



A STUDY ON RISK FACTORS OF ASTHMA IN RURAL POPULATION OF COASTAL ANDHRA PRADESH, INDIA

A. KANAKA RAJU¹, K. SUNITHA², P. V. V. SATISH²,
K. SUNITA^{2*} AND G. SUDHAKAR³.

¹Department of Biotechnology, Acharya Nagarjuna University, Nagarjunanagar 522 510, Guntur, Andhra Pradesh, India.

²Department of Zoology & Aquaculture, Acharya Nagarjuna University, Nagarjunanagar 522510, Guntur, Andhra Pradesh, India.

³Department of Human Genetics, Andhra University, Visakhapatnam 530 003, Andhra Pradesh, India.

ABSTRACT

The objective of the present communication was to study the prevalence and risk factors of asthma patients from rural areas of coastal districts i.e., Guntur, West Godavari and Visakhapatnam of Andhra Pradesh. Two twenty nine (229) asthma patients were selected for the study from November 2010 to April 2012. A questionnaire was designed for collecting the information of asthma cases regarding socio-demographic data, Body Mass Index (BMI), environmental risk factors that develop asthma. From out of 229 subjects, 92(40.17%) were males and 137(59.83%) were females. Regarding the risk factors of asthma; 96.51% was effected by weather change, 67.69% by pollengrains, 60.66% by cooking fumes and 37.48% by allergy. Regarding smoking and alcoholism; 13.54% of the subjects were smokers, 17.91% of the subjects were alcoholics and 69.55% of the subjects were non-smokers. Thus the present investigation shows that asthma is an important public health problem in rural areas. It also revealed that occupation, smoking, hereditary are the other causes for increasing the incidence of asthma.

KEY WORDS: Asthma, risk factors, smoking, Body Mass Index



Dr. K. SUNITA

Assistant Professor, Department of Zoology & Aquaculture, Acharya Nagarjuna University,
Guntur, Andhra Pradesh, India. email sunitamichael@yahoo.com
Telephone +91 9704073393

*Corresponding author

INTRODUCTION

Asthma is a chronic inflammatory disease. It is universally distributed irrespective of age group. Global initiative for Asthma describe as 'chronic inflammatory disorder of the airways in which many cells and cellular elements play a significant role'. Sometimes the Asthma results in chronic inflammation associated with airway hyper responsiveness that leads to symptoms like repeated episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. The occurrence of above asthma symptoms is common but the airflow obstruction within the lung is often reversible either spontaneously or with the treatment. Incidence of asthma is caused by both genetic elements and also by environmental risk factors¹. The widespread of the disease asthma is so high that an estimated statistics as on 2009 states that 300 million people worldwide were affected and thus leading to approximately 250,000 deaths per year^{2,3,4}. The prevalence of asthma worldwide is estimated to be 7-10% and the rate of occurrence of asthma has increased significantly over the years⁵. Asthma is clinically segregated into four types depending upon the frequency of symptoms as 'intermittent stage' where the frequency of symptoms is more than two weeks, secondly 'mild persistent stage' where the frequency is less than two weeks, thirdly 'moderate persistent stage' where the symptom occurrence is daily, finally 'severe persistent stage' where the symptoms occur throughout the day⁶. The occurrence of asthma is also induced by exercise and also by occupation. It has been reported that the place of working highly worsens the asthma condition. The complete cause of asthma and its incidence is yet to be completely found. Asthma is a complex disease where the occurrence of it is caused by environmental factors, genetic as well as their interaction with each other. The complexity of the disease is yet to be completely explored⁷.

The guidelines to follow for the diagnosis of asthma is to look out for indicators such as wheezing, cough (worse particularly at night), recurrent wheeze,

recurrent difficulty in breathing, recurrent chest tightness, exercise, viral infection, animals with fur or hair, house dust mites, smoke, pollen, changes in weather, strong emotional expression, airborne chemicals or dusts etc. The medication for asthma is given in two ways quick-relief medications used to treat acute symptoms; and long-term control medications used to prevent further exacerbation. Beta 2-adrenoceptor antagonists (SABA) such as Salbutamol (*Albuterol* USAN), Ipratropium bromide and Epinephrine are the drugs that are given for rapid action. Glucocorticoids, long acting beta-adrenoceptor antagonists (LABA) and Zafirlukast which are Leukotriene antagonists employed for long term control⁸. The purpose of the present study was to reveal socio-demographic data, physical condition and to analyze the different risk factors that develop asthma thereby increase the incidence of asthma among study subjects situated in rural areas of coastal districts i.e., Guntur, West Godavari and Visakhapatnam of Andhra Pradesh.

MATERIALS AND METHODS

The present study was conducted in Government Hospitals and Private Nursing Homes which are located in rural areas of Guntur, Visakhapatnam and West Godavari districts. A written consent was taken from the concerned Medical Officers of the hospitals for collection of the data from the subjects. The sample size was 229 asthma patients, collected the data from November, 2010 to April, 2012. Questionnaire method was followed to collect the information about socio-demography regarding gender, age, religion, marriage, no. of children, education, economic status, occupation, history of asthma in the family, cooking etc. Information was also collected on different environmental risk factors and physical status of the subjects. The questionnaires were analyzed by sorting them separately for each question. The percentage, mean and correlation were calculated using MS Excel.

RESULTS

The qualitative data of 229 individuals suffering from asthma was recorded. In the study group of 229 subjects, 92(40.17%) were males and 137(59.83%) were females. As shown in Table 1, out of 229 subjects 2.18% was in age group of 1-10 years, 7.86% was in the age group of 11-20 years, 17.47% was in the age group of 21-30 years, 21.83% was in the age group of 31-40 years, 23.14% was in the age group of 41-50 years, 17.04% was in the age group of 51-60 years and 10.04% was in the age group of 61-70 years. Low percentage i.e., only 10.04% was observed between 1-20 years. More than half of the subjects (62.44%) were aged between 21-50 years and remaining (27.62%) subjects were aged between 51-70 years. Hence, major percentage of the asthma patients found between 21 to 50 years of age. Majority of the patients i.e., 93.45% were Hindus and 6.55% of the subjects were Muslims and Christians. Pertaining to marital status, majority of the subjects (59.39%) were married at 12-17 years, some patients (31.34%) were married at 18-25 years and remaining subjects (9.17%) were unmarried. Regarding type of marriage, 55.02% had affinal marriage and 35.81% of asthma patients had consanguineous marriage. Out of 229 subjects; 23.58% of subjects had 1-2 children, 58.52% of subjects had 3-4 children, 8.30% of subjects had 5-6 children and 9.60% do not have children.

When educational status of the subjects considered, 84.72% individuals were primary school drop outs, 2.62% studied up to primary level, 11.79% studied up to high school level, very less percentage (0.87%) completed intermediate level and none of the subjects had completed graduation level. 76.85% of the subjects were agricultural labourers, 14.85% of the subjects were other workers and 8.30% have no occupation. When socio-economic status (SES) of the subjects concerned, 73.80% come under low SES, 22.27% come under medium SES and 3.93% belong to high SES. Regarding the type of the fuel used by the patients during cooking; 44.11% was using wood, 5.67% was using Kerosene, only 4.81% was using LPG

and remaining 45.41% do not cook. This reveals that majority of the subjects involving in cooking were women and solid fuels like coal and dung are commonly used as cooking fuels in rural areas Asthma in family history was observed in 44.10% of patients while 55.90% did not have any family history for asthma prevalence. Regarding the duration of asthma condition of the patients 55.02% suffering with asthma since three years, 33.19% had asthma since four to six years and 11.79% having asthma since seven years and above. Regarding medication for asthma in the subjects, 97.82% was taking medication and only 2.18% was not taking any medicines for asthma treatment. 61.14% of the subjects were taking proper diet and doing exercise but 38.86% of the subjects neither taking good diet nor doing exercise (Table 1).

The mean height of the total subjects was 164.49 cm and the mean weight of the total subjects was 51.50 kg and the mean BMI of the subjects was 18.86 kg/m². As per the Table 2, basing on BMI categories; 26.64% was in underweight category, 72.05% of subjects fall under normal weight category and only 1.31% of the subjects were in obese category. According to Table 3, 37.48% of the patients affected with asthma due to allergy, 67.69% of the subjects affected due to pollen grains, 60.66% affected with asthma due to cooking fumes and majority of the subjects i.e., 96.51% affected with asthma due to weather change. Regarding physical condition of asthma patients, all the four symptoms occurred in almost all the asthma patients with different frequencies i.e., 88.65% with wheezing, 92.14% with coughing, 40.17% with nasal problems and 85.57% with shortness of breath. Table 4, shows the habits of the asthma patients regarding smoking and alcoholism. 13.54% of the subjects were only smokers and 17.91% of the subjects were both smokers and alcoholics respectively. Only women smokers were 6.55% and men smokers were 25.32% and women smoking is a marked observation from rural areas. Cigarette, Hookah and Chutta, were the commonest forms of tobacco smoking by the study subjects. Majority of smokers had quit smoking after the attack of asthma. Minority of them were continuing so in the recent past.

Age of the subjects has shown significant positive correlation ($p < 0.01$) with height, weight, BMI, occupation, numbers of children, age at marriage and history of condition. Also height of the subjects has shown positive correlation with weight, BMI, occupation, numbers of children, age at marriage are significantly associated. History

of condition was found to be significantly related with age, BMI, number of children. But there was no significant correlation between history of condition and height, weight, occupation, age at marriage. All the other variables were significantly associated with each other and a positive correlation was observed (Table 5).

Table 1
Socio-demographic Profile of Asthma patients (N = 229)

Characteristics	Number (%)
Gender	
Male	92 (40.17)
Female	137 (59.83)
Age (years)	
01-10	5 (02.18)
11-20	18 (07.86)
21-30	40 (17.47)
31-40	50 (21.83)
41-50	53 (23.14)
51-60	39 (17.04)
61-70	24 (10.48)
Religion	
Hindus	214 (93.45)
Muslims & Christians	15 (6.55)
Age at the time of Marriage	
12-17 Years	136 (59.39)
18-25 Years	72 (31.44)
Un-married	21 (9.17)
Type of marriage	
Affinal marriage	126 (55.02)
Consanguineous marriage	82 (35.81)
Number of children per patient	
1-2	54 (23.58)
3-4	134 (58.52)
5-6	19 (08.30)
None	22 (09.60)
Educational status	
Nil to primary school dropouts	194 (84.72)
Primary	6 (02.62)
High school	27 (11.79)
Intermediate	2 (00.87)
Occupation	
Agricultural labourers	176 (76.85)
Other workers	34 (14.85)
None	19 (08.30)
Socio-Economic Status (SES)	
Low SES	169 (73.80)
Medium SES	51 (22.27)
High SES	9 (03.93)
Type of Cooking fuel	
Wood	101 (44.11)
Kerosene	13 (5.67)
LPG	11 (4.81)
Not Cooking	104 (45.41)
History of Asthma in the family	
Yes	101 (44.10)
No	128 (55.90)
Presence of Asthma condition	
From three years	126 (55.02)
From Four to six years	76 (33.19)
From Seven and above years	27 (11.79)
Current Medication	
Yes	224 (97.82)
No	5 (2.18)
Diet and Exercise	
Yes	140 (61.14)
No	89 (38.86)

Table 2
Body Mass Index of Asthma patients under study (N = 229)

BMI Category	Number of Patients (N)	Percentage of Patients (%)	Mean BMI of the patients
< 18.4 (Underweight)	61	26.64	17.70
18.5 – 22.9 (Normal weight)	165	72.05	19.16
23 – 22.9 (Over weight)	-	-	-
> 25 (Obese)	03	1.31	26.04

Table 3
Distribution of factors influencing Asthma and Physical Condition in study subjects (N = 229)

Factor	Yes N (%)	No N (%)
Asthma due to allergy	86 (37.48)	143 (62.52)
Asthma due to pollen grains	155 (67.69)	74 (32.31)
Asthma due to cooking fumes	139 (60.66)	90 (39.34)
Asthma due to weather change	221 (96.51)	8 (03.49)
Physical condition		
Wheezing	203 (88.65)	26 (11.35)
Coughing	211 (92.14)	18 (7.86)
Nasal Problems	92 (40.17)	137 (59.83)
Shortness of breath	196 (85.57)	33(14.43)

Table 4
Prevalence of smokers and alcoholics in study patients (N = 229)

Habit	N (%)
Only smokers	31 (13.54)
Smokers & alcoholics	41 (17.91)
Men smokers	60 (25.32)
Women smokers	12 (5.24)
Non smokers	157 (69.55)
Type of smoking	
Cigarette	15 (6.55)
Hookah	36 (15.72)
Chutta	21 (9.17)

Table 5
Correlation matrix of variables of study patients

	Age	Height	Weight	BMI	Occupation	No. of Children	Age at marriage	History of Condition
Age	1							
Height	0.497*	1						
Weight	0.646*	0.807*	1					
BMI	0.604*	0.417*	0.778*	1				
Occupation	0.475*	0.722*	0.732*	0.501*	1			
No. of Children	0.619*	0.426*	0.503*	0.469*	0.469*	1		
Age at marriage	0.255*	0.384*	0.404*	0.212*	0.526*	0.526*	1	
History of Condition	0.190*	0.010#	0.104#	0.139*	0.008#	0.204*	0.020#	1

*Significant at $p < 0.01$, # Not Significant at $p < 0.01$

DISCUSSION

The present study reveals that more number of people (44.97%) being affected by asthma

within the age group of 31-50 is from rural areas and is adversely affected by asthma.

This finding is similar to the result obtained by Anuradha et al. [2011]¹⁰, Kaur et al. [2008]¹¹ and Rao et al. [2011]¹². General profile survey showed that 58.52% of the subjects had 3-4 children and 8.3% had 5-6 children. This indicates that family planning is not properly being followed and the need of educating them regarding family welfare in this area. Educational level in the area was found to be considerably low. Most of the subjects were engaged in farming along with the day to day tasks. Subjects basically belonged to marginal class farmers. The present study reveals that 84.72% of the asthma affected people are illiterates. Thus poor knowledge regarding asthma, their resources and requirements are always been considered as one of the factors affecting asthma adversely in the population. The finding of the present study is that, a positive association was observed between asthma and people with lower socio economic status i.e., low income, illiteracy and labour. This finding is closely associated with the previous studies like Anuradha et al. [2011]¹⁰, Kaur et al. [2008]¹¹ and Rao et al. [2011]¹². This study explore that most of the asthma affected people are found recently and have been suffering with asthma for last three years. The reason is due to their practicing lifestyle in the particular rural areas.

A gender difference was noticed in the present study with females being affected more than the males, unlike the studies of Anuradha et al. [2011]¹⁰, Jain et al. [2010]¹³ and Rao et al. [2011]¹². Present study is closely associated with the studies of Kaur et al. [2008]¹¹, Mansi et al. [2007]¹⁴ that female predominance was found which attributed to the fact that use of cow-dung cakes as fuel for cooking leads to airway inflammation and asthma. The female predominance may be related to a greater degree of passive smoking, more exposing to occupational status and cooking fumes. Most of the asthma affected people belongs to normal BMI. According to the guidelines of the World Health Organization (WHO), in Asia-Pacific region the BMI range for normal people is 18.5-22.9. The above result indicates that the people with normal BMI are most affected by asthma in the present study. As hereditary plays a key role in asthma, the findings of the

present study are concurrent with the well documented strong association of family history with the prevalence of asthma revealed in the studies of Anuradha et al. [2011]¹⁰, Prasad et al. [2007]¹⁵, Kaur et al. [2008] and Jain et al. [2010]. Litonjua et al. [1998]¹⁶ observed that the chance of having one asthmatic child was three times greater in the families in which one parent was asthmatic, than in families in which only one parent had inhalant allergy, but did not have asthma. In the present study, family history of asthma was investigated by considering mother, father and siblings. A risk for asthma was higher (44.10%) associated with this variable. This indicates that the occurrence of asthma among parents is an important predictor of asthma in their children. In the study population, most of the subjects were exposed to various environmental allergens and pollutants. The present study correlates with the study of Anuradha et al. [2011]¹⁰ and Kaur et al. [2008]¹¹ that most of the asthma patients were suffering with physical conditions like wheezing, coughing and shortness of breath in the study subjects. Tobacco smoking by hookah emerged a highly significant risk factor in present study population even after adjusting for other confounding factors like age, gender and socioeconomic factors. Smoking of cigarette and chutta also increased the chances of asthma but the effect was not significant. It is, therefore, possible that tobacco smoking through hookah is an independent risk factor for bronchial asthma. The higher prevalence of asthma in rural areas of the study population also possibly related to hookah smoking. Active smoking was observed to have an association with bronchial asthma by some but not by others. Smoking is emerged as a risk factor for asthma. The present study shows that only 31.45% of the subjects were smokers. According to Jindal and Gupta [2005]¹⁷ smoking as a risk factor of asthma has remained debatable. Most of the studies show correlation with this factor. In this study most of the asthma persons and their physical characteristics deliberately indicates about the disease. In the correlation study asthma is the factor which linked with another factor which was revealed in the present study. In this

connection most of the variables are very closely linked with each other. This association reveals that there is a positive correlation within the personality of the affected person. Hence, asthma is significantly associated with age, weight, BMI, height, occupation, age at marriage, and history of condition. This is the first report on this subject especially from rural areas in Andhra Pradesh of selected districts.

Thus the present study work leads to the study which concentrates on finding the dependency of environmental factor and genetic factor on each other for the advent of asthma. Recent findings suggest a CD14 gene which is a cause of hereditary asthma but its expression is controlled or influenced by the presence of an environmental factor that is bacterial endotoxin⁹. Few studies have come up with findings about the influence of the above factor on each other. The patient's data collected from rural background and their main occupation is agriculture. The surroundings of the 229 patients have a possibility for exposure of the endotoxin. With respect to the collected data information, little less than half of the subjects' asthma is caused by hereditary confirming the strong presence of hereditary factor in the sample collected. An observation in 221 (96.51%) subjects revealed that they have been affected with asthma during a weather change which is yet another scope of confirmation for the influence of endotoxin effect on the incidence of asthma. Pollen grains, dust and cooking fumes exposure have also led to the incidence of asthma in the study subjects. The correlation of the number of subjects between the hereditarily incident asthma and environmental risk factors is evident in the present study. The data suggests that there is an influence of hereditary factor and more so weather change has much influence on prevalence of asthma. The combined effect of

both these factors in asthma incidence is being tried to find out by means of genetic studies which are in the pipeline of the work. The present data and genetic studies may suggest us the information regarding the interaction of gene and environment on the incidence of asthma.

CONCLUSION

This is the first regional epidemiological study on the subjects in rural areas of Andhra Pradesh and is limited to few villages. Asthma is highly prevalent in rural India, and it is a serious problem that should be controlled. This investigation provides useful inputs into the epidemiology and other relevant factors influencing asthma in this region of the state. Poor knowledge regarding asthma is one of the causative factors which were observed among rural people. Ignorance, illiteracy, poverty, smoking (active/passive) and inheritance have been considered as the root causes of subjects suffering from various degrees of asthma. From the results it can be concluded that knowledge of asthma disease in rural people is unsatisfactory and needs interventions. Asthma in rural area is highly prevalent in rural India and it is a serious public health problem. Therefore, specific programs should be developed for its control and eradication.

ACKNOWLEDGEMENTS

The authors are thankful to Prof. K. R. S. Sambasiva Rao, Chairman, BOS, Department of Biotechnology & Zoology and Dr. P. Sudhakar, Co-ordinator, Department of Biotechnology, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India for providing facilities to carry out this work.

REFERENCES

1. Martinez FD, Genes, environments, development and asthma: a reappraisal, *Eur Respir J*, 29 (1): 179–84, (2007).
2. Fanta CH, Asthma, *New England Journal of Medicine*, 360 (10): 1002–14, (2009).
3. World Health Organization Fact Sheet No 307, Asthma 2009, Retrieved 2 September (2010).

4. Braman SS, The global burden of asthma, *Chest* 130, (Suppl): 4S–12S, (2006).
5. Anandan C, Nurmatov U, van Schayck OC, Sheikh A, Is the prevalence of asthma declining? Systematic review of epidemiological studies, *Allergy*, 65 (2): 152–67, (2010).
6. Yawn BP, Factors accounting for asthma variability: achieving optimal symptom control for individual patients, *Primary Care Respiratory Journal*, 17 (3), (2008).
7. Miller, RL, Ho SM, Environmental Epigenetics and Asthma: Current concepts and call for studies, *American Journal of Respiratory and Critical Care Medicine*, 177 (6): 567–573, (2008).
8. Rodrigo GJ, Nannini LJ, Comparison between nebulized adrenaline and beta antagonists for the treatment of acute asthma. A meta-analysis of randomized trials, *Am J Emerg Med*, 24 (2): 217–22, (2006).
9. Fernando D, Martine Z, CD14, Endotoxin, and Asthma Risk Actions and Interactions, *Proc Am Thorac Soc*, 4: 221–225, (2007).
10. Anuradha A, Lakshmi Kalpana V, Narasingarao S, Epidemiological Study on Bronchial Asthma, *Indian J Allergy Asthma Immunol*, 25(2): 85-89, (2011).
11. Kaur S, Behera D, Gupta D, Verma SK, Demographic and Environmental factors in patients of bronchial asthma, *Indian J Allergy Asthma Immunol*, 22(2): 85-89, (2008).
12. Rao S, Ashok NC, Jain T, Anuradha R, Muralidhar, Influence of Associated Factors in the Prevalence of Asthma: A Community Based Study in Mysore, *J Clin Diag Res*. 5: 721-724, (2011).
13. Jain A, Bhat HV, Acharya D, Prevalance of Bronchial Asthma in Rural Indian Children: A Cross sectional Study from South Indian, *Indian J Pediatr*, 77: 31-35, (2010).
14. Mansi R, Joshi SV, Pandloskar SR, Dhar HL, Correlation between Blood Sugar, Cholesterol and Asthma Status, *Indian J Allergy Asthma Immunol* 21: 31-35, (2007).
15. Prasad R, Verma SK, Ojha S, Srivastava VK, A Questionnaire Based Study of Bronchial Asthma in Rural Children of Lucknow, *Indian J Allergy Asthma Immunol*, 21: 15-18, (2007).
16. Litonjua AA, Carey VJ, Burge HA, Weiss ST, Gold DR, Parental history and the risk for childhood asthma. Does mother confer more risk than father? *Am J Respire Crit Care Med*, 158: 176-181, (1998).
17. Jindal SK, Gupta D, Aggarwal AN, Agarwal R, Guidelines for the management of asthma at the primary and secondary levels of health care in India – a consensus statement developed under WHO – government of India collaborative programme (2004 – 2005) *Indian J Chest Dis Allied Sci* 47: 309-343, (2005).