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RESEARCH ARTICLE

FREQUENCY OF ASTHMA IN ADOLESCENCE AND ITS DETERMINANTS

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ABSTRACT

Background: Asthma represents one of the most important cause morbidity among adolescents. Therefore, this study was conducted with an objective in mind to find out the frequency of asthma is one of the most vulnerable age groups i.e. adolescences. Moreover, the study was also meant to find out different determinants that are responsible for the attacks of asthma in this age group.
Objective: To investigate the frequency of asthma in adolescence and its determinants.
Material and Methods
Study Design: It was a cross sectional study
Study Setting and duration: This research was carried out in Capital Development Authority (CDA) Hospital. The duration of the study was 4 months, from 1st April, 2014 to 31st July 2014.
Inclusion criteria: Asthma patients were selected from medical and pulmonology wards of Capital Development Authority (CDA) Hospital.
Data Collection and analysis: Data was collected from the patients via a health questionnaire. The questionnaire comprised of several open and close ended questions in order to collect personal, social, medical and environmental data.
Results: Results showed that mean age of adolescents to develop asthma is around 17 years. The frequency of asthma is higher in male subjects as compared to females, 56.7% and 43.3% respectively. Frequent attacks of asthma are associated with symptoms like cough and difficulty in breathing (72.3% patients), waking up at night due to coughing and difficulty in breathing (65.1% patients) and wheezing (57.8% patients). Middle socioeconomic group and outdoor pollutants like dust and smoke are the most important determinants ($P< 0.05$).
Conclusion: The frequency of asthma is quite high during adolescence (mean age 17 years). Outdoor pollutants like smoke and dust are the main determinants that govern the development of asthma in such individuals.

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INTRODUCTION

Asthma is a disease characterized by hypersensitivity and inflammation of air passages resulting in the manifestation of symptoms similar to that of lower airway obstruction (Holgate, 2008). The most important triggers of asthma attack include bacterial allergens, psychological co-morbidities, food and drug allergies (Spergel and Fiedler, 2005; Covar *et al*., 2005). In addition environment triggers (dust, pollen) are also important causative agents (D'Amato *et al*., 2005). Respiratory symptoms of asthma include cough, wheezing, tightness of chest and difficulty in breathing (Jerry A. Krishnan *et al*., 2012).

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Asthma during adolescence (age 12-18) is a fairly common condition. Recent epidemiological studies have shown that the lifetime prevalence of asthma in this age group is 10.3%. (Sestini and La Grutta, 2005) Adolescents with asthma are a different group of patients with entirely unique problems when compared to children and adults. Over exposure to certain risk factors, poor diagnosis and under treatment makes asthma common among this age group (Sadof and Kaslovsky, 2011). Treating asthma in adolescents is also a challenge because the individuals of this age group tend to refuse the presence of any symptoms, show poor compliance to any therapy given and tend to adopt a life style full of exposure to risk factors. Moreover, adolescence is a period of psychological upheaval and the individuals of this group show symptoms of depression, anxiety and post-traumatic stress disorder, which make asthma

even more prevalent in this group (de Benedictis and Bush, 2007). The major determinants of asthma during adolescence can both be personal or environmental. Personal variables that tend to trigger asthma during adolescence include difference of gender, previous history of an atopic disease, family history of the disease, obesity, smoking and some anomalies at the time of birth (prematurity and low birth weight).

Similarly the environmental determinants that tend to influence the frequency of asthmatic attacks among adolescents include domestic exposure to irritants (moldy walls at home) and exposure to environmental irritants (dust, smoke, pollen) (Laussmann *et al*., 2012; Joshua A Lawson and William Pickett, 2014). Moreover, socio-demographic variables also seem to influence the frequency of asthma during adolescence (Kuschnir and Alves da Cunha, 2007). The purpose of this study is to statistically evaluate different determinants of asthma during adolescence and their relationship with the frequency of asthmatic attacks among these individuals. This study will thus help in finding the most important risk factors of asthma among adolescents and this will eventually help in sharpening preventive and therapeutic approach for the treatment of this condition in this particular age group.

Objectives

This study was conducted with an objective in mind to find out the frequency of asthma in one of the most vulnerable age groups i.e. adolescents. Moreover, the study was also meant to find out different determinants that were responsible for the attacks of asthma in this age group.

Operational definition

According to World Health Organization (WHO), asthma can be defined as a condition/disease characterized by recurrent attacks of wheezing and breathlessness. These attacks may vary in frequency and severity from person to person. Moreover, these attacks may last from few hours to several days. So, all patients who presented with these features or were labeled as asthma sufferers by physicians were included in the study.

MATERIAL AND METHODS

Study design

It was a cross sectional study.

Study setting

This research was carried out in Capital Development Authority (CDA) Hospital.

Duration of study

The duration of the study was 4 months, from 1st April, 2014 to 31st July 2014.

Sample size

Sample comprised of 150 asthma patients.

Sampling technique

The sampling was non probability / purposive sampling.

Sample selection

Inclusion criteria

Asthma patients were selected from medical and pulmonology wards of Capital Development Authority (CDA) Hospital.

Exclusion criteria

All other patients were not included in the study.

Data collection procedure

The medical questionnaire was about the frequency of asthma in adolescence and its determinants. The patients who agreed to participate were asked to sign an informed consent. A self-designed questionnaire consisting of closed and open ended questions was provided to each patient. The questions covered personal, social, medical and environmental data. All this data was meant to find out different causes that might have triggering the attacks of asthma in the patients. Different triggers that the patients were inquired about included dust, smoke, animal dander, mites/cockroaches, pollen, plant allergens, emotional triggers, any underlying illness like flu or other factors. Since asthma has a tendency to run in families, so the questionnaire also asked about family history of this disease. Patients were asked if anyone else in their blood relatives had experienced asthma attacks. Socioeconomic status makes up another important factor that might cause asthma. Socioeconomic status was divided into 3 levels according to the education and occupation of the patients, and their guardians: high level (highly educated and occupation reasonable for their educational level), middle level (high or secondary educated and occupation be- low their education level) and low level (illiterate and occupation not permanent). The questionnaire was anonymous to ensure confidentiality.

Data analysis procedure

Data was entered and analyzed in SPSS Version 17.0. Mean and standard deviation were calculated for numerical variables like age, frequency of asthma attacks and determinants of asthma. Results were recorded as frequencies, percentages, mean and standard deviation. Tests of significance was also performed. Pearson chi-squared test was used for univariate analysis. The variables found to be significantly associated with asthma were entered into logistic regression with crude odds ratio (OR) and were adjusted for sex differences calculated to establish the statistically significant factors. Differences was considered significant at $P < 0.05$.

RESULTS AND MAIN FINDINGS

We added the age of the respondents into the software and analyzed it for variables like mean, median, mode and standard deviation. Results came out as follows.

Statistics

Figure 1. Age of subjects

N	Valid	150
	Missing	0
Mean		17.0333
Median		18.0000
Mode		18.00
Std. Deviation		3.21368
Minimum		12.00
Maximum		28.00

Next step was to analyze the range of age in which most of the respondents fell. Results are shown in tabulated form in the Figure 2.

Figure 2. Age of Respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	12 - 18 years	131	87.3	87.3	87.3
	19 - 28 years	19	12.7	12.7	100.0
	Total	150	100.0	100.0	

Figure 3 is a pie chart representing the gender of the patients that we interviewed. Most of the patients (56.7%) of the patients interviewed were males. Remaining patients (43.3%) were females.

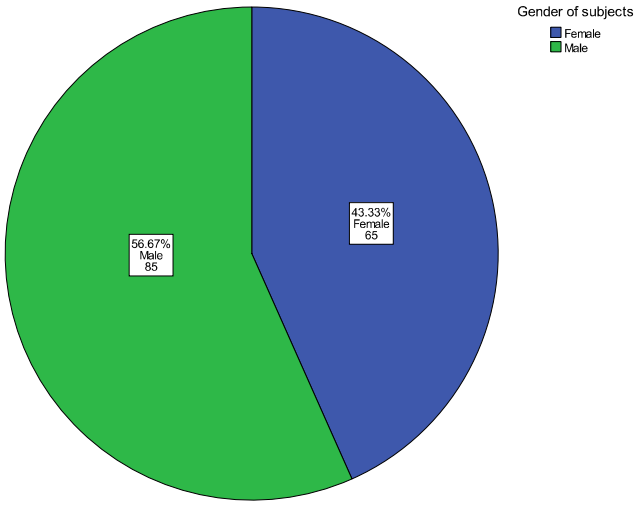

Figure 3. Gender of Subjects

We also gathered data regarding the frequency of symptoms like wheezing, difficulty in breathing and getting up at night due to difficulty in breathing in the respondents over the past one month. Results are shown in table in the Figure 4.

We were also interested in knowing what kind of treatment the respondents were using for the treatment of their symptoms.

Figure 4. Symptoms Frequencies

		Responses		
		N	Percent	Percent of Cases
$Symptoms	Had wheezing episode in past month	48	29.6%	57.8%
	Experienced cough and difficulty in breathing in past month	60	37.0%	72.3%
	Woke up at night due to coughing or difficul breathing in past month	54	33.3%	65.1%
Total		162	100.0%	195.2%

1. Dichotomy group tabulated at value 1.

Also, we interviewed them about how frequently they used their asthma medications or inhalers. This would provide us with another way to look into the frequency of attacks in the respondents. Results are shown in the form of a bar chart in Figure 5.

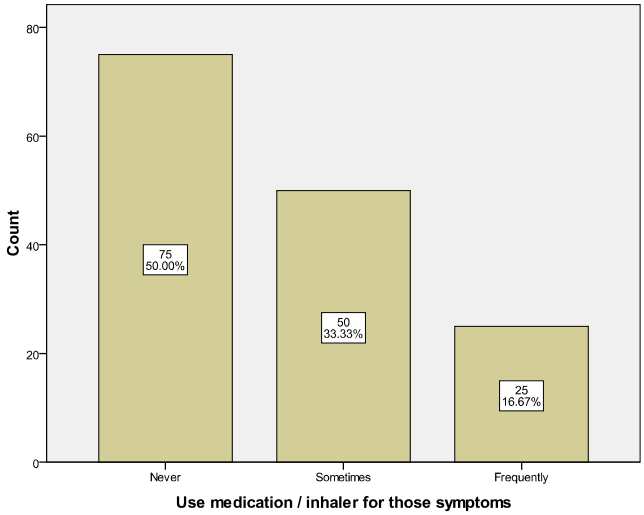

Figure 5. Use of Medications / Inhaler for the Symptoms

Next we asked the patients how frequently they had experienced the symptoms in the last month: not at all, 2 times a week, more than 2 time a week or once every day. This also helped us to find out the frequency of asthma symptoms in the questioned patients. Results are shown in the form of a table in the Figure 6.

Figure 6. Frequency of symptoms appeared in past month

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not appeared	30	20.0	20.0	20.0
	2 times a week or less	78	52.0	52.0	72.0
	More than 2 times a week	29	19.3	19.3	91.3
	Once everyday	13	8.7	8.7	100.0
	Total	150	100.0	100.0	

Asthma might be associated with a significant sick role. So, we questioned the patients how the symptoms were affecting their life. We established this by inquiring them regarding the number of their absentees from their educational institutions (schools or colleges) or their place of work. This also gave us further insight into the frequency of asthma attacks in the respondents. Results are shown in the form of a pie chart in the Figure 7.

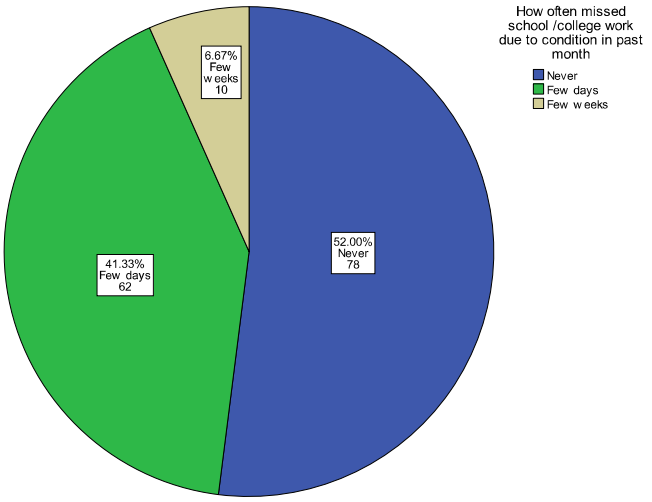

Figure 7. Frequency of Sick Role

Once we had questioned the patients about the frequency of asthma attacks; we then moved on to find the determinants of asthma in the respondents. Socioeconomic status is a known risk factor for the development of asthma since most of the patients with asthma belong to certain socioeconomic class. Our data showed that most of the respondents that we questioned belonged to middle socioeconomic status (62%). Results are shown in the form of a bar chart in the Figure 8.

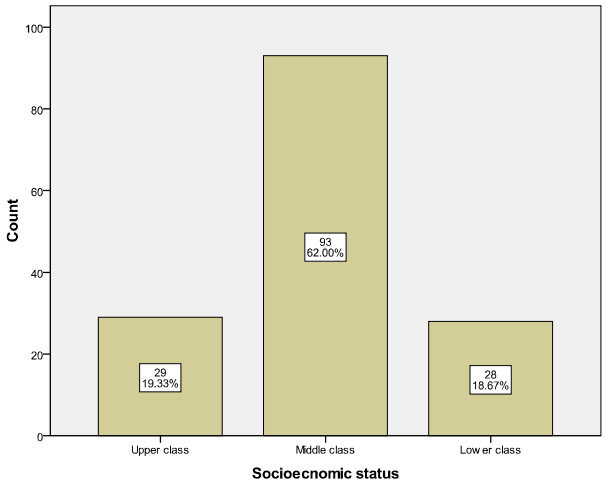

Figure 8. Socioeconomic Status

We also asked the respondents about all the known triggers of asthma (dust, smoke, fungus, animals/pets, plant allergens, mites/cockroaches, chalk, perfume, climate changes (hot and cold), emotional triggers, underlying illnesses (respiratory tract infections, flu for instance), skin allergies and family history of the disease) and asked them to select one or multiple triggers that they thought were most responsible for triggering asthma symptoms in them. Results are shown in the form a table in the Figure 9.

Figure 9. Asthmatriggering substance Frequencies

	Responses		Percent of Cases
	N	Percent	
Asthma triggering substances: 1 Smoke	82	10.0%	59.4%
Asthma triggering substances: 2 Dust	94	11.5%	68.1%
Asthma triggering substances: 3 House mold / fungus	51	6.2%	37.0%
Asthma triggering substances: 4 Animal / pets	49	6.0%	35.5%
Asthma triggering substances: 5 Grass / flower / pollens	74	9.0%	53.6%
Asthma triggering substances: 6 Mites / cockroaches	55	6.7%	39.9%
Asthma triggering substances: 7 Chalk / chalk duse	55	6.7%	39.9%
Asthma triggering substances: 8 Perfumes / pungent smell	82	10.0%	59.4%
Asthma triggering substances: 9 Hot / cold	65	7.9%	47.1%
Asthma triggering substances: 10 Stress / Emotions	60	7.3%	43.5%
Asthma triggering substances: 11 Illness e.g Flu	71	8.7%	51.4%
Asthma triggering substances: 12 Family members suffering from same illness	52	6.3%	37.7%
Asthma triggering substances: 13 Associated allergies e.g skin allergy	29	3.5%	21.0%
Total	819	100.0%	593.5%

a. Dichotomy group tabulated at value 1.

The results of evaluating asthma triggering substances/gender cross tabulation came as follows and are shown in the form of a table in the Figure 10.

RESULTS

Asthma represents a significant cause of morbidity in people of all ages. But one of the most vulnerable groups to develop this condition is adolescents. Out of 150 patients that we questioned, 87.3% individuals fell in the desired age range i.e. 12-18 years (Figure 2). The mean age of the patients we interviewed came out to be 17.3 years (Figure 1). As far as gender of the respondents is concerned, 56.7% were males and 43.3% were females (Figure 3). As for the frequency of symptoms in the respondents, 72.3% patients experienced cough and difficulty in breathing, 65.1% reported of waking up at night due to coughing and difficulty in breathing and 57.8% complained of wheezing episodes in the last one month (Figure no.4). Another measure of frequency of asthma that we used was the frequency of use of medicines/inhalers for the relief from symptoms of asthma. 50.0% of the patients claimed that they have never used any medicine/inhaler for the treatment of their symptoms. Another 33.3% used the treatment options sometimes and remaining 16.7% respondents turned out to be regular users of asthma medicines and inhalers (Figure 5). Another measure of frequency was how regularly the symptoms had appeared in the respondents in the last one month.

Figure 10. Asthmatriggeringsubstance*gender Cross tabulation

		Gender of subjects		Total
		Female	Male	
Asthma triggering substances: 1 Smoke	Count	46	36	82
	% within gender	78.0%	45.6%	
Asthma triggering substances: 2 Dust	Count	42	52	94
	% within gender	71.2%	65.8%	
Asthma triggering substances: 3 House mold / fungus	Count	26	25	51
	% within gender	44.1%	31.6%	
Asthma triggering substances: 4 Animal / pets	Count	20	29	49
	% within gender	33.9%	36.7%	
Asthma triggering substances: 5 Grass / flower / pollens	Count	26	48	74
	% within gender	44.1%	60.8%	
Asthma triggering substances: 6 Mites / cockroaches	Count	26	29	55
	% within gender	44.1%	36.7%	
Asthma triggering substances: 7 Chalk / chalk duse	Count	24	31	55
	% within gender	40.7%	39.2%	
Asthma triggering substances: 8 Perfumes / pungent smell	Count	41	41	82
	% within gender	69.5%	51.9%	
Asthma triggering substances: 9 Hot / cold	Count	25	40	65
	% within gender	42.4%	50.6%	
Asthma triggering substances: 10 Stress / Emotions	Count	21	39	60
	% within gender	35.6%	49.4%	
Asthma triggering substances: 11 Illness e.g Flu	Count	32	39	71
	% within gender	54.2%	49.4%	
Asthma triggering substances: 12 Family members suffering from same illness	Count	28	24	52
	% within gender	47.5%	30.4%	
Asthma triggering substances: 13 Associated allergies e.g skin allergy	Count	12	17	29
	% within gender	20.3%	21.5%	
Total	Count	59	79	138

52.0% individuals experienced the symptoms 2 times a week or less, 20.0% didn't experience any symptoms, 19.3% experienced symptoms 2 times or more and 8.7% experienced symptoms once every day in the last one month (Figure 6). The last measure of frequency that we used was presence of sick role. 52.0% said that they never skipped their workplace, 41.3% respondents said that they had to skip their educational institution or workplace for few days and 6.7% claimed that they had to skip their school/college/workplace for several weeks in the past one month due to asthma symptoms (Figure 7).

As for the socioeconomic status, 62.0% respondents belonged to middle class, 19.3% belonged to upper class and 18.6% belonged to lower class (Figure 8). The relation of asthma attacks with different known allergens was: Dust (68.1%), Smoke (59.4%), Perfumes/Pungent smells (59.4%), plant allergens (53.6%), Illnesses like flu (51.4%), Hot/Cold (47.1%), Stress/Emotions (43.5%), Mites/Cockroaches (39.9%), Chalk/Chalk dust (39.9%), Positive family history (37.7%), Mold/Fungus (37.0%), Animals/Pets (35.5%) and associated allergies like skin allergies (21.0%) respectively (Figure 9). Result of asthma triggers/gender cross tabulation came as: Dust (F:71.2% ; M:65.8%), Smoke (F: 78.0% ; M: 45.6%), Perfumes/Pungent smells (F: 69.5% ; M: 51.9%), plant allergens (F: 44.1% ; M: 60.8%), Illnesses like flu (F: 54.2% ; M: 49.4%), Hot/Cold (F: 42.4% ; M: 50.6%), Stress/Emotions (F: 35.6% ; M: 49.4%), Mites/Cockroaches (F: 44.1% ; M: 36.7%), Chalk/Chalk dust (F: 40.7% ; M:39.9%), Positive family history (F: 47.5% ; M: 30.4%), Mold/Fungus (F: 44.1% ; M: 31.6%), Animals/Pets (F: 33.9% ; M: 36.7%) and associated allergies like skin allergies (F: 20.3% ; M: 21.5%) respectively (Figure 10).

DISCUSSON

Asthma represents a significant cause of morbidity among people of all ages, sex and ethnicities. However, difference do exist and some groups are more prone to develop this condition as compared to the others. Adolescence (age 12-18 years) is one such group that is most vulnerable to the attacks of asthma. Several studies have reported that the incidence of asthma among the individuals aged 12-18 years is higher as compared to adults age 18 years or more (Lara *et al*., 2012; Sestini *et al*.,

2005). The results of our study showed that the maximum number of patients that presented with symptoms of asthma were aged 17 years, which is in accordance with the available literature (Linnéa Hedman *et al*., 2012).

The trends of asthma change significantly among male and female genders in different ages of life. In the early childhood, the prevalence of asthma is higher in boys than in girls. In adolescence the prevalence of this condition is similar among boys and girls or reverses in the favor of girls (Bjornson and Mitchell, 2000; Vink, 2010; Postma, 2010). Our study produced contradictory result with slight male predominance. This apparent discrepancy can be explained on the basis of social and cultural setup of our society where females are reluctant to visit a hospital to get themselves checked.

Shelagh *et al*. 2013 reported that difficulty in breathing, cough and wheezing are the most prominent asthma symptoms associated with frequent episodes in adolescence. Other studies confirm the same thing (Shelagh A Mulvaney, 2013; Archer and Simpson, 1985; Yeatts *et al*., 2003). Results of our study produced similar results and showed that cough, difficulty in breathing and wheezing were most prominent signs associated with frequent asthma episodes. Another important symptom that defines the frequency of asthma attacks in disturbance of night time sleep due to cough and difficulty in breathing. Our findings were similar to current literature that states that difficulty in sleep is most common among kids and adolescent sufferers of asthma (Stores *et al*., 1998; Chugh *et al*., 2006).

Asthma can cause a significant sick role among the adolescent population. Since this population is mostly school or college going; so frequent attacks of asthma can lead to more frequent college or school absence. Higher the frequency of asthmatic attacks, greater will be the academic absence. Our study also showed that asthmatic attacks were frequent among the adolescent population, which lead them to skip school and college days. This fact is proved by current literature that states that asthma is one of the most common cause of sick leave from school and colleges (Ying-Ying *et al*., 2012; Adam Davis *et al*., 2008). One of the most important determinant in the development of asthma is the socioeconomic status of the patient. Repeated studies have reported that development of asthma is associated with lower socioeconomic status (Farfel *et al*., 2010; Chen *et al*., 2003; Spencer *et al*., 2013). The results of our study were contradictory as our study showed that asthma frequency was higher in people of middle socioeconomic group. This contradiction can be explained on the basis of the social, economic and health setup of our country. People of low socioeconomic group are mostly located in village or in city areas far off from the hospitals. Second, people of low socioeconomic group prefer going to traditional healers and quacks than come to professional doctors. Our study was conducted in a governmental hospital. Therefore, people belonging to higher class were not present since they prefer going to private clinics.

The available western literature consider causes like mites, eczema, pets and use of drugs as the most important determinants for the development of asthma during adolescence (Kuschnir and Alves da Cunha, 2007; ussmann *et al*., 2012; McConnell *et al*., 2002). However, our study produced different results and smoke and dust ranked higher in our list of primary asthma determinants. The reason for this discrepancy can be explained on the basis of health and environmental cleanliness status of Pakistan. Pakistan is a country where pollution is the harbinger of countless diseases. It is a country where the laws regarding public and environmental health are ill defined and people show least compliance to these laws. Therefore, dust and smoke, which are the most frequent outdoor pollutants, are responsible for triggering asthmatic attacks in adolescents of this region. Smoke was found to be the most important trigger among girls and dust the most important trigger among boys.

Conclusion

Asthma represents an important source of morbidity in individuals of all ages but adolescents represent one of the most vulnerable group that could fall prey to this condition. Asthma is associated with symptoms like wheezing, coughing, disturbance of sleep at night and can be responsible for poor academic performance in adolescents. Outdoor pollutants like smoke and dust are the most important determinants that trigger asthmatic episodes in such individuals. Therefore, there is need to put extra emphasis on the control of environmental pollution and providing better medical care in order to decrease the frequency of asthma in adolescent individuals.

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