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Relations between obesity and asthma in young adult females

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Abstract

Purpose: Previous research has linked obesity and asthma, but results have shown conflicting findings overall and do not focus solely on young adult females. Therefore, the purpose of this study is to assess the relationship between obesity and asthma among females ages 18-34 in the general population.

Methods: This cross-sectional analysis used 2017 BRFSS data for females ages 18-34 in Kansas (N = 1557), Kentucky (N = 615), Maine (N = 502), and Michigan (N = 847). Multiple logistic regression analysis by state was performed to determine the relationship between obesity and asthma after controlling for health-related, socioeconomic, and demographic factors.

Results: Across states, up to one-quarter of the participants reported having asthma (16-24%) and up to one-half reported obesity (29%-52%). Results of adjusted analysis indicated that asthma did not differ by weight status in any state. However, asthma was related to having two or more health conditions in three out of four states.

Conclusion: Overall, asthma was not related to obesity in young adult females ages 18-34 in the general population; however, asthma was highly related to having two or more health conditions. The results of this study may be generalizable to young adult females in primary care practice. Practitioners should always screen patients for obesity and educate on the causes of obesity, including genetics, metabolism, and lifestyle, and possible treatment options. Practitioners should also screen young adult females for asthma and chronic health conditions if they present with symptoms of either; educate about the management of comorbid conditions; and assess the treatment options for comorbid conditions.

Worldwide, over 300 million people of all ages, genders, and races suffer from asthma [1-3]. Of the 25 million people in the United States with asthma, 18.7 million, or around 7%, are adults, and the prevalence is increasing by about 0.5% every year [2,4-6]. Asthma is the chronic inflammation and constriction of airways accompanied by thick mucus secretion that can further impede air flow [5-8] with visible symptoms including coughing, wheezing, and shortness of breath. Unfortunately, a person's inability to effectively manage their asthma symptoms can lead to excessive healthcare utilization and even mortality [10-11]

Obesity may be a major risk factor for asthma and increased asthma symptom severity [2,4,11]. Obesity is most commonly measured via Body Mass Index (BMI), with a BMI of 18.5-24.9 considered normal, 25-29.9 considered overweight, and 30 or higher considered obese [4,12,13]. Over 20% of the U.S. adult population are considered obese, or about 44.3 million people – 21.4 million men and 22.9 million women, and these numbers are only predicted to increase [4,11]. Worldwide, at least 2.8 million people die annually due to complications of overweight or obese with other diseases including diabetes, high blood pressure, high cholesterol level, arthritis, stroke incidence, cardiovascular disease, and even cancer [2,4,11,13]. Furthermore, women are more likely to be obese than men, and the prevalence of obesity is higher in older populations than in younger [11]. Finally, socioeconomic status, such as unemployment, has shown to be related to BMI in the general population [4,12].

Research reviews have found that about 10% of overweight and obese individuals also suffer from asthma, and that factors such as age, gender, activity level and diet influence the relationship between obesity and asthma [4,11]. However, many of these studies have included small sample sizes and inconsistent measurements for obesity [4,10]. Moreover, there are conflicting findings on asthma and gender with some evidence showing that being female increases your chance of having obesity and asthma concurrently, and others finding that gender plays no role in the relationship [4]. Furthermore, no studies focus solely on the obesity-asthma relationship for young adult females in the general population [4], and this may be important as asthma is the second leading health concern for use of health care services in young adults, and the average BMI for young adult females has increased over time at a much higher rate than BMI increases for young adult males [14]. Therefore, the purpose of this study is to explore whether obesity is related to asthma in young adult females in the general population.

Methods

Design

This cross-sectional analysis used data from the 2017 Behavior Risk Factor Surveillance System (BRFSS) conducted by the Center for Disease Control and Prevention [15]. The purpose of BRFFS is to collect data on health risks behaviors, chronic diseases, health conditions, and health prevention practices. More than 400,000 adults 18 and older are

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interviewed annually using random digit dialing survey techniques across all 50 States and the District of Columbia. The CDC compiles all BRFFS data and makes de-identified data available to researchers for secondary data analysis. This study was given exempt status by the Institutional Review Board of the University of North Texas Health Science Center.

Sample

The samples for this study included females ages 18-34 in Kansas (N = 1557), Kentucky (N = 615), Maine (N = 502), and Michigan (N = 847) who had data for obesity and asthma. These states were selected because of higher prevalence of (a) obesity, (b) asthma, and (c) young adult females based on the BRFFS 2016 prevalence survey data maps [16].

Data

The outcome, asthma, was measured as "yes" or "no" to having ever been diagnosed with asthma. The factor of interest, obesity, was measured in BRFSS by calculating the participants' BMI based on their reported height and weight, and "obese" was categorized as a BMI of 30.00 or higher. Control variables included general health status, health conditions, healthcare access, vegetable consumption, physical activity, alcohol use, tobacco use, age category, ethnicity/race, education level, employment status, and income level. All variables and categories are shown in table 1. Health conditions was calculated as the number of "yes" responses to ever being diagnosed with any of the following: heart

Table 1. Participant characteristics by state

Variable	Kansas n = 1557		Kentucky n = 615		Maine n = 502		Michigan n = 847	
	N	%	N	%	N	%	N	%
Asthma	1557	100	615	100	502	100	847	100
Yes	299	19	99	16	122	24	190	22
No	1258	81	516	84	380	76	657	78
Weight Status	1557	100	615	100	502	100	847	100
Obese	457	29	196	32	262	52	221	26
Not obese	1100	71	419	68	240	48	626	74
General Health Status	1553	100	614	99	502	100	847	100
Good or better	1369	88	539	88	445	89	749	88
Fair or poor	184	12	75	12	57	11	98	12
Health Conditions	1206	77	505	82	375	75	588	69
0	668	55	223	44	184	49	297	51
1	325	27	168	33	133	35	188	32
2 or more	213	18	114	23	58	15	103	17
Vegetable Consumption	1402	90	564	92	469	93	787	92
Daily	1157	83	475	84	429	91	787	92
Not daily	245	17	89	16	40	9	152	19
Physical Activity	1395	90	550	89	457	91	780	92
Inactive or insufficient	689	49	294	53	226	49	404	52
Active or highly active	706	51	256	47	231	51	376	48
Healthcare Access	1555	100	615	100	502	100	847	100
Cost did not influence	1265	81	526	86	413	82	710	84
Cost did influence	290	19	89	14	89	18	137	16
Alcohol Use	1466	94	584	95	467	93	794	94
Use	171	25	277	47	316	68	506	64
No use	111	18	307	53	151	32	288	36
Tobacco Use	1515	97	606	99	490	98	827	98
Never smoker	1044	69	388	64	336	69	590	71
Former smoker	184	12	64	11	60	12	95	11
Current smoker	287	19	154	25	94	19	142	17
Age	1557	100	615	100	502	100	847	100
18-24	552	35	222	36	149	30	332	39
25-34	1002	65	393	64	353	70	515	61
Ethnicity/Race	1541	99	612	99	499	99	842	99
White	1161	75	541	88	465	93	582	69
Other	380	25	71	12	34	7	260	31
Education Level	1557	100	615	100	500	100	845	99
No college	467	30	166	27	146	29	243	29
Some college	588	38	264	43	151	30	313	37
Graduated college	502	32	185	30	203	41	289	34
Employment Status	1542	99	613	99	501	100	840	99
Work	1059	69	374	61	337	67	520	62
Student	221	14	116	19	68	14	168	20
Other	262	17	123	20	96	19	152	18
Income Level	1294	83	437	71	468	93	702	83
Less than $25,000	405	31	140	32	132	28	216	31
$25,000 to $49,999	379	29	110	25	158	32	181	26
$50,000 or more	510	39	187	43	178	38	305	43

attack/myocardial infarction; angina or coronary heart disease; stroke; skin cancer; other types of cancer; chronic obstructive pulmonary disease, emphysema or chronic bronchitis; arthritis; depressive disorder; kidney disease; diabetes; high blood cholesterol; and high blood pressure. We then categorized values as "0 health conditions," "1 health condition," or "2 or more health conditions."

Analysis

Frequency distributions by state were used to describe the samples and identify any issues among the distribution of variables. We analyzed data separately by state to determine any patterns in relationships across similar samples. Multiple logistic regression by state was conducted to assess the relationship between obesity and asthma after controlling for health-related, demographic, and socioeconomic factors. Similar results in three or four out of four states were considered reliable evidence for relations. Any observations with missing data for any variables were excluded from adjusted analysis. All analyses were conducted in STATA 15.1 (Copyright 1985-2017 StataCorp LLC).

Results

Descriptive statistics

Table 1 lists participant characteristics for young adult females in Kansas, Kentucky, Maine, and Michigan. Up to one-quarter of the participants reported having asthma (16-24%) and up to one-half reported as obese (29-52%). For health-related factors, most participants reported good or better general health status (88-89%) and about half reported having one or more health conditions (45-56%). Most of participants reported consuming vegetables daily (83-92%), up to one-half reported being inactive or insufficiently active (26-53%), and most reported that cost did not influence their decision to see a doctor (81-86%). For substance use, up to two-thirds of the participants reported drinking in the last 30 days (25-68%) and never having smoked (64-71%). For socioeconomic factors, the participants were fairly divided amongst those who did not attend, attended, or graduated college; the majority of participants were employed (61-69%); and participants were fairly divided amongst annual income categories. Most of the participants were white (69-93%), and over two-thirds were ages 25-34 years (61-70%).

Adjusted statistics

As shown in table 2, the results of multiple logistic regression analysis for young adult females in Kansas, Kentucky, Maine, and Michigan indicated that after controlling for all other variables in the model, asthma did not differ by weight status in any state. However, across states, participants who reported two or more health conditions were about 3.2-4.2 times more likely to report asthma compared to those with zero health conditions.

Discussion

The purpose of this study was to explore whether obesity was related to asthma in young adult females when controlling for health-related, socioeconomic, and demographic factors. Across states, up to one-quarter of the participants reported having asthma and up to one-half reported as obese. The results of adjusted analysis indicated that obesity was not related to asthma in young adult females. Our findings are similar to a previous study whose research showed that there was no significant association between asthma and obesity among young adult Brazilian male and females ages 23-25 who were randomly selected [17]. However, other studies have shown significant relations, especially among women of all ages [18,19]. It may be that health consequences of obesity and asthma become more interlinked as women age.

Although our study found that obesity may not relate to asthma in young adult females, having multiple health conditions may. Our study indicated that participants with two or more health conditions were up to four times more likely to report asthma. These results are similar to prior research which suggests that asthma shares close relationships with a variety of obstructive diseases and depression [8,20]. Therefore, issues with comorbid health conditions may show earlier than issues complicated by obesity in this younger demographic.

Limitations

The use of 2017 BRFSS data allowed access to multiple large samples for determining the association between asthma and obesity in our target population, and the data was current. However, cross-sectional data only indicates relations and not direction of relations and our samples were not representative of different races, both of which could limit the generalizability of the results. Furthermore, BRFSS measured weight status by asking participants for their height and weight to calculate BMI, which may be inaccurately reported as well as inaccurate in estimating weight status. Utilizing a more appropriate measure such as an abdominal circumference may be beneficial to assess health status in future research [4]. In addition, we lacked information on symptom severity, management strategies, and medications related to asthma or other health conditions, all of which may impact the relationship between asthma and obesity.

Conclusions

Because this was a population-based study, the results may be generalizable to young adult females in primary care practice. In the clinic, up to one-half of this target population may be obese but obesity may not be related to asthma. Practitioners should screen for asthma if symptoms present, educate on ways to manage asthma symptoms, and refer to allergy or asthma specialists as needed. Although obesity may not be related to asthma in this target population, obesity can

Table 2. Adjusted results across states

Predicting Asthma (yes vs. no)	Kansas			Kentucky			Maine			Michigan		
	AOR	95 % CI		*AOR*	95 % CI		*AOR*	95 % CI		*AOR*	95 % CI	
		Low	High		Low	High		Low	High		Low	High
Weight Status (ref: not obese)												
Obese	1.13	0.75	1.71	1.14	0.51	2.56	1.06	0.55	2.04	1.23	0.71	2.13
Health Conditions (ref: 0)												
1	1.13	0.70	1.80	0.80	0.34	1.91	**2.41**	1.24	4.68	**2.84**	1.59	5.08
2 or more	**3.77**	2.29	6.33	0.98	0.33	2.88	**3.15**	1.33	7.49	**4.23**	1.99	9.03

AOR= adjusted odds ratio; 95 % CI=95 % confidence intervals; ref=referent group; boldface indicates significance (*AORs* with 95% CI that do not include 1.00 are significant); results shown are only for the factor of interest and any control variables that were significant in three or more states; model also included general health status, healthcare access, vegetable consumption, physical activity, alcohol use, tobacco use, age category, ethnicity/race, education level, employment status, and income level.

lead to other complications over time. Therefore, practitioners should always screen young adult females for obesity and educate patients on the causes of obesity, implementing lifestyle changes, testing that can inform the patient on the role genetics and metabolism play in their obesity, and surgical options. Referrals should be made to weight reduction specialists as needed. Additionally, up to one-fourth of the young adult females seen in primary care may have multiple health conditions, and having comorbidities may be highly related to asthma in this target population. Thus, practitioners should screen for comorbidities if asthma symptoms present and educate on preventative measures for chronic conditions and the importance of managing comorbid conditions. Practitioners should also assess the compatibility of treatments for multiple chronic conditions and make referrals to specialists as needed.

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