

## RISK FACTORS AND PREVALENCE OF CHRONIC BRONCHITIS IN ADULT INDIAN SUBJECTS-AN OBSERVATIONAL STUDY

Dr Vikas B R,<sup>1</sup> Dr B R Kiran,<sup>2</sup> Dr V. Shreyas Kumar,<sup>3</sup> Dr. Arun Kumar<sup>4\*</sup>

<sup>1</sup>MBBS MD, Associate Professor, Department of General Medicine, Raja Rajeswari Medical College and Hospital, Kambipura, Mysore road Bangalore, Karnataka

<sup>2</sup>MBBS MD, Associate Professor, Department of General Medicine, Raja Rajeswari Medical College and Hospital, Kambipura, Mysore road Bangalore, Karnataka

<sup>3</sup>MBBS MD, Associate Professor, Department of General Medicine, Raja Rajeswari Medical College and Hospital, Kambipura, Mysore road Bangalore, Karnataka

<sup>4\*</sup>MBBS MD, Assistant Professor, Department of General Medicine, Raja Rajeswari Medical College and Hospital, Kambipura, Mysore road Bangalore, Karnataka

### Corresponding author

Dr. Arun Kumar

Email id: [arunpatil2001@gmail.com](mailto:arunpatil2001@gmail.com)

Type of study: Original Research Paper

Conflict of Interest: None

---

### ABSTRACT

**Background:** Chronic bronchitis is a form of COPD (chronic obstructive pulmonary disease) depicting a cough of >3 months and recurring over two years. Studies on chronic bronchitis are primary and assessed only older subjects.

**Aim:** The present study was aimed at the identification of risk factors linked with chronic bronchitis in adult Indian subjects visiting medical care for respiratory diseases.

**Methods:** The present study assessed 78 subjects and a questionnaire was used to assess nutritional, environmental, and seasonal factors, family history, individual factors, and demographic data. The majority of the subjects were male in the age range of 21-35 years residing in rural areas. The study also had a control group where the majority of subjects were from urban residences.

**Results:** It was seen that asthma was the most common and prevalent disease associated with the subjects having chronic bronchitis diagnosed with asthma along with chronic bronchitis. Various associated risk factors with chronic bronchitis were identified including family history, pertussis, pneumonia, pulmonary obstruction, asthma, hay fever, spring sensitivity, dust sensitivity, respiratory sensitivity, exposure to secondhand smoke, smoking, and residency.

**Conclusion:** The present study focuses on healthy eating habits, physical fitness, and smoking cessation to prevent chronic bronchitis in affected subjects. The results of the present study are vital for healthcare professionals in India to implement and design effective management and prevention strategies for chronic bronchitis.

**Keywords:** Asthma, chronic bronchitis, respiratory diseases, risk factors, smoking

## INTRODUCTION

A common form of COPD (chronic obstructive pulmonary disease) is chronic bronchitis which has a characteristic pattern of productive cough production present for more than three months and recurring over two years. Subjects having chronic bronchitis usually feel symptoms including chronic productive cough, lethargy, stomach ache, and/or chest pain. Subjects having COPD (chronic obstructive pulmonary disease) or chronic bronchitis can develop recurrent exacerbations of the disease along with an increase in purulence, sputum volume, or both.<sup>1</sup>

Decreasing the exacerbations is vital in chronic bronchitis to reduce medical and personal expenses. Oral mucolytics are the drugs that reduce the viscosity of the sputum, reduce the frequencies of the exacerbations of COPD, and promote expectorations.<sup>2</sup> Bronchitis leads to chronic airway inflammations which can further lead to acute respiratory events including the progressive loss of lung function, restrictions in the airflow, and exacerbations which eventually leads to a high all-cause mortality rate. chronic bronchitis is a highly prevalent respiratory condition affecting nearly 4% to 22% of adult subjects globally and nearly 5% to 7% of subjects in India.<sup>3</sup>

Also, subjects with COPD and smokers show a high prevalence of COPD with the range of nearly 20% to 75%. Previous literature data showed that chronic periodontitis primarily focuses on adult subjects and subjects having COPD which can lead to scarce literature data on young subjects despite the increased incidence of chronic bronchitis in young subjects.<sup>4</sup> Majority of the previous literature data assessed subjects in the age range of 18 years to 40 years with prevalence rates between 1% and 10%.<sup>5</sup> The present study was aimed at the identification of risk factors linked with chronic bronchitis in adult Indian subjects visiting medical care for respiratory diseases.

## MATERIALS AND METHODS

The present cross-sectional clinical study was aimed at the identification of risk factors linked with chronic bronchitis in adult Indian subjects visiting medical care for respiratory diseases. The study was done at Department of General Medicine, Raja Rajeswari Medical College and Hospital, Bangalore, Karnataka after the clearance was given by the concerned institutional Ethical committee. The study population was recruited from the subjects visiting the Outpatient Department of the Institute. Informed consent in written and verbal format was taken from all the study subjects before study participation.

After the final inclusion of the study subjects, all subjects were given a questionnaire and were asked to complete the questionnaire on the spot which took approximately 10 minutes to 20 minutes. The questionnaire was formulated by the researcher's expert in their field following the opinion of the experts, their experience, textbooks, and the previous literature data.

Part 1 of the questionnaire assessed the demographic data and comprised the seven components including the smoking exposure, smoking, occupation, residence, education level, age, and gender of the study subjects. In part 2 of the questionnaire, eight parts were assessed related to the individual factors including spring sensitivity, drug sensitivity, respiratory sensitivity, hay

fever-like allergies and sensitivities, body mass index, weight, and height of the subjects. Part three of the questionnaire had two categories that assessed the family history and five chronic diseases namely pertussis, pneumonia, lung obstruction, and asthma. Part four of the questionnaire assessed 8 factors related to the nutritional, environmental, and seasonal factors like egg consumption, spicy foods, seasonal allergies, air pollutants, dust, mass burning, winter, and summer.

All the study subjects were instructed to complete the questionnaire on their own. Also, the weight and height were measured for all the study subjects with the use of appropriate and standardized scales. It took nearly 10 to 20 minutes for the examiner to collect the data. The data gathered were analyzed statistically using the SPSS software version 17.0 (Chicago, IL, USA). The data were expressed as frequency and percentage and mean and standard deviations. The p-value of  $<0.05$  was considered statistically significant.

## RESULTS

The present cross-sectional clinical study was aimed at the identification of risk factors linked with chronic bronchitis in adult Indian subjects visiting medical care for respiratory diseases. The present study assessed 67 subjects and a questionnaire was used to assess nutritional, environmental, and seasonal factors, family history, individual factors, and demographic data. The mean age of study subjects was  $34.46 \pm 1.3$  years. The majority of the study subjects in the control and study group were in the age range of 21-35 years with 47.36% (n=90) and 48.71% (n=38) study subjects respectively. There were 50.52% (n=96) males and 49.47% (n=94) females in the control group and 58.97% (n=46) males and 41.02% (n=32) females in the study group. The majority of subjects in the control group were from the urban background with 66.31% (n=126) subjects and from rural background in the study group with 71.79% (n=56) subjects. In the control group, the majority of the subjects were postgraduate with 36.84% (n=70) subjects followed by intermediate level education in 27.36% (n=52) subjects, whereas, in the study group, the majority of the subjects had intermediate level education with 33.3% (n=26) study subjects followed by 25.64% (n=20) subjects with high-school level education. In the control group, 14.73% (n=28) subjects were smokers and 33.68% (n=64) subjects had exposure to smoking and in the study group, 48.71% (n=38) subjects were smokers and 84.61% (n=66) subjects had exposure to smoking. The majority of the subjects were employed in both the control and study group (Table 1).

For the individual factors in the study subjects, the mean BMI in study subjects was  $26.44 \pm 6.14$  kg/m<sup>2</sup> with no underweight subject in the control group and 10.25% (n=8) underweight subjects in the study group and 43.15% (n=82) and 30.76% (n=24) obese subjects in control and study groups respectively. Hay fever was reported by 8.42% (n=16) subjects from the control and 66.6% (n=52) subjects from the study group. Spring sensitivity was reported in 22.10% (n=42) subjects from the control and 64.10% (n=50) subjects from the study group. Dust sensitivity was reported in 41.05% (n=78) and 87.17% (n=68) study subjects respectively from control and study groups. Respiratory sensitivity was reported in 29.47% (n=56) and 84.61% (n=66) subjects from control and study groups respectively as shown in Table 1.

Concerning the family history of respiratory diseases, family history was positive in 35.78% (n=68) subjects from the control and 76.92% (n=60) subjects from the study group. Pertussis history was positive in 1.05% (n=2) and 15.38% (n=12) subjects from control and study groups respectively. Pneumonia history was positive in 8.42% (n=16) and 48.71% (n=38) subjects from the control and study groups respectively. Pulmonary obstruction was reported in 2.10% (n=4) and 30.76% (n=24) subjects respectively from the control and test group. Asthma history was positive in 26.31% (n=50) and 64.10% (n=500) subjects from the control and study group. For the allergies, a higher incidence of dietary allergies was seen in a study group with 1 and 2 types of allergies in 61.53% (n=48) subjects compared to a control group where type 1 and type 2 allergy was seen in 50.52% (n=96) and 6.31% (n=12) study subjects respectively. Environmental allergies were seen in 43.15% (n=82) subjects from the control and 15.38% (n=12) subjects from the study group. Seasonal allergies to both summer and winter were seen in 4.21% (n=8) subjects from the control and 48.71% (n=38) subjects from the study group (Table 2).

On assessing the association of various characteristics to chronic bronchitis in study subjects, it was seen that no significant association was seen in age and chronic bronchitis with  $p=0.7$ . Also, no significant association was seen between gender and chronic bronchitis with  $p=0.4$ . A significant association was seen between residence and chronic bronchitis with the majority of subjects with chronic bronchitis being residents of rural areas. A non-significant association of chronic bronchitis to educational status was seen with  $p=0.4$ . A highly significant association was seen for chronic bronchitis to smoking and smoking exposure with  $p=0.000$  with a high proportion of smokers and subjects with smoking exposure having chronic bronchitis. For individual characteristics, no association was seen between BMI and chronic bronchitis with  $p=0.16$ . However, a highly significant association was seen of chronic bronchitis to hay fever, spring sensitivity, dust sensitivity, and respiratory sensitivity with  $p=0.000$  with a greater number of subjects with hay fever, spring sensitivity, dust sensitivity, and respiratory sensitivity with chronic bronchitis.

For the association of risk factors and allergies to chronic bronchitis in study subjects, a highly significant association was seen for chronic bronchitis to family history, pertussis, pneumonia, pulmonary obstruction, and asthma with  $p=0.000$  with a higher number of subjects with family history, pertussis, pneumonia, pulmonary obstruction, and asthma reporting chronic periodontitis. On assessing the association of various allergies to chronic bronchitis in study subjects, no significant association of chronic bronchitis to dietary allergies was seen with  $p=0.47$ . However, a highly significant association was seen between chronic bronchitis to environmental allergy and seasonal allergy with  $p=0.000$  as depicted in Table 4.

## DISCUSSION

The mean age of study subjects was  $34.46 \pm 1.3$  years. The majority of the study subjects in the control and study group were in the age range of 21-35 years with 47.36% (n=90) and 48.71% (n=38) study subjects respectively. There were 50.52% (n=96) males and 49.47% (n=94) females in the control group and 58.97% (n=46) males and 41.02% (n=32) females in the study group. The majority of subjects in the control group were from the urban background with 66.31%

(n=126) subjects and from rural background in the study group with 71.79% (n=56) subjects. In the control group, the majority of the subjects were postgraduate with 36.84% (n=70) subjects followed by intermediate level education in 27.36% (n=52) subjects, whereas, in the study group, the majority of the subjects had intermediate level education with 33.3% (n=26) study subjects followed by 25.64% (n=20) subjects with high-school level education. In the control group, 14.73% (n=28) subjects were smokers and 33.68% (n=64) subjects had exposure to smoking and in the study group, 48.71% (n=38) subjects were smokers and 84.61% (n=66) subjects had exposure to smoking. The majority of the subjects were employed in both the control and study group. These data were similar to the studies of Song J et al<sup>6</sup> in 2021 and Boucher RC<sup>7</sup> in 2019 where authors assessed subjects with demographic data similar to the present study.

It was seen that for the individual factors in the study subjects, the mean BMI in study subjects was 26.44±6.14 kg/m<sup>2</sup> with no underweight subject in the control group and 10.25% (n=8) underweight subjects in the study group and 43.15% (n=82) and 30.76% (n=24) obese subjects in control and study groups respectively. Hay fever was reported by 8.42% (n=16) subjects from the control and 66.6% (n=52) subjects from the study group. Spring sensitivity was reported in 22.10% (n=42) subjects from the control and 64.10% (n=50) subjects from the study group. Dust sensitivity was reported in 41.05% (n=78) and 87.17% (n=68) study subjects respectively from control and study groups. Respiratory sensitivity was reported in 29.47% (n=56) and 84.61% (n=66) subjects from control and study groups respectively. These data were compared to the previous studies of Mooren K et al<sup>8</sup> in 2019 and Abo-Elkhair M et al<sup>9</sup> in 2014 where authors assessed subjects with comparable clinical characteristics as in the present study.

The study results showed that concerning the family history of respiratory diseases, family history was positive in 35.78% (n=68) subjects from the control and 76.92% (n=60) subjects from the study group. Pertussis history was positive in 1.05% (n=2) and 15.38% (n=12) subjects from control and study groups respectively. Pneumonia history was positive in 8.42% (n=16) and 48.71% (n=38) subjects from the control and study groups respectively. Pulmonary obstruction was reported in 2.10% (n=4) and 30.76% (n=24) subjects respectively from the control and test group. Asthma history was positive in 26.31% (n=50) and 64.10% (n=50) subjects from the control and study group. For the allergies, a higher incidence of dietary allergies was seen in the study group with 1 and 2 types of allergies in 61.53% (n=48) subjects compared to the control group where type 1 and type 2 allergy was seen in 50.52% (n=96) and 6.31% (n=12) study subjects respectively. Environmental allergies were seen in 43.15% (n=82) subjects from the control and 15.38% (n=12) subjects from the study group. Seasonal allergies to both summer and winter were seen in 4.21% (n=8) subjects from the control and 48.71% (n=38) subjects from the study group. These results were consistent with the previous studies of Karunanayake CP et al<sup>10</sup> in 2017 and Ye J et al<sup>11</sup> in 2012 where authors reported a similar prevalence of various allergies and chronic respiratory disease history in their study subjects as in the present study.

It was seen that on assessing the association of various characteristics to chronic bronchitis in study subjects, it was seen that no significant association was seen in age and chronic bronchitis with p=0.7. A non-significant association of chronic bronchitis to educational status was seen



with  $p=0.4$ . A highly significant association was seen for chronic bronchitis to smoking and smoking exposure with  $p=0.000$  with a high proportion of smokers and subjects with smoking exposure having chronic bronchitis. However, a highly significant association was seen of chronic bronchitis to hay fever, spring sensitivity, dust sensitivity, and respiratory sensitivity with  $p=0.000$  with a greater number of subjects with hay fever, spring sensitivity, dust sensitivity, and respiratory sensitivity with chronic bronchitis. These results were in agreement with the previous findings of Pelkonen M<sup>12</sup> in 2008 and Konard S et al<sup>13</sup> in 2013 where authors suggested a significant association of chronic bronchitis to smoking, smoking status, hay fever, spring sensitivity, dust sensitivity, and respiratory sensitivity as in the present study.

It was seen that concerning the association of risk factors and allergies to chronic bronchitis in study subjects, a highly significant association was seen for chronic bronchitis to family history, pertussis, pneumonia, pulmonary obstruction, and asthma with  $p=0.000$  with a higher number of subjects with family history, pertussis, pneumonia, pulmonary obstruction, and asthma reporting chronic periodontitis. On assessing the association of various allergies to chronic bronchitis in study subjects. However, a highly significant association was seen between chronic bronchitis to environmental allergy, and seasonal allergy with  $p=0.000$ . These results were in line with the studies of Pahwa P et al<sup>14</sup> in 2017 and Wang G et al<sup>15</sup> in 2021 where authors reported a significant association of chronic bronchitis to family history, pertussis, pneumonia, pulmonary obstruction, and asthma along with seasonal and environmental allergies as in the present study.

## CONCLUSION

The present study focuses on healthy eating habits, physical fitness, and smoking cessation to prevent chronic bronchitis in affected subjects. The results of the present study are vital for healthcare professionals in India to implement and design effective management and prevention strategies for chronic bronchitis. However, further longitudinal clinical studies are warranted to reach a definitive conclusion.

## REFERENCES

1. Widysanto A, Mathew G. Chronic Bronchitis. In StatPearls. 2021 Jul 17; StatPearls Publishing.
2. Lee HW, Huang D, Shin WK, de la Torre K, *et al.* Obesity in early adulthood increases the risk of gastric cancer to the Health Examinees-Gem (HEXA-G) study. Plos one. 2022;17:e0260826.
3. Grigsby M, Siddharthan T, Chowdhury MA, Siddiquee A, *et al.* Socioeconomic status and COPD among low-and middle-income countries. Int J Chron Obstruct Pulmon Dis. 2016;11:2497-2507.
4. Rumselly KU, Suhartono S, Sulistiyani S. Factors that are related to bronchitis in employees in the cement warehouse Unit Ambon City. International Journal of Health, Education & Social (IJHES). 2020;3:27-36.
5. Choi JY, Yoon HK, Lee SY, Kim JW, *et al.* Comparison of clinical characteristics between chronic bronchitis and non-chronic bronchitis in patients with chronic obstructive pulmonary disease. BMC Pulm Med. 2022;20: 69.

6. Song J, Zeng M, Wang H, Qin C, *et al.* Distinct effects of asthma and COPD comorbidity on disease expression and outcome in patients with COVID- 19. *Allergy.* 2021;76:483-96.
7. Boucher RC. Muco-obstructive lung diseases. *N Engl J Med.* 2019;380:1941-53.
8. Mooren K, van der Linden GG, Pool K, Engels Y. The attitudes of pulmonologists regarding smoking behavior of their patients with advanced COPD: qualitative research. *Int J Chron Obstruct Pulmon Dis.* 2019;14:2673-9.
9. Abo-Elkhair M, Bazid AI, Abd El-Razak AG, Zidan SA, Sultan H. The role of avian influenza virus (Subtypes H9 and H5) and avian infectious bronchitis virus in an outbreak affecting commercial poultry flocks in Egypt in 2012. *Benha Veterinary Medical Journal.* 2014;27:21-8.
10. Karunanayake CP, Rennie DC, Ramsden VR, Fenton M, *et al.* Bronchitis and its associated risk factors in first nation Children. *Children.* 2017;4:103.
11. Ye J, He J, Wang C, Wu H, *et al.* Smoking and risk of age-related cataract: a meta-analysis. *Investigative ophthalmology & visual science.* 2012;53:3885-95.
12. Pelkonen M. Smoking: relationship to chronic bronchitis, chronic obstructive pulmonary disease, and mortality. *Curr Opin Pulm Med.* 2008;14:105-9.
13. Konrad S, Hossain A, Senthilselvan A, Dosman JA, Pahwa P. Chronic bronchitis in Aboriginal people--prevalence and associated factors. *Chronic Dis Inj Can.* 2013;33:218-25.
14. Pahwa P, Karunanayake CP, Rennie DC, Lawson JA, *et al.* Prevalence and associated risk factors of chronic bronchitis in First Nations people. *BMC Pulmonary Medicine.* 2017;17:1-0.
15. Wang G, Hallberg J, Bergström PU, Janson C, *et al.* Assessment of chronic bronchitis and risk factors in young adults: results from BAMSE. *European Respiratory Journal.* 2021;57:2002120.

## TABLES

S. No	Characteristics	Control group (n=190)		Study group (n=78)	
		Number (n)	Percentage (%)	Number (n)	Percentage (%)
1.	Mean age (years)	34.46±1.3			
2.	Age range (years)				
a)	<20	34	17.89	12	15.38
b)	21-35	90	47.36	38	48.71
c)	36-50	42	22.10	14	17.94
d)	51-65	12	6.31	4	5.12
e)	66-80	12	6.31	8	10.25
f)	>80	0	0	2	2.56
3.	Gender				
a)	Males	96	50.52	46	58.97
b)	Females	94	49.47	32	41.02
4.	Residence				

a)	Rural	64	33.68	56	71.79
b)	urban	126	66.31	22	28.20
<b>5.</b>	<b>Educational status</b>				
a)	Illiterate	26	13.68	12	15.38
b)	Primary schooling	6	3.15	4	5.12
c)	High school	24	12.63	20	25.64
d)	Intermediate	52	27.36	26	33.3
e)	Graduate	12	6.31	6	7.69
f)	Postgraduate	70	36.84	10	12.82
<b>6.</b>	<b>Smoking</b>				
a)	Yes	28	14.73	38	48.71
b)	No	162	85.26	40	51.28
<b>7.</b>	<b>Smoking exposure</b>				
a)	Yes	64	33.68	66	84.61
b)	No	126	66.31	12	15.38
<b>8.</b>	<b>Occupational status</b>				
a)	Housewife	32	16.84	14	17.94
b)	Student	40	21.05	12	15.38
c)	Retired	0	0	4	5.12
d)	Freelancer	46	24.21	20	25.64
e)	Employed	72	37.89	28	35.89
<b>9.</b>	<b>Mean BMI (kg/m<sup>2</sup>)</b>	26.44±6.14			
a)	Morbid obesity	6	3.15	10	12.82
b)	Obese	82	43.15	24	30.76
c)	Overweight	68	35.78	28	35.89
d)	Normal weight	34	17.89	8	10.25
e)	Underweight	0	0	8	10.25
<b>10.</b>	<b>Hay fever</b>				
a)	Yes	16	8.42	52	66.6
b)	No	174	91.57	26	33.3
<b>11.</b>	<b>Spring sensitivity</b>				
a)	Yes	42	22.10	50	64.10
b)	No	148	77.89	28	35.89
<b>12.</b>	<b>Dust sensitivity</b>				
a)	Yes	78	41.05	68	87.17
b)	No	112	58.94	10	12.82
<b>13.</b>	<b>Respiratory sensitivity</b>				
a)	Yes	56	29.47	66	84.61
b)	No	134	70.52	12	15.38



**Table 1: Demographic and disease characteristics in study subjects**

Parameters	Control group (n=190)		Study group (n=78)	
	N	%	N	%
<b>Family history</b>				
Yes	68	35.78	60	76.92
No	122	64.21	18	23.07
<b>Pertussis</b>				
Yes	2	1.05	12	15.38
No	188	98.94	66	84.61
<b>Pneumonia</b>				
Yes	16	8.42	38	48.71
No	174	91.57	40	51.28
<b>Pulmonary obstruction</b>				
Yes	4	2.10	24	30.76
No	186	97.89	54	69.23
<b>Asthma</b>				
Yes	50	26.31	50	64.10
No	140	73.68	28	35.89
<b>Dietary allergy</b>				
No	82	43.15	10	12.82
1 type	96	50.52	48	61.53
2 types	12	6.31	10	12.82
<b>Allergy</b>				
2 types	34	17.89	8	10.25
3 types	20	10.52	22	28.20
4 types	4	2.10	34	43.58
<b>Environmental allergy</b>				
No	50	26.31	2	2.56
1 type	82	43.15	12	15.38
<b>Seasonal allergy</b>				
No	52	27.36	0	0
Summer	24	12.63	12	15.38
Winter	86	45.26	28	35.89
Both	8	4.21	38	48.71

**Table 2: Allergies and history of chronic respiratory diseases in two groups of study subjects**

Characteristics	Control group (n=190)		Study group (n=78)		p-value
	N	%	N	%	
Mean age (years)	34.46±1.3				
Age range (years)					

30 and less	104	54.73	42	53.84	0.7
31 and more	86	45.26	36	46.15	
<b>Gender</b>					
Males	96	50.52	46	58.97	0.4
Females	94	49.47	32	41.02	
<b>Residence</b>					
Rural	64	33.68	56	71.79	<b>0.000</b>
urban	126	66.31	22	28.20	
<b>Educational status</b>					
Illiterate	26	13.68	12	15.38	0.4
Primary schooling	6	3.15	4	5.12	
High school	24	12.63	20	25.64	
Intermediate	52	27.36	26	33.3	
Graduate	12	6.31	6	7.69	
Postgraduate	70	36.84	10	12.82	
<b>Smoking</b>					
Yes	28	14.73	38	48.71	<b>0.000</b>
No	162	85.26	40	51.28	
<b>Smoking exposure</b>					
Yes	64	33.68	66	84.61	<b>0.000</b>
No	126	66.31	12	15.38	
<b>Mean BMI (kg/m2)</b>	26.44±6.14				
Morbid obesity	6	3.15	10	12.82	0.16
Obese	82	43.15	24	30.76	
Overweight	68	35.78	28	35.89	
Normal weight	34	17.89	8	10.25	
Underweight	0	0	8	10.25	
<b>Hay fever</b>					
Yes	16	8.42	52	66.6	<b>0.000</b>
No	174	91.57	26	33.3	
<b>Spring sensitivity</b>					
Yes	42	22.10	50	64.10	<b>0.000</b>
No	148	77.89	28	35.89	
<b>Dust sensitivity</b>					
Yes	78	41.05	68	87.17	<b>0.000</b>
No	112	58.94	10	12.82	
<b>Respiratory</b>					

<b>sensitivity</b>					
Yes	56	29.47	66	84.61	<b>0.000</b>
No	134	70.52	12	15.38	

**Table 3: Association of various individual and clinical factors with chronic bronchitis in study subjects**

Parameters	Control group (n=190)		Study group (n=78)		p-value
	Number (n)	Percentage (%)	Number (n)	Percentage (%)	
<b>Family history</b>					
Yes	68	35.78	60	76.92	<b>0.000</b>
No	122	64.21	18	23.07	
<b>Pertussis</b>					
Yes	2	1.05	12	15.38	<b>0.000</b>
No	188	98.94	66	84.61	
<b>Pneumonia</b>					
Yes	16	8.42	38	48.71	<b>0.000</b>
No	174	91.57	40	51.28	
<b>Pulmonary obstruction</b>					
Yes	4	2.10	24	30.76	<b>0.000</b>
No	186	97.89	54	69.23	
<b>Asthma</b>					
Yes	50	26.31	50	64.10	<b>0.000</b>
No	140	73.68	28	35.89	
<b>Dietary allergy</b>					
No	82	43.15	10	12.82	0.47
1 type	96	50.52	48	61.53	
2 types	12	6.31	10	12.82	
<b>Environmental allergy</b>					
No	50	26.31	2	2.56	<b>0.000</b>
1 type	82	43.15	12	15.38	
<b>Seasonal allergy</b>					
No	52	27.36	0	0	<b>0.000</b>
Summer	24	12.63	12	15.38	
Winter	86	45.26	28	35.89	
Both	8	4.21	38	48.71	

**Table 4: Relationship of risk factors and allergies to chronic bronchitis in study subjects**