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research article

PREVALENCE OF ALLERGIC DISEASES AMONG THE POPULATION OF A POLLUTED AND A LESS POLLUTED AREAS OF WEST BENGAL

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There is uncertainty regarding the precise causes for the prevalence of allergic diseases. The cumulative effect of climate, meteorological factors, pollutants, patients' lifestyle, occupation, socioeconomic status and immunity, etc., can enhance the sensitivity of patients to a particular allergen. The present study aimed to find out the prevalence of various allergic symptoms among the population of a polluted and a less polluted areas of West Bengal. A total of 3391 subjects (1526 subjects from Durgapur and 1865 subjects from Santiniketan) were studied both at the Durgapur as well as Bolpur sub-divisional hospitals from 2013 to 2016. Out of 3391, a total of 1536 (Male 845 and Female 691) allergic subjects with age group between 6 months to 78 years were studied through a questionnaire both at Bolpur sub-divisional hospital and Durgapur sub-divisional hospital in the presence of the clinicians. Some of the allergic diseases showed higher prevalence in the polluted area like allergic cough (30.5%), allergic asthma (45.39%), rhinosinusitis (9.2%), while allergic rhinitis (38%), allergic conjunctivitis (33.3%) were more prevalent in the less polluted area. In case of allergic skin diseases, 95.3% allergic subjects were reported to have different types of skin related symptoms in Santiniketan (less-polluted area) which was 34% higher than that of polluted area Durgapur (61.3%). The outcome of the present study confirms the highly prevalence of allergic cough and allergic asthma at polluted area (Durgapur). These two diseases are interrelated and highly associated with the heavy atmospheric load of PM2.5 and PM10.

Key Words: Allergic Prevalence, Questionnaire, Hospitalization data, pollution, West Bengal, India

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INTRODUCTION

Allergy is a disease with many faces that can affect different organs like the upper and lower respiratory tracts, eyes, intestinal tract and skin. The various symptoms may be manifested as allergic rhinitis[1], allergic asthma[2], IgE-associated atopic dermatitis[3], food allergy[4], insect venom allergy[5], etc. The common characteristic of allergic diseases is a switch to the production of allergen-specific IgE raised against normally innocuous environmental allergens[6] that, in special cases, might also cross-react with self-antigens[7,8]. At this asymptomatic stage, the person is sensitized to a given allergenic source due to the presence of allergen-specific IgE in serum, a condition also called 'atopy'. In atopic individuals, however, re-exposure to the offending allergen induces cross-linking of the high-affinity receptor FceRI-bound allergen-specific IgE on effector cells and, thus, causes immediate release of anaphylactogenic mediators[9]. To explore the prevalence of allergic diseases among local inhabitants, the hospital survey is a prerequisite that plays an important role. The clinicians often ask the patients to fill up a questionnaire encompassing health status, occupation, food habits, family history, etc., of patients from where he or she gathers ideas about the source and nature of allergens. Therefore, it is essential to know the nature of symptoms and the time of onset of allergy. Case history of patients may also provide information about the relationship between patients' allergy symptoms and environmental and/or genetic factors if any. Personal characteristics of patients like diet, smoking habit, occupation, period of stay in the locality, lifestyle, hobby, family history, etc., may also have a connection with allergic manifestation. Since allergen avoidance is one of the effective measures to cure an allergy, all the probable factors are to be taken into consideration for the correct diagnosis and treatment of allergic patients.

In the present study, an extensive health survey of the two selected polluted and less polluted areas of West Bengal was undertaken to prepare a detailed report on the prevalence of various allergic symptoms among local allergy patients and their probable cause.

METERIALS AND METHODS

Area of the study

Durgapur (polluted area) is located at 23.48°N 87.32°E.[10] with an average elevation of 65 m m.s.l. and it is a tier-II city in Paschim Bardhaman district, in the state of West Bengal, India on the bank of the Damodar River (Fig. 6.1). In the 2011 census, Durgapur had a population of 522,517, out of which 294,255 were males and 272,262 were females. The effective literacy rate for the 7+ population was 87.70[11]. Durgapur is by far the most industrialized city in eastern India and the second-planned city in India.

Santiniketan (less polluted area) is located at 23.68°N 87.68°E (Fig. 6.1)[12]. It has an average elevation of 56 meters above m.s.l. It is a small rural setup near Bolpur town in the Birbhum district of West Bengal, India, approximately 160 km north of Kolkata metropolis. Santiniketan-Bolpur Municipality has a total population of 80, 210 (as of the 2011 census), out of which 40,468 are males and 39,742 are females. The male-female ratio of Santiniketan-Bolpur is 1: 0.982. with an 86.77% literacy rate[13]. Santiniketan was established by Maharshi Devendranath Tagore and later expanded by his illustrious Nobel laureate son, Rabindranath Tagore whose vision became what is now a university town, Visva-Bharati University.

Pollution and Meteorological data

The average of minimum and maximum temperature, relative humidity, average wind speed and rainfall of the study areas were collected from the local Meteorological Centre at Durgapur and Santiniketan. The daily concentrations of SO_2, NO_2, PM10 and PM2.5 of the study areas were collected from the West Bengal Pollution Control Board at Kolkata, India (Table 6.1).

Health survey through hospitalization data

The health survey was conducted in many hospitals and clinics. These include Bolpur sub-divisional hospital and Durgapur sub-divisional hospital, Institute of Child Health (Kolkata), Allergy Satellite Centre (Burdwan). A total of 3391 subjects (1526 from Durgapur and 1865 from Santiniketan) were studied at both the Durgapur and Bolpur sub-divisional hospitals from 2013 to 2016. Out of 3391, a total of 1536 allergic subjects (Male 845 and Female 691) having age group ranged from 6 months to 78 years) were investigated.

Questionnaire study and health data collection

A health survey of local patients was carried out by visiting the outpatient department of the sub-divisional hospital of the respective study areas. The data on the demographic and medical history of the studied allergic patients were collected in the presence of physicians using a standard questionnaire which was prepared

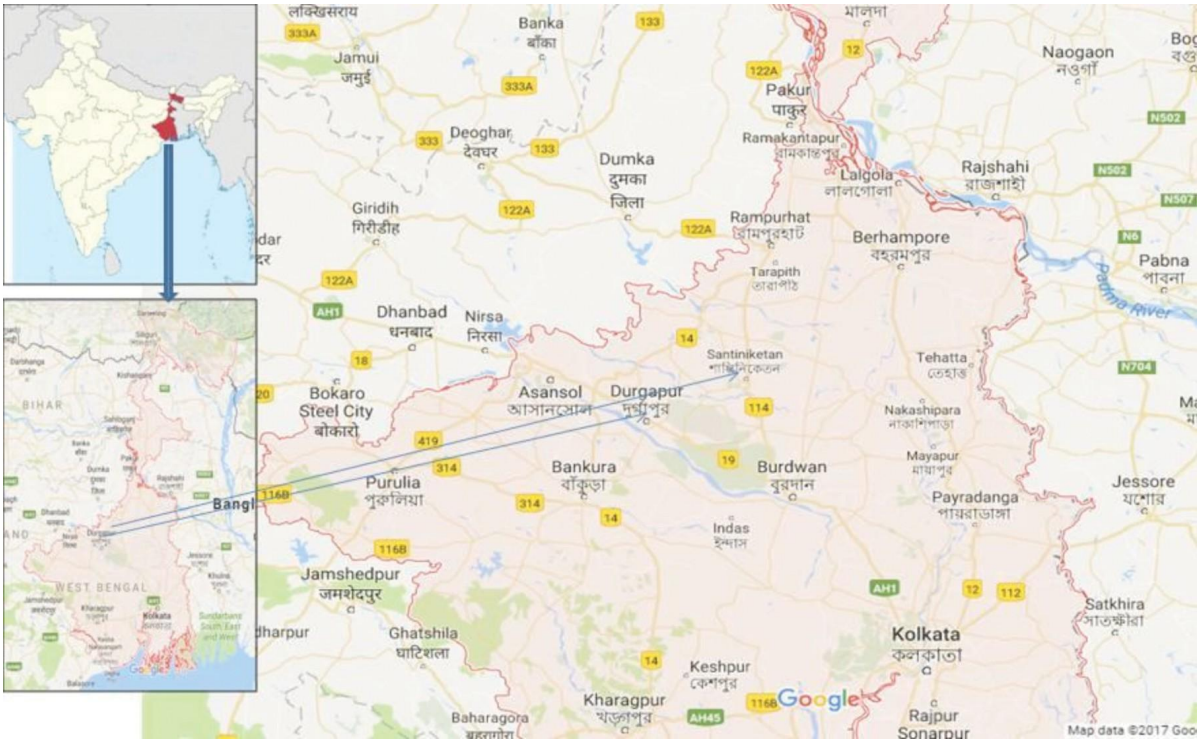

Fig. 6.1: Map of West Bengal showing sampling sites : Durgapur and Santiniketan.

Table: 6.1: Information on pollutants, meteorological factors, fungal spore load in Durgapur and Santiniketan

Pollutants, Meteorological factors, Fungal spore load	Durgapur		Santiniketan	
	Total conc. in 24 Months	Monthly average conc.	Total conc. in 24 Months	Monthly average conc.
NO_2 (µg/m³)	1011	42.13	719	29.98
PM10 (µg/m³)	2838	118.29	2177	90.74
PM2.5 (µg/m³)	1257	52.40	1234	51.44
SO_2 (µg/m³)	335	13.98	129	5.40
Average Max Temp (°C)	770	32.08	768	32.02
Average Min Temp (°C)	494	20.58	493	20.56
Average Rainfall (mm)	64	2.70	1394	58.11
RH (%)	1518	63.26	1761	73.40
Windspeed (km/hr)	34	1.45	1081	45.04

according to WHO (2010) with some modifications based on local socio-economic conditions. The patients were clinically examined by the physician before collecting information from them. The questions concerning allergic symptoms were related to cough, breathlessness, allergic rhinitis, allergic conjunctivitis, allergy-related skin disease and food allergy. Occurrence patterns of symptoms whether seasonal, perennial or irregular, worst month and time of onset of symptoms were also recorded.

RESULTS

The two study fields are different from each other according to their geographical position as well as their pollutant content in the air (Fig. 6.1 & Table 6.1). According to Pollution Control Board data, Durgapur is much more polluted than Santiniketan. So we aimed to find out the prevalence of allergic diseases in both polluted and less polluted areas of West Bengal. A total of 1536 (Male 845 and Female 691: age group 6 months to 78 years) subjects were diagnosed as allergy patients by the enlisted clinicians which was confirmed through the study of the authentic questionnaire.

Some of the allergic diseases showed higher prevalence in the polluted area like allergic cough (30.5%), allergic asthma (45.39%), rhinosinusitis (9.2%), while allergic rhinitis (38%), allergic conjunctivitis (33.3%) were more prevalent in the less polluted area (Table 6.2). In case of allergic skin diseases, 95.3% allergic subjects were reported to have different types of skin related symptoms in Santiniketan which was 34% higher than that of Durgapur (61.3%). Subjects with family genetic allergic record and food allergy were not reported from Durgapur, which may be due to the small sample size, but few subjects were reported to have a genetic allergy (44.1%) and food allergy (16.2%) in Santiniketan (Table 6.2).

DISCUSSION

Air pollution, especially pollution associated with heavy traffic areas and industrial belts, has a significant impact on respiratory-related morbidity and mortality. The prevalence of allergic diseases is now a worldwide concern[14]. In recent decades, the prevalence of allergic disease has noticeably increased globally, particularly in industrialized countries[15]. Among the known causes of allergic diseases, urban air pollution has been attracting attention as an important environmental and extrinsic etiologic agent[16]. Pollutants include gaseous materials such as ozone (O_3) and nitrogen dioxide (NO_2), as well as particulate matter (PM), which are generated by automobile traffic and industry. Strong epidemiological evidence along with experimental studies have elucidated the cellular and molecular events that explain how these pollutants are related to the exacerbation of asthma and other allergic diseases and

Table 6.2: Allergic disease prevalence recorded from polluted (Durgapur) and less polluted (Santiniketan) areas of West Bengal, India.

Prevalence of allergic diseases from polluted and less polluted areas	Durgapur (polluted area)		Santiniketan (less polluted area)	
	Percentage of monthly average patients	Percentage of allergic	Percentage of monthly average patients	Percentage of allergic
Allergy patients admitted at Santiniketan and Durgapur Sub-divisional Hospital OPD	5.88	9.23	13.13	16.89
Allergic Cough (R05)	1.79	30.50	3.71	28.20
Allergic Asthma (J45)	2.66	45.39	3.33	35.08
Allergic Rhinitis (J30.9)	1.58	27.00	3.25	38.00
Chronic allergic conjunctivitis H10.45 (ICD-10-CM) (perennial, seasonal)	0.50	8.50	3.29	33.30
Rhinosinusitis	0.54	9.20	0.38	3.20
The allergic family genetic record	-	-	1.88	44.10
Other allergic symptoms (insect bite allergy, Bed mite allergy etc.)	0.58	9.90	3.13	27.70
Food allergy	-	-	1.63	16.20
Allergic skin diseases	3.71	63.10	9.38	95.30

induced adverse effects in the respiratory system[17,18]. A questionnaire survey of 1536 local allergic patients was obtained by visiting the outpatients' departments of Bolpur and Durgapur Sub-divisional hospitals. The number of Allergy patients admitted at Santiniketan Sub-divisional Hospital OPD is higher than at Durgapur Sub-divisional Hospital (Table 6.2 & Fig. 6.2). Some of the allergic diseases like allergic cough, allergic asthma and rhinosinusitis showed higher prevalence in the polluted area, which may be due to the heavy load of particulate matter in the air as per pollution control board data, while allergic rhinitis, allergic conjunctivitis, and allergic skin diseases were more prevalent in the less polluted area (Fig. 6.2). The local people in various age groups frequently suffer from various allergic incidences which may have a significant relationship with concentration of pollen, fungal spore and pollutants in the air along with other physiological factors. The most common allergic symptom was cough followed by allergic rhinitis, breathlessness, food allergy, allergic conjunctivitis and allergy-related skin diseases (Table 6.2 & Fig. 6.2).

CONCLUSION

The present survey gives a basic idea about the prevalence of different allergic symptoms in Durgapur (A polluted area) and Santiniketan (a Less polluted area) of West Bengal. A wide-scale survey is needed to find out the significant result of allergic prevalence. Allergy can manifest due to several reasons and to find out the reasons we need to study the aeroflora of pollen and fungal spore concentration, various airborne and inorganic pollutants concentration, meteorological factors and socioeconomic status etc. of the study area.

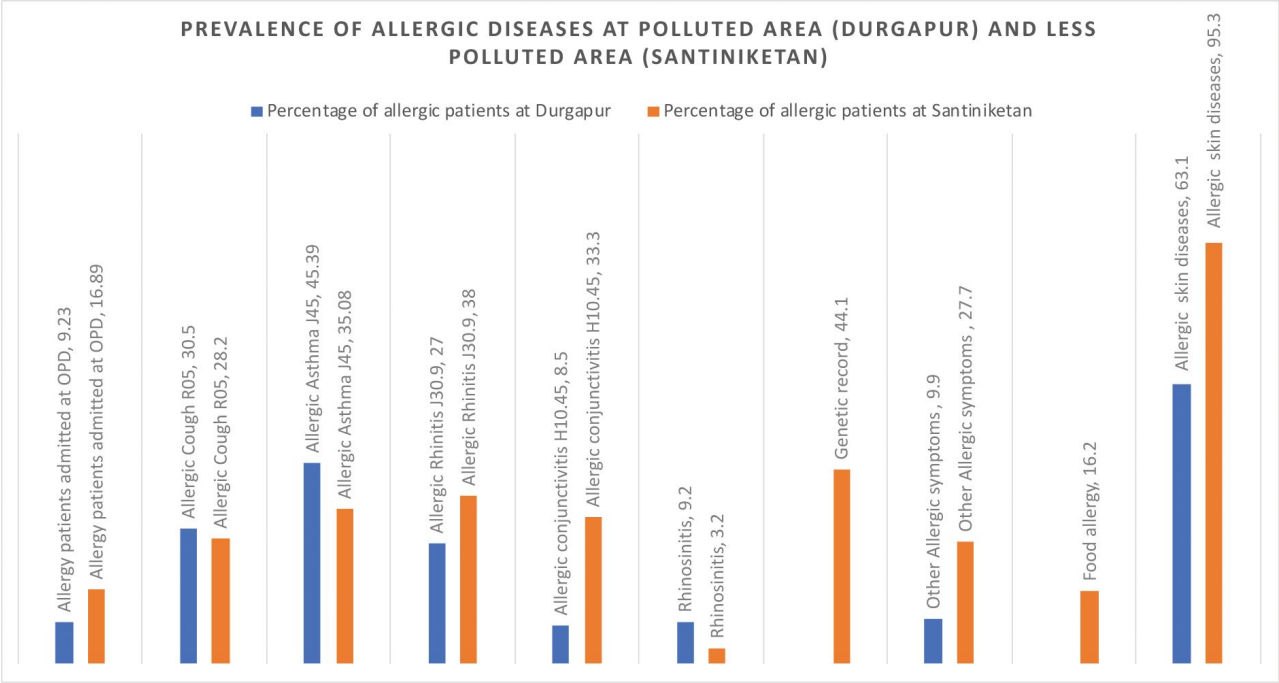

Fig. 6.2: Prevalence of allergic diseases at polluted area (Durgapur) and less polluted area (Santiniketan).

Identification, isolation and characterization of allergic proteins from common airborne fungus and pollen of West Bengal need to explore. The fungal spore and pollen calendar of the study sites may be helpful to the physicians in diagnosis and immunotherapy of allergy sufferers, particularly those residing in these unexplored biozones of eastern India. Considering all the factors, a statistical model with significant correlation can be used to predict the different types of allergic disease prevalence.

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