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 BRFSS 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 BRFSS 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 BRFSS 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 %           | 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 43          | 223 44          | 184 49        | 297 51          |
| 1                         | 325 21          | 168 33          | 133 35        | 188 32          |
| 2 or more                 | 213 14          | 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 44          | 294 53          | 226 49        | 404 52          |
| Active or highly active   | 706 46          | 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 11          | 277 47          | 316 68        | 506 64          |
| No use                    | 111 11          | 307 53          | 151 32        | 288 36          |
| Tobacco Use               | 1515 97         | 606 99          | 490 98        | 827 98          |
| Never smoker              | 1044 66         | 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 84          |
| 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          |
attacked by 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 |
| Weight Status (ref: not obese) | AOR | 95 % CI | AOR | 95 % CI | AOR | 95 % CI | AOR | 95 % CI |
| 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) | | | | | | | | |
| 1-3 | 3.77 | 2.29-6.33 | 3.02 | 1.70-5.37 | 3.15 | 1.33-7.49 | 4.23 | 1.99-9.03 |
| 2 or more | 1.13 | 0.70-1.80 | 0.80 | 0.34-1.91 | 2.41 | 1.24-4.68 | 2.84 | 1.59-5.08 |

AOR= adjusted odds ratio; 95 % CI=95 % confidence intervals; ref=referent group; boldface indicates significance (AOR 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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