrapped appearance of bidis and absence of health warnings on their package lead to the perception among young people that bidis are "safe, herbal" cigarettes. Even though, a number of worldwide, population based case controlled studies as well as cohort studies have proved the association of tobacco smoking to the lung cancer, very few studies have been carried out to demonstrate the association between bidi smoking and lung cancer.

2. Data Sources

The Pubmed medical literature database was searched for published articles that had the key words 'bidi-smoking', 'beedi-smoking' and 'lung cancer'. The bibliographies of all papers found were searched for further relevant

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articles. Any study, whether case-control, retrospective, cross-sectional or longitudinal, was included.

3. Results

After this thorough search, there were only 8 studies where the association between bidi smoking and lung cancer had been specially analyzed. A review of this study is presented.

The first study was done by Notani and Sanghvi (*15*). This retrospective study of 520 patients with lung cancer conducted at Tata Memorial Hospital, Bombay revealed the relative risk of all types of smokers to nonsmokers was 2.45, of cigarette smokers 2.23 and bidi smokers 2.65.

In another study by Notani *et al*. (*16*), the relative risks for bidi and cigarette smoking were assessed from analysis of 683 male lung cancer cases and 1,279 male non-cancer patients from Mumbai. The relative risk of 3.38 for bidis was higher than the 2.36 relative risk for cigarette smoking, compared to non-smokers.

In another retrospective study by Jussawalla *et al*. (*17*), 792 male lung cancer patients for whom detailed smoking history is available, were matched for age, and community with randomly selected controls. All smokers appear to be at high risk (16.8) compared with non-smokers. The relative risk in bidi smokers of 19.3 was, however, even higher than in cigarette smokers.

Prasad *et al*. (*18*) from Lucknow conducted a hospital-based case-control study comparing 52 cases of lung cancer with 156 healthy controls. They were able to demonstrate that bidi smokers had an odds ratio of 5.05 (2.21-11.7). The authors were also able to show a significant length of time smoking and dose-relationship between bidi smoking and lung cancer. The risk of lung cancer in bidi smokers of 11-20 bidis per day was seven times that of nonsmokers (7.06; 5.41-11.24) while that of smokers of more than 20 bidis per day, the risk was more than 10 times (10.60; 6.82-15.36). The effect of increasing duration of bidi smoking is reflected by the increasing odds ratios from 3.43 (1.62-6.84) for bidi smokers of 1-39 years duration to 14.24 (8.34-24.31) that of bidi smokers of more than 40 years.

Gupta *et al*. (*19*) from Chandigarh conducted a case-control comparing 265 cases of lung cancer with 525 matched controls from 1995 to 1997. The odds ratio for bidi smoking was 5.76 (3.42-9.70) while that for cigarette smoking was 3.86 (2.11-7.06).

A study from Bhopal (*20*) revealed that the risk of developing lung cancer was higher for bidi smokers when compared to cigarette smokers. The odds ratio for bidi smoking was 11.6 (6.4-21.3) while that for cigarette smoker was 7.7 (3.2-18.4). The authors were also able to demonstrate that the risk of lung cancer increases with the increase in duration of cigarette smokers.

Gajalakshmi *et al*. (*21*) from Chennai and Thirvananthapuram conducted a case-control study comparing 778 lung cancer cases with 3,430 controls. The odds ratios were 4.54 (2.96-6.95) and 6.45 (4.38-9.50) for more than 30 years of exclusive cigarette smoking and exclusive bidi smoking, respectively. The study also concluded that the lung cancer risk of former cigarette smokers drops more quickly after they quit smoking than it does for former bidi smokers.

In a study from Kolkata (*22*), 217 new patients with lung and larynx cancer along with 200 matched controls were recruited. Adjusted odds ratios observed for smokers for a duration of more than 40 years of smoking and smoking more than 40 bidi/cigarettes per day were 4.3 and 3.9, respectively. This study did not analyze the odds ratio of bidi smoking separately.

4. Why bidi is more hazardous than cigarettes

Although bidi contains about one-fourth the quantity of tobacco as a cigarette, the mainstream smoke of bidi contains a much higher concentration of several toxic agents including hydrogen cyanide, carbon monoxide, ammonia, other volatile phenols, and carcinogenic hydrocarbons such as benz(a)anthracene and benzopyrene (*23*). Bidis typically deliver 3-5 times more nicotine, tar and carbon monoxide as compared to conventional cigarettes (*24*). It has been reported that bidi contains 1.5 times more carcinogenic hydrocarbons than American cigarettes (*25*). The relatively low combustibility and non-porous nature of the tendu leaves require more frequent and deeper puffs by the smokers to keep bidi lit, and it is therefore harder on the smoker's lungs than cigarettes rolled in paper (*26*). Bidi smokers were found to take almost five puffs per minute compared to cigarette smokers who smoked two puffs per minute (*23*). All these facts are responsible for a greater deleterious effect of bidi in comparison to cigarettes.

5. Conclusion

A review of the literature strongly suggests that bidi smoking should be considered an important risk factor for the development of lung cancer. All eight studies on bidi smoking and lung cancer demonstrated a direct relationship and seven studies showed that bidi smoking is more hazardous than cigarette smoking. Two studies also demonstrated that the rate of developing lung cancer increases was directly proportional to the duration of smoking. One study showed that lung cancer risk of former cigarette smokers drops more quickly after they quit smoking than it does for former bidi smokers.

It can be concluded that bidi smoking also poses a very high risk of lung cancer. Traditionally, tobacco control programs have focused on reducing cigarette consumption. Effective strategies are now needed to expand the focus of tobacco control programs to all types of tobacco use, including bidis (*27,28*). Countries that adopted comprehensive tobacco control programs

with a mix of interventions (including bans on tobacco advertising, strong warnings on packages, controls on the use of tobacco in indoor locations, high taxes on tobacco products, and health education and smoking cessation programs) have had considerable success in decreasing the prevalence of cigarette smoking (*29*). A similar policy framework with a mix of interventions will have to be implemented to control bidi use in India and other Southeast Asian countries where bidi use is prevalent, as well as in countries like USA where the bidi market is relatively new and expanding.

References

1. Behera D. Managing lung cancer in developing countries: difficult and solutions. Indian J Chest Dis Allied Sci. 2006; 48:243-244.
2. Viswanathan R, Gupta S, Iyer PVK. Incidence of primary lung cancer in India. Thorax. 1962; 17:73-76.
3. National Cancer Registry Programme. An epidemiological study. Indian Council of Medical Research, Biennial Report, 1988-1989. New Delhi: ICMR; pp. 3-42.
4. National Cancer Registry Programme. Consolidated Report of the Population-based Cancer Registries 1990-1996. New Delhi: Indian Council of Medical Research. 2002.
5. Nandkumar A, Gupta PC, Gangadharan P, Visweswara RN. Development of an Atlas of Cancer in India: First All India Report 2001-2002. National Cancer Registry Programme 2001-2004. Bangalore; Indian Council of Medical Research. 2004.
6. Prasad R. Bidi smoking and bronchogenic carcinoma in India. JAMS. 2003; 14:7-10.
7. Chaudhry K, Rath GK. Multisectoral and intersectoral approach to national tobacco control. Paper commissioned by the World Health Organization on the occasion of the WHO International Conference on Global Tobacco Control Law: Towards a WHO Framework Convention on Tobacco Control. 2000 Jan 7-9, New Delhi, India.
8. Celebucki C, Turner-Bowker DM, Connolly G, Koh HK. Bidi use among urban youth – Massachusetts. MMWR. 1999; 48:796-799.
9. Centers for Disease Control and Prevention. Tobacco use among middle and high school students – United States 1999; MMWR. 2000; 49-53.
10. Indian hand-rolled cigarettes outpacing Sri Lankan brands. Hoover's online. 2001 Aug 31 [cited 2004 Jun 5]. Available from: *http://news.globalink.org 119354.shtml.*
11. Ansari KM. French women blow hot with Indian bidi. Hindustan Times, 2003 Nov 10 [cited 2004 Jun 5]. Available from: *http://news.globalink.org 220832.shtml.*
12. Barbara McLintock/The Province. Liberals move to ban bidis. National newspapercanada.com network. 2003 Feb 13 [cited 2004 Jun 5]. Available from: *http://news.globalink.org/157122.shtml.*
13. Australian customs seize smuggled cigarettes from India. Wall Street Journal 2001 Jul 17 [cited 2004 Jun 5]. Available from: *http://news.globalink.org 116019.shtml.*
14. Gupta PC, Asma S (eds.) Bidi smoking and Public Health, New Delhi: Ministry of Health and Family Welfare, Government of India, 2008.
15. Notani P, Sanghvi LD. A retrospective study of lung cancer in Bombay. Br J Cancer. 1974; 29:477-482.
16. Notani PN, Rao DN, Sirsat MV, Sanghvi LD. A study of lung cancer in relation to bidi smoking in different religious communities in Bombay. Indian J Cancer. 1977; 14:115-121.
17. Jussawalla DJ, Jain DK. Lung cancer in Greater Bombay: correlations with religion and smoking habits. Br J Cancer. 1979; 40:437-448.
18. Prasad R, Tandon S, Kumar S, Pant MC, Sinha KN, Mukerji PK. A case control study on tobacco smoking and lung cancer. Lung India. 1998; 16:60-64.
19. Gupta D, Boffetta P, Gaborieau V, Jindal SK. Risk factors of lung cancer in Chandigarh, India. Indian J Med Res. 2001; 113:142-150.
20. Dikshit RP, Kanhere S. Tobacco habits and risk of lung, oropharyngeal and oral cavity cancer: a population-based case-control study in Bhopal, India. Int J Epidemiol. 2000; 29:609-614.
21. Gajalakshmi V, Hung RJ, Mathew A, Varghese C, Brennan PK. Tobacco smoking and chewing, alcohol drinking and lung cancer risk among men in southern India. Int J Cancer. 2003; 107:441-447.
22. Roychowdhury S, Roychowdhury G, Sen U. Assessment of awareness level on tobacco and smoking habits as risk factors for cancer among lung and laryngeal cancer patients in Kolkata-a case control study. Asian Pac J Cancer Prev. 2005; 6:332-336.
23. Jayant K, Pakhale SS. Toxic constituents in bidi smoke. In: Sanghavi LD, Notani P (eds). Tobacco and Health: The Indian Scene. Bombay: Tata Memorial Centre 1989; pp. 101-110.
24. Rickert WS. Determination of yields of "tar", nicotine and carbon monoxide from Bidi, cigarettes: final report. Ontario, Canada: Labstat International, Inc., 1999.
25. Hoffman D, Sanghvi LD, Wynder EL. Comparative chemical analysis of Indian bidi and American cigarette smoke. Int J Cancer. 1974; 14:49-55.
26. Bhonsle RD, Murti PR, Gupta PC. Tobacco habit in India. In: Gupta PC, Hammer JE, Murti PR, editors. Control of tobacco related cancers and other disease. Proceedings of an International Symposium; 1990 Jan 15-19; Bombay, India. Bombay: Oxford University Press. 1992; pp. 25-46.
27. The Global Youth Tobacco Survey Collaborative Group. Differences in worldwide tobacco use by gender: findings from the Global Youth Tobacco Survey. J Sch Health. 2003; 73:207-215.
28. The Global Youth Tobacco Survey Collaborative Group (US Centers for Disease Control and Prevention; the World Health Organization, the Canadian Public Health Association, and the U.S. National Cancer Institute). Tobacco use among youth: a cross country comparison. Tobacco Control. 2002; 11:252-270.
29. World Health Organization. Reducing risks, promoting healthy life. In: The World Health Report, 2002. Geneva, 2002; pp. 225.

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