**Mohammed Noufal Poongadan[1], Nitesh Gupta[2], Raj Kumar[1]**

[1]Department of Respiratory Allergy and Applied Immunology V P Chest Institute, University of Delhi, India
[2]Department of Pulmonary Medicine, LHMC and SSK Hospital New Delhi, India

# Lifestyle factors and asthma in India — a case-control study

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## Abstract

**Introduction:** There has been a recent trend of increasing prevalence of asthma in developing countries; prevalence in the Indian population is reported to be 2%. The link between lifestyle factors and asthma has been mostly derived from western literature. The present study intended to study relationship if any, between life style factors and asthma in a representative Indian population.
**Material and methods:** The study is a case-control study performed for a period of one year, between 2014 and 2015. 125 asthma and correspondingly age and sex matched healthy controls were recruited for the purpose of study. A self-reported questionnaire has been prepared based on routine lifestyle habits of Indian population.
**Results:** The hours of TV watching and hours of sleep were significantly higher in asthma patients, and also duration of sports activity showed inverse relation with asthma. Smoking, tobacco, chewing as well as alcohol consumption were higher in asthma patients in comparison to controls, though neither was statistically significant. The mental stress as assessed on scale of 1–10, was significantly higher in asthma patients ($p < 0.001$). Asthma patients had significantly lower travel duration/week ($p < 0.05$).
**Conclusion:** The present study concluded increased TV watching, increased mental stress, reduced hours of physical activity and travel may be correlated with asthma in India. With growing evidence of increasing association of asthma and sedentary lifestyle, it is imperative to reduce acquaintance to as well as incidence of these factors through public health policies, which may impact prevalence of asthma in Indian population.

**Key words:** asthma, India, lifestyle, TV watching

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## Introduction

Asthma is a common respiratory disorder with prevalence in India of about 2.38% and burden of about 17 million patients [1–4]. It is an important public health problem with significant morbidity with an estimated cost of asthma treatment per year for the year 2015 being calculated at about 139.45 billion Indian rupees [5].

The etiology of rise of asthma in developing countries has been attributed to a combination of genetic pre-disposition, environmental factors and lifestyle changes including dietary habits [6]. Lifestyle factors such as BMI, smoking, alcohol intake and time spent on television watching all have been allied to increased asthma prevalence in literature from western countries [7–9]. The association between psychological diseases and asthma has been observed, particularly with respect to anxiety and depression [10]. Also, absence of exercise and the adoption of a sedentary lifestyle may lead to respiratory deconditioning and to lower thresholds for exercise-induced symptoms [11, 12]. Atopic diseases, such as asthma, can affect sleep quality through the disruption of sleep, likely in part because of the presence of nocturnal symptoms [13].

The link between lifestyle factors and asthma has been mostly derived from western literature. The present study intended to study relationship

**Address for correspondence:** Prof. Raj Kumar, MD, Department of Respiratory Allergy, and Applied Immunology, National Centre of Respiratory Allergy, Asthma, and Immunology, V P Chest Institute, University of Delhi, Delhi 110007, India, Tel.: 9810146835; 91-011-27667667, Ext. 144, Fax: 91-011-27667420, e-mail: rajkumarvpci@gmail.com
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if any, between lifestyle factors and asthma in an representative Indian population.

## Material and methods

### Study design and demographics

The study is a case-control study performed for a period of one year, between 2014 and 2015.

### Diagnosis of asthma

The diagnosed patients with bronchial asthma (BA) as per Global Initiative For Asthma (GINA) guidelines were enrolled for the study from the outpatient clinics [6]. All 125 cases of asthma underwent spirometry with reversibility testing.

A total of 125 subjects (55 females and 70 males) aged between 6 and 40 years were evaluated. The exclusion criteria were 1) Inability to fill the questionnaire 2) Pregnant and lactating females.

### Healthy controls

Correspondingly 125 (55 females and 70 males), age and sex matched healthy subjects were enrolled from the community. The healthy subjects were enquired if they previously had any episode of asthma or any previous physician based diagnosis of asthma. Only those with negative answer were included for the study.

### Socioeconomic status (SES)

The socioeconomic status was graded by the Modified Kuppuswamy scale, modified for the current cost inflation index [14, 15].

### Lifestyle factors

The lifestyle factors that were assessed included:

1. Body Mass Index (BMI).
2. a) Smoking status – present/absent b) Tobacco chewing – present/absent c) Alcohol consumption- present/absent d) Duration of travel (hours/week) e) Stress (11-point Visual Analog Scale (VAS) "0," defined as no stress, and "10," reflecting the highest possible level of stress).
3. a) Sports activity — hours/day b) Television (TV) watching/video games — hours/day c) Duration of Sleep — hours/day.

All subjects gave a written informed consent to participate in the study. Institutional ethical committee approved the study protocol.

### Statistical analysis

The data analysis was performed using SPSS statistical package version 15.0 for windows (SPSS, Chicago, IL, USA). The data was examined for distribution and homogeneity of variances was checked before applying parameters tests. The comparison of quantitative variables between three groups was done using ANOVA / Kruskal -Wallis test. The comparison of quantitative variables between two groups was done using unpaired t-test/Mann-Whitney test. The comparison of qualitative variables between two groups was done using Chi-square/Fisher's exact test. Statistical significance was used at the ventional 5% level ($p < 0.05$).

## Results

125 patients (< 12 years, n = 10; >12 years, n = 115) with asthma were evaluated; mean duration of symptoms being 9.02 ± 6.53 years and age of onset of symptoms was 11.93 ± 7.66 years. The demographic details of these patients and the corresponding healthy controls are summarized in table 1. The two groups did not have any significant difference in SES. The comparative analysis of the different lifestyle factors has been summarized in table 2. Smoking, tobacco chewing as well as alcohol consumption was higher in asthma patients in comparison to controls, though neither was statistically significant. Also, the stress as assessed on 1-10 points scale, was significantly higher in asthma patients ($p < 0.0001$). However, asthma patients had significantly lower travel duration/week ($p < 0.05$).

The hours of TV watching and hours of sleep were significantly higher in asthma patients ($p < 0.0001$ and $p < 0.001$ respectively), and also duration of sports activity showed inverse relation with asthma ($p < 0.05$).

## Discussion

Worldwide, it is established that more affluent Westernized countries as well as countries adopting the shift to a Westernized lifestyle have a higher prevalence of asthma in contrast to less -developed countries; association between atopic sensitization and asthma symptoms in children increases with economic advancement [16, 17].

Asthma and obesity are growing epidemics in the developing and the developed world [18]. Studies have shown a significant positive association between increasing obesity (usually BMI) and a new diagnosis of asthma [19, 20]. Obesity affects the respiratory system via mass loading of the thorax, resulting in a reduction in chest wall compliance and changes in airway resistance [21]. In accordance with the literature, present study

**Table 1. Demographic characteristics of bronchial asthma and healthy controls**

| Variable | Bronchial asthma n = 125 | Healthy Control n = 125 | p |
|---|---|---|---|
| Male/Female | 70/55 | 70/55 | NS |
| Height (cms) (mean ± SD) | 159.31 ± 10.15 | 160.22 ± 8.86 | NS |
| Weight (kg) (mean ± SD) | 60.56 ± 12.87 | 57.12 ± 12.07 | < 0.0001 |
| BMI (kg/m$^2$) (mean ± SD) | 23.56 ± 3.43 | 22.05 ± 3.28 | < 0.0001 |
| Kuppuswamy scale | n (%) | n (%) | |
| Upper | 4 (3.20%) | 6 (4.80%) | NS |
| Upper Middle | 16 (12.80%) | 17 (13.60%) | NS |
| Lower Middle | 35 (28.00%) | 32 (25.60%) | NS |
| Upper Lower | 46 (36.80%) | 43 (34.40%) | NS |
| Lower | 24 (19.20%) | 27 (21.60%) | NS |

NS — not significant

**Table 2. Comparison of lifestyle factors in asthma and healthy controls**

| Lifestyle factor | Bronchial asthma n (%) | Healthy Control n (%) | p |
|---|---|---|---|
| Smoking status | 23 (18.40) | 19 (15.20) | NS |
| Tobacco chewing | 23 (18.40) | 20 (16.00) | NS |
| Alcohol consumption | 22 (17.60) | 31 (24.80) | NS |
| | mean ± SD | mean ± SD | |
| Travel duration (hours/week) | 6.87 ± 7.15 | 8.36 ± 7.51 | < 0.05 |
| Stress (VAS score) | 5.62 ± 1.86 | 4.16 ± 2.88 | < 0.0001 |
| Sports activity (hours/day) | 0.58 ± 0.74 | 0.78 ± 0.89 | < 0.05 |
| Television watching (hours/day) | 1.88 ± 0.78 | 1.50 ± 1.05 | < 0.0001 |
| Sleep duration (hours/day) | 4.12 ± 0.59 | 5.38 ± 0.73 | < 0.001 |

NS — not significant; VAS — Visual Analogue Scale

also documented significantly higher BMI among asthma patients (p value < 0.0001).

There exist a complex relationship relation between SES and asthma. Literature vary with respect to whether low socioeconomic status is associated with an increased risk, reduced risk, or not associated with asthma. In the present study, SES was not associated with asthma [22–24].

The present study recognized higher number of smokers and tobacco consumers among patients suffering from asthma, though the results could not reach statistical significance. In previous laboratory studies in human subjects and animals, polyaromatic hydrocarbons (eg, anthracene, fluoranthene, pyrene, and phenanthrene) present in the particulate phase of cigarette smoke and diesel fumes have shown ability to induce allergic immune responses and enhance allergic inflammation [25, 26]. This may be an explanation of higher incidence of asthma in smokers.

Vally et al. reported association of non-alcohol congeners present in different alcoholic beverages, that may act as triggers for asthma. Alcohol may, in some asthmatics, act as a bronchodilator. The product of ethanol oxidation, acetaldehyde, has long been recognized as a trigger for asthma in Asians and is referred to as "alcohol-induced bronchial asthma" [27]. However, in present study the alcohol consumption was higher among healthy controls.

Absenteeism of exercise and the adoption of sedentary lifestyle can lead to respiratory deconditioning and lower thresholds for exercise-induced symptoms [11, 12]. This deconditioning may further discourage patients from exercising, thus perpetuating a vicious cycle of inactivity and worsening asthma symptoms [11]. Compounding the problem, lack of physical activity can contribute to obesity, which is a well-known correlate of poor asthma outcomes [28, 29]. In the present

study, level of physical activity, as assessed by hours of sports activity/week, documented lower activity among asthma patients. This could be due to cause as well as effect of asthma.

ALSPAC (Avon Longitudinal Study of Parents and Children), a prospective study in children, concluded, that children watching television for 2 hours per day were almost twice as likely to develop asthma by 11.5 years of age compared with those watching TV for 1 to 2 hours per day [30]. The PANACEA study (Physical Activity, Nutrition and Allergies in Children Examined in Athens) also documented the association of TV/Video game watching with asthma symptoms [8]. The present study too documented significantly increased hours in watching TV among asthma patients ($p < 0.001$).

TV watching has been associated with unhealthy eating patterns (high caloric intake, decreased fruits and vegetables), low levels of physical activity and a higher body mass index. Thus, overall TV watching promotes a sedentary lifestyle. On the contrary, asthma patients may stay indoors more often than non-asthmatic, in order to avoid outdoor allergens or exercise. This may lead to increased TV watching, positive energy balance, and consequently increased obesity as well as decreased vitamin D status because of reduced exposure to sunlight. The above-mentioned factors too lead to increase asthma symptoms since obesity and decreased vitamin status are inversely associated with asthma [31, 32].

Desanger et al. reported sleep deprivation in asthmatics is induced by poor disease control, abnormal bedtime behaviours and drug-induced insomnia [33]. In the present study, evaluation of hours of sleep per day, documented significantly lower sleep duration in asthma patients ($p < 0.0001$). Strachan D et al., stated that asthma can affect sleep quality through the disruption of sleep, likely in part because of the presence of nocturnal symptoms [13]. The present study also reported less hours of travel in asthmatic patients. It could be attributed to disease itself or due to adoption of sedentary lifestyle in asthma patients.

Priftis et al. suggested linkage of genes involved in stress and inflammatory response with expression of asthma [34]. In the present study, stress was significantly higher in asthma patients as compared to controls ($p < 0.0001$). This is in accordance with literature, which states an association between psychological disease like anxiety and depression and asthma [10, 35].

To the best of our knowledge, the present study is the first population based study to identify lifestyle habits among asthmatic individuals in India, and can provide a basis to further longitudinal studies that would allow better understanding of the influence of lifestyle habits on the development of asthma in India.

The small number of subjects enrolled is a limitation of our study. Also, the broader age group and cultural diversity may have lead to differential lifestyle preferences, which may have influenced the results. Hence, a further large-scale population based study is required for assessing the effect of dietary patterns in Indian population.

## Conclusions

The present study reports an increased TV watching duration and increased stress in patients suffering from asthma in India. Also, reduced hours of physical activity as well as travel and reduced sleep duration may contribute to adoption of sedentary lifestyle, which may further account to increased asthma prevalence. With growing evidence of increasing association of asthma and sedentary lifestyle, it is imperative to reduce acquaintance to as well as incidence of these factors through public health policies, which may impact prevalence of asthma in Indian population.

## Conflict of interest

The authors declare no conflict of interest.

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