

Does physical activity modify the gastroesophageal reflux symptoms independent of obesity? Or obesity confounds the relationship between physical activity and gastroesophageal reflux symptoms?

We read with interest the paper published by Shahid Karim and colleagues on physical activity and its association with gastroesophageal reflux disease.¹ While the aims of the study are to be commended, we have one major and few minor concerns regarding the methodology and interpretations of the findings. Our aim from this letter is to generate a healthy debate and provide scientific evidence to readers not to criticize the authors or their paper.

We appreciate the efforts of authors for collecting the information of fairly large sample from multiple centres. With respect to the methodology, study was a typical cross section as the information on gastroesophageal reflux disease (GERD) symptoms and other lifestyle factors was collected in a single interview and no follow-up data of the subjects described or presented anywhere in the paper. However, study was reported as a "prospective", which is slightly misleading for the readers.

An important consideration for the GERD symptoms is (our main concern) its association with body weight and obesity. A fair amount of literature has reported the role of obesity in development of GERD symptoms and a paper referenced by the authors has also debated on the issue.² In general, epidemiological evidence suggests that obesity satisfies several criteria of causal association with GERD and its associated complications.³ Authors have presented the

mean Body Mass Index (BMI) of the two groups (Table-1), which is not statistically different, but falls into the range of overweight category, based on Asian population specific BMI guidelines.⁴

Obesity itself is a multi-factorial condition and its association with physical activity and sedentary lifestyle is well established.⁵ Given that, obesity is linked with outcome (GERD) and exposure (physical activity), any effect observed for physical activity would be confounded by obesity. We could not understand the rationale of not including BMI in univariate and multivariate logistic regression analysis to adjust for its confounding effect? A variable which is a known confounder or has significant association on univariate analysis should be included in multivariate model.^{6,7} Individuals who are obese, their dietary and physical activity habits are usually different than those with normal BMI; it is possible that the effects of physical activity observed in this study are confounded by the weight or BMI of the individuals. Our speculation is that individuals with higher body weight are more likely to sit or lie and less likely to walk after a meal as compared to those with normal BMI's. If this is true then obesity also explains the difference of GERD symptoms observed in this study between those who sat or walked after the dinner. Therefore, any potential benefit of physical activity on GERD symptoms can not be assessed

from this analysis. However, we believe that this could be further explored by careful analyses of the existing data.

Authors highlighted that higher prevalence of GERD symptoms in this study, compared to a previous study of mainly urban sample might be explained by the difference of age and both, urban and rural sample in this study. Age might explain the higher observed prevalence in this study, but we do not agree that, including a rural sample would explain the higher observed prevalence of GERD symptoms as both the authors' argument of physical activity and our of obesity do not explain these findings (because obesity is perhaps higher in urban areas and physical activity in rural areas).

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