

## The association between body mass index and academic performance

*To the Editor*

A recent study by Alswat et al<sup>1</sup> demonstrated no correlation between body mass index (BMI) and school performance, except for physics results, where students with obesity perform worse than those who are normal weight. We found this to be a very interesting and elegant study. When obesity is defined as a disease, the fact that it is associated with low academic achievement poses a significant issue. It would have been very frustrating if the results came out, like the literature cited in the introduction, in situations where we have to overcome the stigma of obesity as it is today. If the academic achievement of students with obesity was low in this study, students with obesity may give up prematurely because their score will be low despite making significant efforts to learn. Further, the teachers may cease to teach enthusiastically because these students are predicted to have low academic achievement despite being taught well. Because of the personal and social stigmas associated with obesity, it was previously considered to be due to unhealthy lifestyle habits; therefore, individuals with obesity were socially considered to be reluctant to exercise, lazy, unable to refrain, and lack the ability to work or learn.<sup>2,3</sup> However, in recent years, the claim that patients with obesity should not be treated as such is becoming stronger, as it has been recognized as a disease that can occur in spite of a healthy lifestyle. Regardless, the stigma for obesity does not seem to have changed much, which in turn results in people with obesity being treated unfairly and unable to live a healthy life. Fortunately, BMI appeared to be irrelevant to school performance except for physics results, but we were actually worried when I read this article. If it appears to be relevant, those findings may lead to prejudice against students with obesity, which affects the attitudes toward them, interferes with teacher-student relationships, and reduces student motivation, thereby reducing the quality of learning. Furthermore, students with obesity may be blamed personally for their low academic achievement.<sup>4</sup> Therefore, the stigma for obesity is one of the major obstacles that teachers who teach students with obesity need to overcome. Teachers can overcome this stigma and improve the quality of education by using strategies that can maximize the study motivation of students with obesity.<sup>5,6</sup> Another interesting result of this study is that students with excellent academic

achievement are likely to be taller. There is no difference in the other subjects, but it is interesting that students with obesity have only physics scores lower than normal-weight students; however, a hypothesis or additional explanation of the authors' views is needed regarding these results. We wonder if this is due to nutritional status, as mentioned at the beginning of the Discussion section, or if it is due to a small sample size. However, it is understandable that inappropriate nutrition, such as fast food or skipping breakfast, is detrimental to a student's academic performance. Because exercise is known to have a positive effect on cognitive function,<sup>7</sup> it is also understandable that a student with a lack of exercise may have poor learning outcomes. The third question concerns the diagnostic criteria for obesity in children and adolescents. A child's overweight or obesity status is determined using an age- and sex-specific percentile for BMI rather than the BMI categories used for adults.<sup>8</sup> In this study, the authors used the BMI values as is, which are widely used for diagnosis of adult obesity. In addition, I wonder if the data for score comparisons between the participants according to body fat percentage and the correction variables of the correlational analysis included the student absent rate. Finally, in the study, the students were divided into 2 groups based on 90% of the GPA, such that the size of the 2 groups increased; in particular, students with more than 90% of the GPA were few, which may lead to bias in the statistical analysis process. Did the authors compare the scores between quintiles or quintiles according to the distribution of obesity? It would be a great help for better understanding this study if the authors provide us some comments and explanations regarding several of our questions so far.

*Sang Y. Lee*

*Department of Medical Education*

*Jin H. Kim, Chang R. Geum, Sung J. Wu, Jin S. Kim,*

*Department of Pre-Medicine and Pusan National*

*University School of Medicine*

*Pusan National University Yangsan Hospital*

*Yangsan, Republic of Korea*

### *Reply from the Author*

We appreciate the valuable inputs and comments from Lee et al, on our recent publication entitled.<sup>1</sup> Our study design was cross-sectional which limit our ability to assess the causality but rather did help us to assess the association between BMI and academic performance of

the participants. We had a fairly small sample size of 424 students but those students were from 14 schools which we felt better representative than larger number of students but from limited schools number. I agree with the comment that Dr. Lee and his colleagues wrote regarding the obesity stigma and we believe we all have to educate clinicians, family and teachers about the harmful effects of such stigma. Unadjusted association was positive between worse physics results and obesity but we believe that this should be considered in context with the other important study findings. We showed in (Table 2) that those with excellent grade were no different from those with lower grade in regards to the measures of obesity (BMI and waist circumference) but those with excellent grade mostly were more likely to have better parents educational status, living situation, sleeping habits, nutritional behaviors and activity habits and were also less likely to be active smokers and all of those likely to explain the poor academic performance rather than BMI. We believe that BMI is a surrogate marker for such poor habits that will be negatively reflected on the academic performance more than high BMI by itself. We agree with the comment regarding the BMI estimation and that if we used BMI age- and sex-specific percentile that would be in general more optimal than what we used but our sample mean age was 15.44 years and since we measured the waist circumference, those make our result clinically relevant.

Unfortunately, we did not have access to the student's attendance data and if we had those data it will be interesting to see if we were able to confirm what other publications concludes that overweight and obese students were more likely to have sick leaves.<sup>9,10</sup> All of those just reflect that BMI could be an easy surrogate marker for clinicians, parents and teachers to pay more attention to such students and to offer them the help

they need to overcome the possible factors that may compromise their academic achievements.

***Khaled A. Alswat***

*Department of Internal Medicine  
Taif University School of Medicine  
Taif, Kingdom of Saudi Arabia*

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