The effect of serum insulin on the blood pressure responses after oral glucose load in lean and centrally obese adult male subjects

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Submission: 12-01-2021 Revision: 21-03-2021 Publication: 01-05-2021

ABSTRACT

Background: The vasodilator action of insulin might contribute to the reduction of blood pressure in the postprandial state and it remains to be clarified whether this action is impaired in the insulin-resistant obese state or not. Aims and Objective: The present study aimed to determine the blood pressure responses after an oral glucose load in lean and insulin resistant centrally obese adult male subjects. Materials and Methods: This study was carried out in eleven lean and eleven centrally obese adult male subjects. After a 75 g oral glucose load, blood pressures were measured at 15-minute intervals and the serum insulin level was determined at 30-minute intervals for two hours. Blood pressure was measured by indirect sphygmomanometry and serum insulin concentration was analyzed by ELISA method. Results: All centrally obese subjects were insulin resistant (HOMA-IR≥2.6). After oral glucose load, the per cent change in glucose-stimulated insulin responses at 30 minutes (626% vs 344%, p<0.05) and at 60 minutes (756% vs 417%, p<0.01) were significantly greater in the lean group than the centrally obese group. The fall in postprandial blood pressures started at 15 minutes and returned to baseline values at 120 minutes. The per cent change in SBP at 15 minutes (-2.2% vs -1.2%, p<0.05) and at 30 minutes (-3.2% vs -2.1%, p<0.05) were significantly greater in the lean group than the centrally obese group. Conclusion: The present findings suggest that attenuation in BP responses as well as a lesser change in glucose-stimulated insulin responses in the centrally obese subjects might be attributable to the presence of insulin resistance.

Key words: serum insulin; Blood pressure responses; Oral glucose load; Centrally obese
results during postprandial period in lean and insulin resistant centrally obese adult male subjects.

RESULTS

Fasting plasma glucose was 87.64 ± 5.92 mg/dL in the lean group and 109.64 ± 8.19 mg/dL in the centrally obese group. Median and interquartile range of fasting serum insulin level was 10.1 (9.5–10.8) µIU/mL in the lean group and 16.7 (14.9–33.6) µIU/mL in the centrally obese group. There was significantly higher (p<0.001) fasting serum insulin in the centrally obese group than the lean group. HOMA-IR values in the lean and obese subjects were 2.2 (2.2-2.4) and 4.5 (4.2-9.3) respectively (p<0.001).

The patterns of blood pressure responses after oral glucose load in the lean and centrally obese adult male subjects are illustrated in Figure 1. The systolic mean and diastolic blood pressures fell after oral glucose load in both study groups, with maximum fall at 30 minutes. When compared between two groups, the per cent change in SBP at 15 minutes (-2.2% vs -1.2%, p<0.05) and at 30 minutes (-3.2% vs -2.1%, p<0.05) were significantly greater in the lean group than the centrally obese group.

There was no significant difference in the per cent change in DBP and MAP between the lean and centrally obese male subjects at all time points (Figure 2).

After oral glucose load, at 30, 60, 90 and 120 minutes, serum insulin level increased significantly from fasting level in both study groups (p < 0.01) (Figure 3).

Figure 4 shows comparison of the per cent change in serum insulin response after oral glucose load in the lean and centrally obese male subjects. The per cent change in serum insulin level after oral glucose load of the lean subjects was greater than that of the centrally obese male subjects at 30 minutes (p < 0.05) and at 60 minutes (p < 0.01).

DISCUSSION

In the present study, the range of HOMA-IR values in the lean subjects was 1.4 to 2.5 and that of the centrally obese subjects was 3.1 to 15.9. This finding also confirmed that all centrally obese subjects participated in the present study are insulin-resistant and all lean subjects are insulin sensitive since the cut-off point for defining insulin resistance was HOMA ≥2.6.8

After oral glucose load, there was a definite reduction in blood pressures at 15 minutes, 30 minutes and 45 minutes in both study groups. The fall in blood pressures was noted...
BP was found at 15 minutes following oral glucose load or a meal and reached maximal fall at 60 minutes. The magnitude of fall in BPs was comparable with that of a study in which the age range of the participants was found to be similar to that of the present study. However, other studies exhibited a greater fall in BPs than the present study, as these studies were conducted in elderly (age of >60 years). Postprandial hypotension is recognized as a very common clinically relevant disorder in elderly persons. One of the proposed mechanisms for postprandial hypotension is insulin-induced vasodilatation following a meal by promoting NO release through PI3-K pathway. In the present study, a maximal fall in BP and significant per cent change in glucose-stimulated insulin response (626% in the lean and 344% in the centrally obese subjects) were recorded at 30 minutes after oral glucose load. These findings suggested that a fall in BP might probably be due to splanchnic blood pooling following oral glucose load as a result of insulin-induced vasodilatation in both groups.
The lesser glucose-stimulated insulin responses at 30 and 60 minutes in the centrally obese subjects in comparison with the lean subjects might be due to insulin resistant in obese subjects. Thus, it could be assumed that the attenuation of fall in BP following an oral glucose load in the centrally obese subjects might be due to impaired insulin induced vasodilatation as there was defect in nitric oxide synthesis during the insulin-resistant state. In conclusion, the present study suggests that glucose-stimulated insulin responses might be involved in reduction of BP after oral glucose load.

ACKNOWLEDGEMENT

We are particularly grateful to Professor Dr. Zaw Wai Soe, Rector, University of Medicine 1, Yangon, for allowing us to undertake this study. We would like to express our special thanks to all the subjects involved in our study for their co-operation and participation.

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Author’s Contribution:
TWH- Prepared concept, study design, review of literature and manuscript, analyzed data and interpreted; ZT- reviewed the literature and manuscript preparation; OM- revision of the manuscript, statistically analysis and interpretation.

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Source of Funding: None, Conflict of Interest: None.