Asthma Control Level and Relating Socio-Demographic Factors in Hospital Admissions

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Abstract: *Purpose*: Asthma is one of the serious public health problems that we face today and the rate of complete control is very low. This study aims to determine the level of asthma control and its relationship with socio-demographic factors in asthma patients.

Methods: This cross-sectional study was conducted between November 2020-April 2021 among people aged 18-64 who applied to the hospital and were not diagnosed with asthma. The data of the research were made with the personal information form, ACT (asthma control test). ACT is a questionnaire consisting of 5 questions. Patients rate each question between one and five points. The total score of the five questions forms the test result. If the total score is 25, it is considered as full control, 24-20 as partial control, and ≤19 as not under control. In the research, 206 people participated.

Results: Of the participants, 60.7% were female, 60.2% had a family history of asthma, 94.2% of them used asthma medication, and the average age was 45.7±13.85. In the last 12 years, 50.5% of asthma patients stated that they applied to the emergency department due to respiratory problems, and 23.3% were hospitalized due to these problems. It was determined that 78.6% of asthma patients were not under control, 21.4% were under partial control, and there was no patient under full control. The mean age (48.8) and body mass index (BMI) (29.4) of those whose asthma was not under control were higher than those with partial control (32.2 and 24.7, respectively) ($p<0.001$). It has been determined that the probability of asthma not being controlled increases as age and BMI increase, and life satisfaction decreases, and it is higher in quit smokers than in current smokers ($p<0.05$).

Conclusion: Asthma is largely uncontrolled. The rate of uncontrolled asthma increases with increasing age and BMI. Patients with high BMI should be supported to lose weight and should be directed to exercise.

Keywords: Asthma, control, sociodemographic factors.

1. INTRODUCTION

Asthma is a disease characterized by signs of expiratory airflow limitation and respiratory symptoms such as shortness of breath, chest tightness, cough, and wheezing [1]. Asthma is one of the most common chronic diseases in developed and developing countries. As the incidence of asthma has increased over the years, it is among the important public health problems. In 2017, it was determined that there were approximately 272.7 million asthma patients in the world, and 10.6 million years have been lost due to disability in the world due to this disease. The number of asthma-related YLD (Years lost due to a disability) days in the world increased by 19.3% from 2007 to 2017 [2]. It is thought that 250,000 people die annually due to asthma in the world. It is estimated that there will be 100 million new cases of asthma by 2025. 82% of deaths from asthma are due to controllable conditions [3].

It is estimated that there are approximately 4 million asthma patients in our country. Socioeconomic factors increase the prevalence of the disease [4,5]. Asthma is closely related to genetics, age, and gender. According to studies conducted in the last 60 years, it has been reported that the prevalence of asthma in adults and children has increased [3]. To eliminate the effects of asthma, which increases day by day, and to prevent the emergence of the effects, it is necessary to recognize the risk factors and risk groups [3,5].

Being aware of the control and symptoms of asthma will provide evidence to health professionals so that asthma control can be better provided in the community. Asthma affects society economically and socially. When calculating the cost caused by asthma, health expenditures, loss of workforce (patient and his/her environment) and premature deaths due to asthma should be taken into account. There are problems related to the lack of data in our country [6]. The vast majority of pediatric and adult asthma patients in Turkey are those with uncontrolled and low use of preventive medicine [7].

Asthma control focuses on both reducing symptoms and future asthma attacks and meeting treatment goals [1,3]. The basic approach in the treatment of asthma is to plan treatments to provide asthma control. The aim

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of the treatment of asthma, which is a chronic disease, is to be able to control the symptoms daily and to be protected from future risks arising from asthma. Within the scope of protection from future risks, it is aimed to prevent or minimize asthma attacks, prevent persistent airflow limitation, and be within the safe range in terms of side effects of drug use [1]. Health professionals should provide training on asthma management in patients with asthma. The patient's self-management should be provided by supporting the issues that patients lack. As a result of the training given to patients with uncontrolled asthma by health professionals trained in asthma, it was observed that the number of patients applying to health services decreased [8,9].

This study aims to determine the relationship between asthma control levels and socio-demographic factors in asthma patients admitted to the hospital. In this study, it was tried to reveal with multivariate logistic regression how well the disease is under control in asthma patients who applied to hospitals, and what the socio-demographic factors affect being under control.

2. MATERIALS AND METHODS

2.1. Study Design

This was a cross-sectional study.

2.2. Population

The study population was obtained from patients between the ages of 18-64 and diagnosed with asthma applied to Kayseri City Hospital.

2.3. Study Sample

The sample size was calculated using the G-Power 3.1 program. at a power of 0.80 (1-β=0.80) and with an α=0.05 error level, based on the prevalence of uncontrolled asthma 51.3% according to the SERENA study [10], at least n=199 subjects were included in the sample to find the prevalence of uncontrolled asthma between p=0.50 and 95%, and the confidence interval between 40-60%. The study was completed with 206 patients who voluntarily participated in the study.

2.4. Data Collection Tools

The survey form consists of questions about socio-demographic data of the patients, ACT (asthma control test), and allergy symptoms prepared based on the literature (3 questions).

2.4.1. Asthma Control Test

It was administered only to patients diagnosed with asthma by a physician. ACT, which shows the course of asthma, is an important test that is most used today and is easily understood by patients and their families. ACT is a scale consisting of 5 questions. Patients rate each question between one and five points. The total score of the five questions forms the test result. The survey score was classified as follows: 25 points for complete control, 20-24 points for partial control, and ≤19 points for uncontrolled. The sensitivity for the ACT cutoff point was 89% and the specificity was 78%. More frequent follow-up and control by the doctor are recommended, especially for asthmatic patients with a total questionnaire score of 19 or less [11].

2.5. Data Collection

Data were collected from asthma patients aged 18-64 years who applied to Kayseri City Hospital between November 2020 and April 2021. Survey forms were applied by the researcher using the face-to-face interview technique to volunteer patients who could answer the questionnaire. The application of the questionnaire took approximately 15-20 minutes.

2.6. Statistical Analysis

The data obtained from the research were analyzed with the SPSS (Statistical Package for the Social Sciences) program. Descriptive statistics tables of the data were made. The Chi-square test was used for percentages, and an independent t-test and ANOVA test were used for arithmetic means. Variables that were found to be important according to the ACT from socio-demographic characteristics were analyzed by binary logistic regression (BLR) backward elimination method. The variables found to be important in the analysis were shown in the tables. A p-value of <0.05 was considered statistically significant in all tests.

2.7. Institution and Ethics Committee Permission

Written institutional permission was obtained from Kayseri City Hospital, where the research was conducted. The ethics committee approval of the research was obtained from the Ethics Committee of Yozgat Bozok University with the decision dated 21.10.2020 and numbered 14/05. In the study, the ethical principles in the Declaration of Helsinki were followed and the confidentiality of the information belonging to the individuals was protected. The explanations made to the participants before the study

were as follows: the purpose of the study, the data would not be used for other purposes, the surveys were prepared anonymously, and the survey questions required 15-20 minutes. The survey was applied to the people who verbally stated that they were willing to participate in the research.

3. RESULTS

The study included 206 subjects. 60.7% of the subjects were female and the mean age was 45.7±13.8%. 67.5% of the study population were married, 40.3% of them had an education duration of 5 years or less. 71.8% of the subjects did not work in any job, and 34.0% of them were obese. 60.2% of them had asthma in their family and 9.7% of them evaluated their health status as bad. 94.2% of asthma patients stated that they used asthma medication, 50.5% of them applied to the emergency department due to respiratory problems in the last 12 months, and 23.3% of them were hospitalized due to respiratory problems. While 66.5% of the patients claimed that the workplace worsened their symptoms, 51.3% of them stated that they had never smoked (Table **1**).

It was observed that the asthma symptoms of 78.6% of the patients were not under control. According to the research, people with a higher rate of uncontrolled asthma were as follows: those aged 50 and over (90.9-92.5%), those who were unsatisfied with their life (96.3%), and obese (91.4%), those whose education level was primary school or below (89.2%) ($p<0.05$). The rate of uncontrolled asthma among those with an income level of less than 6000 Turkish lire (76.9-89.4%) was also higher among married (85.6%) and widowed/separated people (88.9%) compared to singles (47.5%) ($p<0.001$). It was found that as life satisfaction and self-perception of health status became negative, the rate of uncontrolled asthma increased (<0.001). The rate of uncontrolled asthma among those who quit smoking (91.7%) was found to be higher than current smokers (67.5%) and never-smokers (75.5%) ($p<0,01$). It was determined that asthma was not under control in 50% of those not using asthma medication and 80.4% of those using asthma medication ($p<0.02$). Statistically, asthma under control was not found to be significant according to the variables such as gender, employment status, family history of asthma, duration of asthma diagnosis, worsening of symptoms at the workplace, and having to change jobs ($p>0.05$) (Table **1**).

ACT scale items reviews are as follows: 31.6% of the patients suffered from asthma often or always, 36.4% of them experienced shortness of breath once a day or more often, 30.6% of them had asthma 2 or 3 nights a week or more often at night, 53.9% of them stated that they used asthma medication once a day or more frequently, and 20.4% of them stated that their asthma was under control at all or poorly (Table **2**).

When the factors affecting the control of asthma in asthma patients were analyzed by BLR, the results were as follows; the probability of uncontrolled asthma increased as age and body mass index (BMI) increased and life satisfaction decreased, the rate was 3,4 times higher in smokers than in non-smokers, there was no significant difference between current smokers and non-smokers. These 4 important factors explain 39.6% of uncontrolled asthma (Nagelkerke R^2= 0.396). Although they were found to be significant in the chi-square test, marital status, education level, income level, duration of asthma diagnosis, age at the time of asthma diagnosis, and asthma medication use were not statistically significant in multivariate BLR analysis (Table **3**).

4. DISCUSSION

In this study, asthma control and influencing factors were investigated in individuals aged 18-64 who were admitted to the hospital with a diagnosis of asthma.

According to the findings of our study, it was found that asthma symptoms were not under control in 78.6% of asthma patients, and there was no patient under full control (Table **2**). In studies, it has been reported that full control could not be achieved in the majority of asthmatic patients [12].

In the SERENA study, in which the causes of uncontrolled asthma were investigated, the findings were as follows: the rate of uncontrolled asthma was 51.3%, the rate of partially controlled asthma was 39.6%, and the rate of fully controlled asthma was 9.1% [10]. In an epidemiological evaluation conducted in the USA, 30% of asthma patients were found to be well-controlled [13]. In our country, it was found that 22% of asthma patients who applied to a tertiary health institution were fully under control [14].

According to the multivariate BLR analysis performed in our study, the factors affecting uncontrolled asthma were as follows; increase in age and BMI, decrease in life satisfaction, and quitting smoking. The rate was 3-4 times higher in smokers than in non-smokers. It was observed that 39.6% of uncontrolled asthma was due to these 4 factors.

Table 1: Asthma is under Control according to Demographic Characteristics

Demographic characteristics		Not under control		Partial control		Total		X^2
		Count	%	Count	%	Count	%	P
Gender	Male	66	81.5	15	18.5	81	39.3	0.641
	female	96	76.8	29	23.2	125	60.7	0.423
Age groups (years)	18-29	12	33.3	24	66.7	36	17.5	55.257
	30-39	24	80.0	6	20.0	30	14.6	<0.001*
	40-49	39	86.7	6	13.3	45	21.8	
	50-59	50	90.9	5	9.1	55	26.7	
	60+	37	92.5	3	7.5	40	19.4	
	Ort. ±SD	48.8	±11.96	32.2	±14.36	45.7	±13.85	<0.001
Marital status	Married	119	85.6	20	14.4	139	67.5	28.802
	Single	19	47.5	21	52.5	40	19.4	<0.001*
	Spouse dead/ separated	24	88.9	3	11.1	27	13.1	
Education levels	Elementary or uneducated	74	89.2	9	10.8	83	40.3	28.406
	Middle School	41	83.7	8	16.3	49	23.8	<0.001*
	High school	29	80.6	7	19.4	36	17.5	
	University	18	47.4	20	52.6	38	18.4	
Working status	Not working	118	79.7	30	20.3	148	71.8	0.371
	Working	44	75.9	14	24.1	58	28.2	0.542
Income levels (TL)	< 2500'	10	76.9	3	23.1	13	6.3	23.924
	2500-3999	84	89.4	10	10.6	94	45.6	<0.001*,b
	4000-5999	61	75.3	20	24.7	81	39.3	
	≥ 6000	7	38.9	11	61.1	18	8.7	
Life satisfaction	Not satisfied	26	96.3	1	3.7	27	13.1	28.334
	Neutral	102	86.4	16	13.6	118	57.3	<0.001*
	Satisfied	34	55.7	27	44.3	61	29.6	
Health perception	Poor	20	100.0	0	.0	20	9.7	20.013
	Moderate	95	85.6	16	14.4	111	53.9	<0.001*
	Well	47	62.7	28	37.3	75	36.4	
BMI (kg/ m^2)	Normal	31	54.4	26	45.6	57	27.7	28.568
	Over weight	67	84.8	12	15.2	79	38.3	<0.001
	Obese	64	91.4	6	8.6	70	34.0	
	Ort. ±SD	29.4	±6.02	24.7	±4.34	26.7	±5.33	<0.001
Smoking	Current smoking	27	67.5	13	32.5	40	19.4	9.650
	Never smoked	80	75.5	26	24.5	106	51.5	0.008*
	Quit smoking	55	91.7	5	8.3	60	29.1	
Asthma in the family	No	66	80.5	16	19.5	82	39.8	0.277
	Yes	96	77.4	28	22.6	124	60.2	0.599
Asthma diagnosis duration	Within 5 years	42	72.4	16	27.6	58	28.2	1.864
	≥ 5 years	120	81.1	28	18.9	148	71.8	0.172
Age at first diagnosis of asthma	3-19 years	20	54.1	17	45.9	37	18.0	22.940
	20-29 years	20	66.7	10	33.3	30	14.6	<0.001
	30-39 years	51	89.5	6	10.5	57	27.7	
	≥ 40 years	71	86.6	11	13.4	82	39.8	
Using asthma medicine	Not used	6	50.0	6	50.0	12	5.8	6.223
	Used	156	80.4	38	19.6	194	94.2	0.013

(Table 2). Continued.

Demographic characteristics		Not under control		Partial control		Total		X^2
		Count	%	Count	%	Count	%	P
In the last 12 months, admission to the emergency due to respiratory problems.	No	64	62.7	38	37.3	102	49.5	30.392
	Yes	98	94.2	6	5.8	104	50.5	<0.001
In the last 12 months, hospitalization for breathing problems	No	114	72.2	44	27.8	158	76.7	16.998
	Yes	48	100.0	0	0.0	48	23.3	<0.001
In the workplace, worsening disease symptoms	No	52	75.4	17	24.6	69	33.5	0.664
	Yes	110	80.3	27	19.7	137	66.5	0.415
Having to change jobs	No	134	77.5	39	22.5	173	84.0	0.901
	Yes	28	84.8	5	15.2	33	16.0	0.342
Unable to work due to respiratory problems	No	152	77.6	44	22.4	196	95.2	2.855
	Yes	10	100.0	0	0.0	10	4.9	0.91
	Total	162	78.6	44	21.4	206	100.0	

Table 2: Asthma is under Control according to Asthma Control Test Items

Asthma control test items During the last 4 weeks;		Not under control		Partial control		Total	
		Count	%	Count	%	Count	%
How much of the time did your asthma keep you from getting as much done at work, school, or home?	All of the time	3	1.9	0	0.0	3	1.5
	Most of the time	62	38.3	0	0.0	62	30.1
	Some of the time	79	48.8	7	15.9	86	41.7
	A little of the time	17	10.5	35	79.5	52	25.2
	None of the time	1	0.6	2	4.5	3	1.5
How often have you had shortness of breath?	More than once a day	11	6.8	0	0.0	11	5.3
	Once a day	64	39.5	0	0.0	64	31.1
	3 to 6 times a week	62	38.3	5	11.4	67	32.5
	Once or twice a week	23	14.2	28	63.6	51	24.8
	Not at all	2	1.2	11	25.0	13	6.3
How often did your asthma symptoms wake you up at night or earlier than usual in the morning?	4 or more nights a week	8	4.9	0	0.0	8	3.9
	2 to 3 nights a week	55	34.0	0	0.0	55	26.7
	Once a week	68	42.0	2	4.5	70	34.0
	Once or twice	21	13.0	11	25.0	32	15.5
	Not at all	10	6.2	31	70.5	41	19.9
How often have you used your rescue inhaler or nebulizer medication	3 or more times per day	26	16.0	0	0.0	26	12.6
	1 or 2 times per day	85	52.5	0	0.0	85	41.3
	2 or 3 times per week	15	9.3	0	0.0	15	7.3
	Once a week or less	11	6.8	3	6.8	14	6.8
	Not at all	25	15.4	41	93.2	66	32.0
How would you rate your asthma control during the past 4 weeks?	Not Controlled at all	6	3.7	0	0.0	6	2.9
	Poorly Controlled	36	22.2	0	0.0	36	17.5
	Somewhat Controlled	82	50.6	2	4.5	84	40.8
	Well Controlled	38	23.5	33	75.0	71	34.5
	Completely Controlled	0	0.0	9	20.5	9	4.4

Table 3: Analysis of Factors Affecting Asthma Uncontrolled by Binary Logistic Regression

Independent variables	B	P	O.R.	95% CI for O.R.	
				Lower	Upper
Age (years)	0.048	**0.006**	1.049	1.014	1.086
Life satisfaction	-0.773	**0.004**	0.462	0.273	0.781
BMI	0.131	**0.012**	1.140	1.029	1.262
Smoking- Never smoked		0.111			
Smoking –Quit smoking	1.222	**0.036**	3.394	1.082	10.649
Smoking-Current smoking	0.328	0.503	1.388	0.532	3.618
Constant	-2.011	0.212	0.134		

Independent variables: Age, Marital status, Education level, Income level, Life satisfaction, body mass index (BMI), Smoking status, Asthma diagnosis duration, how old is the asthma patient, Using asthma medication. Hosmer and Lemeshow Test X^2=1.99, p=0.981, Nagelkerke R^2= 0.396.

Although they were found to be significant at the p<0.2 level in univariate analysis, marital status, education level, income level, duration of asthma diagnosis, age at the time of asthma diagnosis, and asthma medication use were not also statistically significant in multivariate regression analysis (Table **3**). In addition, in univariate analysis, asthma control level was not found to be significant according to gender, employment status, and presence of asthma in the family (Tables **2**, **3**). Since almost all of the patients (94.2%) used asthma medication, the use of medication was therefore not statistically significant.

In the studies conducted, the factors affecting the uncontrolled state of asthma include infection, obesity, smoking and exposure to cigarettes, air pollution, and improper use of drugs. Similar results were obtained in our study [3,14,15].

According to our study, the rate of uncontrolled asthma increases with increasing age (Table **2**). It has been found that more than half of asthma begins after the age of 50 in elderly individuals, and the severity of asthma increases with increasing age of onset [16]. According to a study called the National Asthma Survey conducted in the USA, asthma control was found to be higher in men and young people [17,18]. In many studies, it has been stated that gender affects asthma control, and it is more uncontrolled in women than in men [19,20]. In our study, it was determined that the gender factor was not important, and the age factor was found to be compatible with the literature.

The reasons for the increase in the rate of uncontrolled asthma with age are listed as follows: worsening of general health with age, additional age-related problems, decrease in interpersonal support systems, decrease in cognitive and physical skills, and changes in social life [21,22]. The reason for uncontrolled asthma at older ages may be additional diseases that come with increasing age. It has been stated in many studies that additional diseases found in patients should be evaluated while examining the control level. In the SERENA study, it was determined that asthma was more uncontrolled in individuals with comorbid diseases [10].

In our study, asthma control levels were found to be low in mildly obese and obese patients. The higher the BMI, the higher the probability that asthma is not under control. In our study, it was found that 34% of the asthma patients were obese and almost all of the obese patients were not under control. In a study evaluating asthma types in our country, 36% of asthmatics were found to be obese [23]. Again, in a study among 218 asthma patients in our country, 54% of asthmatics were found to be obese, and it was found that asthma was more uncontrolled in these patients [24].

The fact that the obesity rate is high in asthmatic cases and that asthma control is more difficult in obese patients is similar to the studies conducted. The increase in BMI affects the course of asthma by causing an increase in bronchial hyperactivity. Obese individuals diagnosed with asthma experience difficulties in treatment. The reasons why asthma control is difficult in obese asthmatic patients are the changes and decrease in lung functions and additional diseases (obstructive sleep apnea, gastroesophageal reflux) [2,25].

In our study, when asthma control levels and life satisfaction were compared, a significant statistical relationship was found (p<0.05). It was determined that as life satisfaction decreased, the rate of uncontrolled

asthma increased (Table **3**). The factor of life satisfaction is important when evaluating the impact of chronic diseases [26]. Decreased life satisfaction may cause people to be more insensitive to life, and accordingly, people may not pay enough attention to factors and situations that trigger asthma symptoms. In addition, it seems very difficult for those who are not satisfied with their life to pay enough attention to the use of drugs. Uncontrolled asthma also negatively affects the quality of life [27].

In our study, the probability of uncontrolled asthma was 3,4 times higher in those who quit smoking compared to those who never smoked. There was no statistically significant difference between current smokers and non-smokers (Table **3**). It is thought that smoking affects asthma control negatively and reduces the effectiveness of steroid and inhaler therapy by causing structural disorders in the airways [28]. In the Turkey experience (PASTE) study, the rate of smoking was found to be 11% in people with asthma [29]. Cigarette smoke exposure in all periods of life increases the development of asthma symptoms, the number of attacks, and hospital admissions. The rate of asthma control decreases in patients who continue to smoke despite being diagnosed with asthma. When examining asthma treatment and control status, smoking or exposure should be investigated before making any changes [3,28]. Smokers usually quit smoking after being diagnosed with asthma. However, since the pathological changes are seen in the lung tissue of people who have smoked for a long time, it is very difficult to control the asthma symptoms even if these people quit smoking. For this reason, it is thought that those who quit smoking are more likely to have uncontrolled asthma than those who have never smoked. The reason why there is no significant difference in asthma control between current smokers and non-smokers may be since current smokers are in the early stages of the disease. In addition, since we did not question how long the smokers had been smoking in our study, the reason for the difference between those who never smoked and those who still smoke could not be fully interpreted.

Limitation of the Study

Since the study was only performed on patients who applied to Kayseri City Hospital, it did not contain information about people who did not apply to the hospital. In addition, since the study was conducted during the Covid-19 pandemic, it is thought that asthma patients may be less likely to apply to the hospital.

5. CONCLUSIONS

It was found that 78% of asthma was not under control. It has been determined that asthma control is related to an increase in age and BMI, smoking, and a decrease in life satisfaction.

Adequate information and education should be given to individuals with asthma about the control of the disease. Patients with high BMI should be supported to lose weight and should be directed to exercise.

Asthma patients should also be supported to quit smoking, and they should avoid exposure to cigarettes, tobacco smoke, and things that provoke the disease.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

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RESEARCH ETHICS AND CONSENT

Participants were informed about the study and their consent was obtained. The research was carried out by the rules and ethical codes specified in the Declaration of Helsinki.

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