Fundamentals for an Osteopathic Obesity Designed Study: The Effects of Education on Osteopathic Medical Students’ Attitudes Regarding Obesity

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Context: Obesity is a major health concern in the United States, and its prevalence continues to rise. Although it is a common health issue, many people, including health care professionals, are biased against people with obesity.

Objective: To determine whether a comprehensive obesity curriculum presented to students in medical school can positively influence their attitudes toward obesity.

Methods: The study was designed around a comprehensive educational obesity curriculum at Touro University College of Osteopathic Medicine-CA, involving the classes of 2013 through 2018. A survey to assess student attitudes toward obesity was distributed to first-year students before the curriculum, directly after completion, and each year after until graduation (graduating classes of 2015 through 2018). Second- and third-year medical students in 2011 (graduating classes of 2014 and 2013), who did not complete the curriculum, were given an examination to establish baseline values and served as the control group. The obesity curriculum consisted of lectures delivered during the first and second year of medical school and case study simulations during the third year. Knowledge gained from the curriculum was assessed with a multiple-choice examination, and bias was assessed using the Fat Phobia Scale.

Results: A total of 718 first- through fourth-year students were included. Students who completed the first year of the obesity curriculum (n=528) showed significantly greater medical knowledge regarding obesity-related epidemiology, pathogenesis, biochemistry, pathophysiology, and metabolic factors; nutrition, diet, physical activity, self-control, and behavior modification; pharmacologic and nonpharmacologic interventions; and associated chronic disorders, based on their multiple-choice examination scores compared with the control group. The examination scores indicated significant increases in medical knowledge compared with the precurriculum cohort after the curriculum (OMS I students: 130 [72.4%]; 133 [92.6%]; 133 [91.1%]; 132 [89.0%]; vs control: 105 [47.2%]; 134 [52.6%], respectively [P<.01]). In all 4 years observed, there was a significant reduction in bias among first-year medical students after obesity curriculum (before: 3.65, 3.76, 3.57, 3.61, and after: 3.47, 3.38, 3.34, 3.37, respectively) (P<.05). The reduction in bias was also significantly sustained throughout the fourth year.

Conclusion: A comprehensive obesity curriculum throughout medical school resulted in an improvement in students’ attitudes toward and knowledge of obesity.

Keywords: Fat Phobia Scale, medical education, obesity, overweight
The prevalence of obesity in the United States continues to rise even though the government has prioritized obesity as a major health concern.1,2 Concurrent with the rise in obesity is the stigmatization of people with obesity.3 Long-standing stereotypes of overweight and obese individuals, including an association with lesser intelligence, sexual unattractiveness, laziness, lack of will power, and gluttony remain prevalent.4-6 Furthermore, many studies7,8 have demonstrated that this bias against people with obesity is also present in health care professionals. Health care professionals with negative attitudes toward patients with obesity may not have successful communication with patients, which can result in less preventive care, more emergent care, avoidance of initiating a discussion about obesity, and the potential to create an environment that results in worse eating behaviors for the patient.15,19-26

Medical students, both osteopathic and allopathic, have been found to share a similar bias, whether implicit or explicit, against people with obesity.27,28 Furthermore, negative comments or discriminatory behavior toward patients with obesity by faculty or staff may influence the attitudes of students toward these patients.16,19,29-31

To address this issue of bias against obesity, many medical schools have incorporated obesity-related behavioral medicine didactics, motivational interview training, and interprofessional learning activities into their curriculum.28,32-36 However, few prospective studies28,33,37,38 have examined the effect of these programs on students’ attitudes toward obesity.

Medical students are aware of multiple causes of obesity; however, their perception of these causes varies considerably.15 O’Brien et al39 compared a curriculum that emphasized controllable causes of obesity, such as diet and exercise, with a curriculum that emphasized both controllable and uncontrollable causes of obesity, such as genetics and environment, and concluded that there was an increased bias toward obesity in the students who were taught only the controllable causes of obesity. To our knowledge, no study to date has demonstrated a sustainable decrease in bias caused by a program in any health sciences school, nor has any study proved a change in bias to be caused by a deeper understanding of the multiple factors complicit in the obesity epidemic.

The purpose of this study was to determine whether a comprehensive obesity curriculum could increase obesity knowledge and positively influence the attitudes of students at Touro University College of Osteopathic Medicine-CA (TUCOM) toward people with obesity. We hypothesized that a comprehensive obesity-specific curriculum designed to increase knowledge regarding obesity would have a positive effect on students’ bias toward these patients.

Methods

The obesity curriculum at TUCOM was initiated in 2011 and represents a modified version of a curriculum developed by Katz et al.8 Students in the classes of 2013 through 2018 at TUCOM were included. Although the curriculum was slightly altered each year, it always consisted of a survey to assess bias against obesity before and after the curriculum, informative lectures, a postcurriculum multiple-choice examination to assess knowledge gained from the lectures, and interactive case study simulations. The institutional review board determined that this project was exempt, and informed consent was implied by completion of the survey.

Survey

The survey was based on the modified Fat Phobia Scale.9 The 14 adjective pairs used in the scale describing obese and normal-weight people have been used to establish bias baselines in previous health care provider groups, including family physicians, dietician students, physician assistant students, and registered nurses.9-13 Using a 5-point Likert scale, students were instructed to indicate which adjective better fit their perception of a person with obesity (eg, lazy [5] vs industrious [1]). Scores were calculated using the method described in
Bacon et al., and a comparison between events was determined using the Wilcoxon signed-rank test with a statistical significance of $P < .05$. Higher total scores represented more biased, negative attitudes toward people with obesity. Survey responses were collected from Blackboard course management software (Blackboard Inc), which was later replaced by an online survey tool (Qualtrics LLC). All first-year students completed a survey before receiving any formal education related to obesity to determine their baseline level of bias against obesity. Students were also asked to complete the survey after their first year of the curriculum and then once during the second half of their second, third, and fourth years of medical school. All survey data were collected anonymously, and only pooled average data were used per class.

**Curriculum and Examination**

**First Year, Class of 2015**

First-year students attended lectures covering various topics relating to obesity (ie, epidemiology; pathogenesis and metabolic factors; nutrition, diet, and physical activity; self-control and behavior modification; pharmacologic and nonpharmacologic management interventions; and associated chronic diseases). After the 5-hour curriculum, first-year students received a 14-item multiple-choice obesity examination provided during a larger midterm examination to assess knowledge gained.

**First Year, Classes of 2016, 2017, and 2018**

It was determined that the first-year material used for the class of 2015 was too extensive to cover in 5 hours, so the curriculum was increased to 6 hours for the first-year classes of 2016 through 2018. The multiple-choice examination was increased to 30 questions and given to students in a stand-alone examination, which contained 10 optimal performing items from the previous version based on item analysis (difficulty rating, discriminating index, and point biserials) along with 20 additional questions.

**Second Year**

For second-year students in the class of 2015, the curriculum consisted of 3 hours of course material, which provided updated information based on new reviewed data over the previous year, reemphasized selected obesity topics, and included the following 2 additional topics: (1) the interaction through subclinical inflammation between obesity, metabolic abnormalities, and environmental change; and (2) a distinctive osteopathic approach to managing obesity. For second-year students in the classes of 2016 through 2018, the curricular materials were deemed too dense for 3 hours, and the curriculum was increased to 4 hours. Students in the classes of 2015 through 2017 received a 25-question multiple-choice obesity examination.

**Third Year**

For third-year students, the curriculum included virtual patient case presentations using MedU (http://www.med-u.org), with supporting resources and formative assessment tools covering obesity-related issues encountered in core clinical rotations in family medicine, internal medicine, obstetrics and gynecology, pediatrics, and surgery. MedU cases are online interactive patient presentations through which students can practice the process of history taking, physical examinations, and clinical reasoning skills. Embedded in each case are teaching points, which may link to resources outside MedU or offer explanations within the program. Third-year students were also assigned reading materials regarding the American College of Cardiology/American Heart Association guidelines pertaining to obesity, the National Heart, Lung, and Blood Institute’s research on obesity, healthy eating for children, and other related topics, such as metabolic syndrome.

**Fourth Year**

There was no educational intervention for fourth-year students, but students did take the survey to determine whether the curriculum taken in previous years continued to have the same effect on the students’ attitudes toward obesity.
The classes of 2013 and 2014 (second- and third-year students, respectively) were surveyed, although they did not receive the comprehensive obesity curriculum, to provide a secondary control group. These students did attend 2 to 3 hours of cumulative lectures on various topics (eg, metabolic syndrome, type 2 diabetes mellitus, obstructive sleep apnea, infertility, nutrition, diet) and how they related to obesity. These students also took the multiple-choice examination that was given to the class of 2015, except that the examination for the class of 2013 had only 13 questions.

Statistical Analysis
Statistical significance was measured using SPSS software. The statistical significance comparing the difference between knowledge acquired before and after the comprehensive obesity curriculum was determined using the t test. Statistical significance between the FPS scores was calculated using the Wilcoxon signed-rank test. A P value of less than .05 was considered statistically significant.

Results
Results were obtained from 718 first- through fourth-year students in the graduating classes of 2013 through 2018 at TUCOM. All students were asked to participate, and student participation exceeded 90%. All completed surveys were included in the analysis.

For students who took the 13- or 14-question obesity examination, the first-year students in the class of 2015 scored significantly higher than the classes of 2013 and 2014 (72.4% vs 47.2% and 52.6%, respectively; P<.01). Students in the classes of 2016 through 2018 scored a mean (SD) of at least 89.0% (2.8%) on the 30-item obesity examination. Examination scores are provided in Table 1 and Figure 1.

The mean (SD) survey score of the students who had not yet completed the obesity curriculum (classes of 2013 and 2014) was 3.64 (0.1) (P<.01). This value was compared with the mean (SD) score of first-year students (n=502) who completed the curriculum (class of 2015-2018), which was 3.39 (0.05) (P<.01), indicating a statistically significant decrease (Table 2). Figure 2 illustrates all available survey scores for the classes of 2015 through 2018.

Discussion
After the failure to achieve the Healthy People 2010 goals in reducing obesity, the American Osteopathic Association’s house of delegates passed Resolution 435A in 2011, which stipulated that all osteopathic physicians should address the obesity epidemic in their practice. In 2011, TUCOM’s comprehensive obesity curriculum was implemented with the aim to decrease student bias against obesity and, by extension, change new physician behavior in treating patients with obesity.

The participants in the current study who did not receive the obesity curriculum significantly underperformed on the multiple-choice examination compared with the participants who received the curriculum, demonstrating their lack of knowledge on the topic of obesity. The relatively high scores of students who received the curriculum suggest that students learned from the content taught in the curriculum. Concomitant with this increase in knowledge was a significant decrease in bias toward obesity, as indicated by the decrease in survey scores. By spanning the informational aspect of the program over medical school years 1 through 3, this decreased bias was sustained during all 4 years of medical school (for those students who had 3 years of the curriculum, classes 2015 and 2016). To our knowledge, this is the first study to demonstrate a sustained 4-year decrease in obesity bias.

The current data suggest that providing a comprehensive obesity-related curriculum that includes biologic, psychosocial, epidemiologic, pathologic, and clinical aspects to medical students is vital to reducing bias against obesity and can better prepare them to address...
the concerns of their patients with obesity. In addition, to our knowledge, TUCOM’s obesity curriculum is the first to include information on health disparities and ethnic differences. The curriculum also included the important topic of climate change as it relates to the obesity epidemic, which included teaching students the global burden of disease attributable to the interaction between obesity, metabolic syndrome, and climate change/air pollution, which conforms to the recent American College of Physicians’ position paper on climate change and health.

Limitations of the study include the use of only 1 tool to measure the level of bias toward obesity (ie, the survey). Other surveys are available to measure both

<table>
<thead>
<tr>
<th>Graduation Year</th>
<th>n</th>
<th>No. of Lecture Hours</th>
<th>First-Year Examination</th>
<th>Second-Year Examination*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No. of Questions</td>
<td>Mean (SD) Score, %</td>
</tr>
<tr>
<td>2013</td>
<td>105</td>
<td>2-3</td>
<td>13</td>
<td>47.2 (19.4)</td>
</tr>
<tr>
<td>2014</td>
<td>134</td>
<td>2-3</td>
<td>14</td>
<td>52.6 (21.0)</td>
</tr>
<tr>
<td>2015</td>
<td>130</td>
<td>5</td>
<td>14</td>
<td>72.4 (16.3)</td>
</tr>
<tr>
<td>2016</td>
<td>133</td>
<td>6</td>
<td>30</td>
<td>92.6 (1.6)</td>
</tr>
<tr>
<td>2017</td>
<td>133</td>
<td>6</td>
<td>30</td>
<td>91.2 (1.8)</td>
</tr>
<tr>
<td>2018</td>
<td>132</td>
<td>6</td>
<td>30</td>
<td>89.0 (2.3)</td>
</tr>
</tbody>
</table>

*Examinations provided to second-year students comprised 25 questions.

Students in the classes of 2013 and 2014 did not receive the comprehensive obesity curriculum.

Statistically significant (t test, P<.01) compared with the scores achieved by the classes of 2013 and 2014.

The class of 2018 had not taken the second-year examination at the time of data collection.

Figure 1.
Medical student scores on obesity examination. The classes of 2013 and 2014 took the examination in 2011 without the comprehensive obesity curriculum. The classes of 2015 through 2018 took the examination after the first-year comprehensive obesity curriculum. Students in the classes of 2013 through 2015 took the same 13- or 14-item examination, whereas students in the classes of 2016 through 2018 took a 30-item examination.
intrinsic and extrinsic bias, which could have been used.\(^3\) Further research is needed to determine whether there is a measurable difference in the type of bias that students have against obesity (ie, intrinsic or extrinsic). Another limitation to this study is inherent in the use of a single-arm study design and the fact that the students involved were all from a single institution. The small reduction in bias, although statistically significant, still means that bias is present. Whether this improvement will be clinically relevant has yet to be determined.

This study only addressed student bias toward obesity. It has yet to be determined if this reduction in bias can be maintained in their medical practice and if

### Table 2.
Survey Scores by Class and Year in Medical School Before and After the First-Year Comprehensive Obesity Curriculum

<table>
<thead>
<tr>
<th>Graduation Year</th>
<th>Before First-Year Curriculum</th>
<th>After First-Year Curriculum</th>
<th>(P) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n)</td>
<td>Mean (SE) Score</td>
<td>(n)</td>
</tr>
<tr>
<td>2013(^a)</td>
<td>120</td>
<td>3.76 (0.04)</td>
<td>...</td>
</tr>
<tr>
<td>2014(^a)</td>
<td>119</td>
<td>3.48 (0.04)</td>
<td>...</td>
</tr>
<tr>
<td>2015</td>
<td>116</td>
<td>3.65 (0.04)</td>
<td>121</td>
</tr>
<tr>
<td>2016</td>
<td>120</td>
<td>3.76 (0.04)</td>
<td>126</td>
</tr>
<tr>
<td>2017</td>
<td>127</td>
<td>3.57 (0.04)</td>
<td>123</td>
</tr>
<tr>
<td>2018</td>
<td>116</td>
<td>3.61 (0.04)</td>
<td>132</td>
</tr>
<tr>
<td>Total</td>
<td>718</td>
<td>3.64</td>
<td>502</td>
</tr>
</tbody>
</table>

\(^a\) Students in the classes of 2013 and 2014 were not offered the comprehensive obesity curriculum and took the survey in 2011 as second- or third-year students.

![Fat Phobia Scale Score, mean](#)

**Figure 2.**
Survey scores of the classes of 2015 through 2018. Survey responses were not collected for the class of 2015 in year 2; the class of 2017 in years 3 and 4; and the class of 2018 in years 2, 3, and 4. Compared with the precurriculum survey scores, all postcurriculum scores were significantly lower, indicating reduced bias.
it will translate into better patient care. It is possible that as medical students progress through their clinical training, increased exposure to the clinical components of obesity may be countered by the greater exposure to bias from their health care team as they interact with patients with obesity. This concept will be further explored in the next study phase. No existing curriculum had been replaced by the obesity curriculum at TUCOM, which added less than a 3% increase in material provided during the semester.

In phase 2 of this study, we intend to determine whether electronic-learning modules developed to provide content addressed in the obesity curriculum can achieve a similar reduction in bias at other medical schools. Phase 3 will then modify the curriculum to align with the specific residency specialty programs and extend it to residents in continuity of care clinics to determine whether the improved knowledge and change in attitude will result in better clinical outcomes for their overweight and obese patients.

Conclusion

Studies have demonstrated that health care professionals may have an inherent bias against patients with obesity.10-13 This bias imposes a considerable barrier in attaining positive clinical outcomes when evaluating and treating these patients.20-25 The current study demonstrated that improving a medical student’s basic knowledge of obesity can improve any obesity-related bias. Further evaluation is necessary to determine whether this curriculum can be reproduced with similar results at other osteopathic or allopathic medical schools. Changing attitudes and beliefs may translate into improved changes in behavior and ultimately result in improved clinical outcomes.

Author Contributions

All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; all authors drafted the article or revised it critically for important intellectual content; all authors gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References


