To Study Smoking Violations through Global Positioning System-Enabled Mobile App, in Bhubaneswar, Odisha

Devi K. Mishra, Nalini K. Triathy, Bulu Mahanty, Bhupendra Buda, Manoj K. Behera
Department of Community Medicine, Hi-Tech Medical College, AIIMS, Bhubaneswar, AHRCC, Cuttack, Odisha, India

Abstract

Introduction: The Government of India has formulated the Cigarettes and Other Tobacco Products Act (COTPA) to implement measures to ensure that effective protection is provided to nonsmokers from involuntary exposure to tobacco smoke. Bhubaneswar is the capital city of Odisha, India, was declared as “Tobacco Smoke Free City” in 2010. For strengthening the implementation of the COTPA Act, an effective regular assessment is needed, and hence, an observational study was planned to assess the current violations of Tobacco Smoking in Bhubaneswar.

Materials and Methods: In this observational study, 416 different places were chosen from four different zones of Bhubaneswar. Data were collected with the help of Mobile enabled global positioning system (GPS) technology and pretested structured questionnaire. Results: In this study, 52.88% places were found to be having smoking violations. The study shows maximum violations have occurred in public places (90.89%) followed by transit places (75%). Violations were found to be very low in government buildings, educational, medical institutes, and hotel/ restaurants. The average number of smokers in the city was found to be 4.90/place and the average number of smokers was found to be 4.37/ public place. Conclusion: In this study, GPS-enabled Mobile App can be used to identify the different locations, where a violation of law occurs. This may help administrators to properly plan and implement the law. Even though Bhubaneswar was declared “Tobacco Smoke free city” in 2010, it is still lacking behind in fulfilling the implementation of law, to reduce Second Hand Smoking.

Keywords: Cigarettes and other Tobacco Products Act 2003, global positioning system, public places, smoke free city, tobacco smoking, violations

INTRODUCTION

The Asia pacific region has the highest number of tobacco consumption globally, with the economic and demographic growth. This region has a crucial market for tobacco industry, an expanding business.[1]

The 39th World Health Assembly (WHO) on May 15, 1986 had passed a resolution-to implement the measures to ensure, effective protection is provided to nonsmokers from involuntary exposure to tobacco smoke and to protect children and young people from being addicted to the use of tobacco. Subsequently, the Government of India, has formulated the Cigarettes and other Tobacco Products Act (COTPA) in 2003 to prohibit advertisement and regulation of trade and commerce, production, supply, and distribution of tobacco.[2]

In 2010, Bhubaneswar was declared “Tobacco Smoke Free city” to ensure healthy air for breathing for its citizens[3] and subsequently was declared as Smart city in 2015.[4] The decadal growth rate of the city is very high at 30.2% indicating that Bhubaneswar is growing very fast. The population of the outgrowth areas is about 45,000 the average daily floating population is about 25,000.

According to the Global Adult Tobacco Survey (GATS)-2 study[5] in 2016–17, there were about 38.6% smokers in Bhubaneswar and 54.4% were using both smoke and smokeless Tobacco. A study by Singh and Ladusingh[6] shows the prevalence and determinants of tobacco use in India, is characterized by high prevalence of smoking and smokeless tobacco use.

Address for correspondence: Dr. Nalini Kanta Triathy, Department of Community Medicine, Hi-Tech Medical College and Hospitals, Pandera, Rasulgarg, Bhubaneswar - 751 025, Odisha, India. E-mail: drnkt1979@yahoo.com

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Tobacco use is a leading cause of death and disability in India, killing about 1, 20,000 people in 2010. About 29% of adults were using tobacco on a daily basis and 5% used it occasionally. COTPA is a powerful national law to regulate tobacco use in public places to reduce passive smoking. It is estimated that if current trends of tobacco use persist by 2030, it would take more than 8 million lives every year and out of which, 80% of those are expected to occur in low-middle-income countries. With respect to smoking, India contributes to approximately 10% of the total smokers in the world.

The global positioning system (GPS) is a satellite-based navigation system made up of at least 24 satellites. GPS works in any weather conditions, anywhere in the world, 24 hrs a day, with no subscription fees or setup charges. Hence, GPS technology can be used to identify the tobacco noncompliance at public places in the city.

Bhubaneswar was declared as “Smoke Free City” in 2010 according to GATS-2 study. This city being the capital of the state of Odisha, is having considerable floating population which can acts as an obstacle for proper implementation of the anti-tobacco law. Hence, this observational study was planned to identify current violations of anti-tobacco law.

### Objectives

1. To study the smoking violations of anti-tobacco law (COTPA Section-4 and 6) in the capital of Odisha
2. To study the location specific violations of Anti-Tobacco Law COTPA using GPS enabled Mobile Technology.

### Materials and Methods

#### Type of study

This was an observational study.

#### Location of study

The study was conducted in Bhubaneswar capital city of Odisha.

#### Sample Size

Sample size was calculated to be 343 using formula $n = \left( \frac{4 \times p \times q}{d^2} \right)$ with prevalence of smoking violations at public place to be 69% with allowable error of 20%, total sample size was 416, considering 104 places for each zone.

#### Period of study

July 2018–September 2018.

### Table 1: Zone wise distribution of public places and current smokers

| Zone | Govt. building | Public convenience | Educational institution | Hospital | Transit points | Hotel and restaurants | Current smoking violations in various places/zone | Current number of smokers | Average number of current smokers/zone |
|------|----------------|--------------------|------------------------|----------|---------------|------------------------|-----------------------------------------------|--------------------------|--------------------------------------|
| I    | 30             | 61                 | 7                      | 1        | 2             | 3                      | 56                                            | 264                      | 4.71                                 |
| II   | 22             | 64                 | 12                     | 2        | 2             | 2                      | 66                                            | 320                      | 4.84                                 |
| III  | 30             | 46                 | 13                     | 6        | 3             | 6                      | 46                                            | 284                      | 6.17                                 |
| IV   | 25             | 58                 | 13                     | 4        | 2             | 1                      | 52                                            | 212                      | 4.07                                 |
| Total| 107            | 229                | 45                     | 13       | 9             | 12                     | 220                                          | 1080                     | 4.9                                  |

### Table 2: Distribution of current smoking violations (Cigarette and other Tobacco Products Act) at various public places

| Zone | Public places (smoking) | Violations of COTPA (%) | Compliance (%) | Number of smokers | Average number of smokers/smoking places |
|------|-------------------------|-------------------------|----------------|-------------------|-----------------------------------------|
|      | Present (a)             | Absent (b)              | Total (c)      | 100 - D           | N/a                                     |
| I    | 55                      | 6                       | 61             | 90.16             | 9.84                                    | 254                                      | 4.61 |
| II   | 60                      | 4                       | 64             | 93.75             | 6.25                                    | 295                                      | 4.91 |
| III  | 43                      | 3                       | 47             | 93.47             | 6.53                                    | 239                                      | 5.55 |
| IV   | 50                      | 8                       | 58             | 86.2              | 13.8                                    | 207                                      | 4.14 |
| Total| 208                     | 21                      | 230            | 90.89             | 9.11                                    | 995                                      | 4.8  |

COTPA: Cigarette and other Tobacco Products Act

### Table 3: Distribution of compliance among transit places according to Cigarettes and other Tobacco Products Act

| Zone | Transit places | Smokers | Average smokers/TP | Violations (%) | Compliance (%) |
|------|----------------|---------|--------------------|----------------|----------------|
| I    | 1              | 1       | 2                  | 10             | 50             |
| II   | 2              | 0       | 2                  | 7              | 3.5            |
| III  | 3              | 0       | 3                  | 45             | 15             |
| IV   | 1              | 1       | 2                  | 5              | 5              |
| Total| 7              | 2       | 9                  | 67             | 8.37           |

TP: Transit places
The location of the city according to Latitude and Longitude is 20.2961 and 85.8245 Bhubaneswar city was classified into 4 zones using National Highway 16 which extends from Kolkata to Chennai. The major intersection of the National Highway within the city is at Jayadev Vihar (diagram attached).[11]

Hence, the locations which were taken for this study includes public convenience, transit places, Government buildings, educational, medical institutions along with hotels and restaurants. The individuals who were smoking during our observational period were considered as “Current Violations.”

The standardized questionnaire was collected from previously held study by PGIMER Chandigarh at Fateghar Sahib Punjab on 2013. We have used the English language for the questionnaire.[12] The orientation training for collection of data was conducted among the co-investigators by the researcher having previous experience of conducting similar survey in the district of Fateghar Sahib Punjab, by PGIMER, Chandigarh in 2013 which minimizes the effect of observational bias.[12]

To select the Latitude and longitude application for android mobile phones, different applications were searched independently from Google play store by the researchers. Among different applications available Finacept 2.1 MB having rating of 4/5 was selected on the basis of better rating and easy operability. This mobile app was tested for recording of GPS locations and shared among the researcher to avoid overlapping. The Geo Coordinates of the places visited by the investigators were uploaded in the Map of the “MAPMAKER” applications to make SPOT Map.[13]

A pilot study was conducted randomly selecting 40 places in four Zones for a period of 15 days. The questionnaire was modified to include additional questions such as female smokers, <18 years smokers, and the presence of vendors within 100 yards of Educational and Medical institutions.[2] The reliability test was done through Cronbach’s Alpha test and was found out to be 81.2%.[14] Eighty-one percent of the variance in the scores was indicators of consistency.

From each Zone, 104 places were selected randomly. To minimize the selection bias all the teams visited all the 4 zones. One member of the team has filled the forms while the other one has collected the Geo-Coordinates of the place. Approximately twenty forms were filled per day per team as per the convenience of the team members in the working days. Data collection was started from July 15, 2018 and was finished on September 15, 2018, for 2 months.

Each team was randomly assigned different zones in a particular day after choosing a prominent landmark of that zone; data were collected from various available public places till twenty numbers of forms were filled. Geo-Coordinates of the places were shared among the researchers to avoid overlapping among data collectors. All team members had collected data for a period of 5–6 hrs per day. Nearly 20–25 min of the time were spend in public places and transit areas whereas for collection of information from government building, educational, medical institution and hotels, researcher had taken the consent from the authority and had spent nearly 10 min. This process continued till the entire desired samples were obtained. Researchers also observed about the selling of tobacco products within 100 yards of educational institutions.

**Inclusion criteria**
All public places, markets, educational and medical institutions, government buildings, hotels and restaurants, transit places within the defined zones of Bhubaneswar city.

**Exclusion criteria**
The places (Government buildings, medical institutions, and educational institutes) where permission was not granted for study by the authority.

**Data entry**
Data entry was done in Microsoft Excel version 2010, and statistical analysis was carried using statistical software version SPSS 22.0 (IBM Corp., IBM SPSS statistics for Windows, Armonk, NY). Data were entered through double-entry system independently and was cross-checked by statistician.

Data analysis and interpretation were completed within a month from September 16, 2018 to October 15, 2018. Report writing was done from October 16, 2018 to October 30, 2018.

**Operational definitions**

**Smoking**
Smoking of tobacco in any form whether in the form of cigarette, cigar, bidis, or otherwise with the aid of a pipe, wrapper, or any other instruments. No person shall smoke in any public space provided that in a hotel having thirty rooms or a restaurant having seating capacity of thirty seats or more and in the airports, a separate provision for smoking area or space may be made.

**Cigarettes and other Tobacco Products Act Section 4**
No person shall smoke in any public place.

**Cigarettes and other Tobacco Products Act Section-6**
No person shall sell, offer for sale or permit sale of, cigarette or any other tobacco products to any person who is under 18 years of age and in an area within a radius of 100 yards of educational institutions.

**Public place**
Any place to which the public have access, whether of right or not, and includes auditorium, hospital buildings, railway waiting room, amusement centers, restaurants, public offices, court buildings, educational institutions, libraries, public conveyances and the likes which are visited by general public but does not include any open space.

Government buildings/educational institution and hotels are taken separately in this study.

**Ethics Approval**
Approved.
Results

Descriptive statistics, frequency distributions, Chi-square tests were used to analyze the data. The SPOT MAP was made by the use of Geo – Coordinates.

The public place where anti-tobacco law violations had occurred was found to be 52.88%. Out of the four zones, Zone II having maximum violations of anti-tobacco law 63.5% followed by Zone I (53.84%) [Figures 1 and 2].

Out of total 416 different places taken in this study 107 (25.72%) were Government buildings, 229 (55.04%) were public places, 45 (10.81%) were educational institutions, 13 (3.12%) were hospitals, 9 (2.16%) were transit place, and 12 (2.88%) were hotels and restaurants [Table 1].

The average number of public places where at least one active smoking was found to be 52.88% (220/416) per zone. The average number of smokers in the city was found out to be 4.90/place [Table 1].

The maximum number of active smoking violations was observed in public sites of Zone II followed by Zone III and Zone I. The smoking violations was found to be minimal (COTPA section 4) in the Government buildings (average compliance 99.03%), educational institutions (91.66%) of all the four zones which is above required standards. Similarly, there were no smoking violations within the premises of medical and hospital [Table 2].

For hotels and restaurants, smoke-free status has been achieved 100% not a single person was found to be smoking inside along with no signs of recent smoking. Except for one hotel no other hotels have designated smoking rooms and signage.

Here, in the transit places, there was only 25% compliance, Zone II and III had 100% violations. The average number of smokers per transit place was 8.37 [Table 3].

As per the American Psychological Standard,[15] the result shows there are more violations in smoking areas as compared to the nonsmoking areas which is \( \chi^2 = 8.18 \quad P = 0.04 \), significant. In the study, only 2.2% signages were present of which, only two signages were displayed at main entrance and other conspicuous place. Not a single signage was found comply according to the Law.

Discussion

According to the WHO, all indoor public places and workplaces should be 100% smoke-free to avoid exposure to second-hand smoke.[16] Following these recommendations, India has enacted a comprehensive national law for Tobacco Control in 2003 under the aegis of Framework Convention of Tobacco Control, WHO[17] under Section 4 of COTPA, smoking in public place is prohibited. In this study, the overall violations of anti-tobacco law (COTPA Section-4) found to be 52.3%, which shows hurdles in the proper implementation of the Act.

Out of the four zones, maximum violations were found in Zone II (63.46%) followed by Zone I (46.1%). This might be due to high population density, industrial areas, and higher floating population. It is a fact that the higher the floating population including laborers, workers coming to the city regularly, there might be chance of low awareness and knowledge about the anti-tobacco law in comparison to other zones [Figure 4].

Out of the 416 samples, public conveniences were 55.04% and Government Buildings were 25.72% taken. As per this study, public conveniences are more proportion of in comparison to the government building, educational institutions, and others. The study areas were taken randomly with stratification so the outcome of this study can be generalizable. In this study, out
Mishra, et al.: To study the smoking violations through GPS-enabled mobile app

Figure 3: Spot map (a) zone 2 and 3 (b) Zone 1 and 4

Figure 4: Zone-wise distribution of smoking violations

of 416 samples, nearly 52.88% places were found where at least one current smoker was present.

In most of the public places, a number of vendors selling tobacco products without following the anti-tobacco laws. It may be due to the lack of regular monitoring and supervision by Police Department and other District Tobacco Control Cell officers.

Similarly, average numbers of smokers present in the city were 5 per places and among transit places were 8.37. At any point of observation, approximately five individuals were found to be actively smoking. Similarly, eight individuals were found to be actively smoking per transit places with a high dispersion from 5 to 45. Due to the presence of major interstate bus terminals in Zone III maximum violations of COTPA act were found.

According to John Hopkins Bloomberg School of public health and the UNION the primary indicators of noncompliance is smoking in no smoking zone, and secondary indicators include ashtrays, cigarette butts, and used match sticks.

Bhubaneswar is being the capital city and a pilgrimage center having the airport, major railway stations and interstate bus terminal and also having a significant floating population, can be a challenge for Law Enforcement authorities to implement COTPA 2003 to make “Tobacco Smoke Free City.”

Government buildings of all the four zones were found to be having very less violation this is maybe due to adequate monitoring supervision and implementation of law by the authority and the employees. In educational institutes, compliance was 91.66%. In case of medical institutes, hotels/restaurants 100% compliance was achieved.

Even though there were no active smokers were present within the premises of medical institutes, hotels/restaurants, vendors were found to be selling tobacco products outside the hospital campus. Signages were absent in majority of places and if the present were not according to the law.

Thus, there is a chance of violations of COTPA-4 and 6, and probability of second-hand smoking might be increased.
18 years age group in the population are the most vulnerable. Due to second-hand smoking, non-smokers can be affected by respiratory illnesses which may lead to burden over health system and also can lead to decrease in productivity.

In most of the places, signages were absent and in those places where it was present, were not according to the law. Similar finding was also observed in Sharma and Chauhan study in 2018 in Chandigarh, where none of the sites have displayed the name and contact number of the reporting officers but according to another study conducted in Allwar Rajasthan by Jain et al. in 2016, in which the name and phone number of the reporting officers was mentioned in 75% of Signages.

Hoardings were also not present in either public or transit places. This might be the reason of high violations. The shortage of workforce (Police Department) can be another reason for higher violations in public and transit places (as per the news published by “The Telegraph” newspaper published on October 3, 2017.

To achieve Smoke-Free City status, State/District Tobacco Control Cell should engage various stakeholders for regular monitoring, supervision and conduct various information education communication (IEC) activities.

Strengths of the study
This is an observational community-based study using geo-coordinates to identify the various public places of the smoking violations/violators through mobile-enabled GPS technology. Data reliability and validity were tested using Cronbach’s alpha test which was found to be 81%. Double-entry system was applied to minimize the errors independently by the experts. The study was conducted by the investigators by themselves. This study can form a baseline or reference for policymakers to formulate strategies for the implementation of law.

Limitation of this study
Data were taken only during the daytime. No data were collected on holidays, weekends, and festivals. More than 50% public places (market complex and vendors) which has the ability to skew the result.

Conclusion and Recommendations
Geo-coordinates can be used as a tool to identify violations of the COTPA act in public places. Public sites/transit places should be regularly monitored by Law Enforcement Agencies. Proper Signages should be put at proper places according to COTPA guidelines in government buildings, hotels, and medical and educational institutes. National Tobacco control cell/state Tobacco control cell/District Tobacco control cell should ensure that vendors should not sale tobacco products within 100 yards of the educational and medical institutes. Designated smoking areas should be identified and established. Quarterly review of real-time data should be conducted, and appropriate action should be taken. This study can be an eye-opener for effective implementation of the act to enable Odisha to become “Tobacco smoke-Free.”

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Conflicts of interest
There are no conflicts of interest.

References
1. Tobacco Control for Sustainable Development. Ensuring a Healthy Generation: 13-15 September, 2018. Available from: https://www.vhai.org/12th-APACT-September2018.php. [Last accessed on 2018 Nov 15].
2. The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003; An Act enacted by the Parliament of Republic of India by Notification in the Official Gazette (Act. 32.of. 2003). Available from: http://mohfw.nic.in/index1.php?lang&level=2&sublinkid=671&lid=662. [Last accessed on 2018 Nov 12].
3. The Smart City Mission. Available from: http://smartcities.gov.in/upload/uploadfiles/files/What%20is%20Smart%20City.pdf. [Last accessed on 2018 Sep 17].
4. National Tobacco Control Programme. Available from: http://www.dphodisha.nic.in/?q=node/12. [Last accessed on 2018 Aug 16].
5. Atal Mission for Rejuvenation and Urban Transformation (AMRUT). Available from: http://www.urbanodisha.gov.in/Admin/upload Files/AMRUT/SLIPS/Bhubaneswar.pdf. [Last accessed on 2018 Aug 02].
6. GATS-2 Survey. Available from: https://www.mohfw.gov.in/sites/default/files/GATS-2%20FactSheet.pdf. [Last accessed on 2018 Aug 02].
7. Singh A, Ladusingh L. Prevalence and determinants of tobacco use in India: Evidence from recent Global Adult Tobacco Survey data. PLoS One 2014;9:e114073.
8. Panda B, Rout A, Pati S, Chauhan AS, Tripathy A, Shrivastava R, et al. Tobacco control law enforcement and compliance in Odisha, India-implications for tobacco control policy and practice. Asian Pac J Cancer Prev 2012;13:4631-7.
9. Tobacco. Available from: http://www.who.int/news-room/fact-sheets/detail/tobacco. [Last accessed on 2018Aug 02].
10. Jha P, Jacob B, Gajalakshmi V, Gupta PC, Dhingra N, Kumar R, et al. A nationally representative case-control study of smoking and death in India. N Engl J Med 2008;358:1137-47.
11. Map of Bhubaneshwar, Odisha, India. Available from: https://www.latlong.net/place/bhubaneshwar-odisha-india-3418.html. [Last accessed on 2018 Aug 02].
12. Khawal R, Tripathy JP, Tripathy NK. Dynamics of multi-stakeholder engagement and its role in achieving high compliance of a tobacco control programme. World Dev Perspect 2016;3:7-11.
13. Available from: https://mapmakerapp.com/?map. [Last accessed on 2019 Oct 03].
14. Mahajan BK. Methods in Biostatistics. 7th ed. New Delhi: Jaypee Brothers; 2010.
15. APA. Available from: https://www.statisticssolutions.com/reporting-statistics-in-apa-format/. [Last accessed on 2018.Oct12].
16. Yach D, Bettcher D. Globalisation of tobacco industry influence and new global responses. Tob Control 2000;9:206-16.
17. Dawson J, Singh RJ. Tobacco Control Case Study-Smoke Free City, Chandigarh: International Union against Tuberculosis and Lung Disease; 2009. Available from: http://www.tobaccofreeunion.org/assets/Technical%20Resources/Case%20Studies/Chandigarh Case Study Summary web-ready EN.pdf. [Last accessed on 2018 Nov 14].
18. Sharma N, Chauhan BS. Compliance to tobacco free guidelines (cigarette and other tobacco product act) in medical institutes North India. Indian J Soc Psychiatry 2018;34:213-6.
19. Jain ML, Chauhan M, Singh R. Compliance assessment of Cigarette and other Tobacco Products Act in public places of Alwar district of Rajasthan. Indian J Public Health 2016;60:107-11.