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Papers

Insulin resistance and depression: cross sectional study

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A recent study found that depression is inversely associated with insulin resistance, but positively associated with diabetes.[1] Association between insulin resistance and depression is a poorly studied area and the few earlier findings do not necessarily support this finding,[1] indicating that patients with serious depression have insulin resistance assessed by insulin tolerance, intravenous, or oral glucose tolerance tests.[2] Recently, depression was found to be associated with greater insulin resistance in women with polycystic ovary syndrome.[3] Also, more than the normal rates of depression had already been noted in patients with clinically manifest diabetes.[2] Since insulin resistance is positively associated with the development of diabetes,[1] we hypothesised—given that disturbed glucoregulatory functions behind the development of diabetes might be associated with pathophysiological changes in depression[2]—that insulin resistance should be positively correlated with depressive symptoms. We also investigated whether depressive symptoms varied with different levels of a disturbed glucose metabolism.

Participants, methods, and results

We invited all 1008 people born in 1935 and living in the city of Oulu, Finland, on 1 October 1990 to participate in a study to assess the prevalence of type 2 diabetes and impaired glucose tolerance; 831 attended. The follow up of the earlier participants, on which this study was based (n = 593), was done in 1996-1998; we excluded patients previously diagnosed as having diabetes, leaving 491 cases. A detailed description of the data was given earlier.[4] We defined insulin resistance with the qualitative insulin sensitivity check index,[4] and we evaluated the severity of depressive symptoms with Beck's depression inventory 21.[5] We found a negative correlation between the scores (Spearman correlation coefficient $r = -0.13$, $P = 0.004$). The correlation (see figure on bmj.com) was most evident in subjects with impaired glucose tolerance ($r = -0.24$, $P = 0.029$; table). Regarding different levels of disturbed glucose metabolism, patients with type 2 diabetes and impaired glucose tolerance had higher depression scores (median 6.0 and 6.0) than those with normal glucose tolerance (5.0); the difference was statistically significant between impaired and normal glucose tolerance groups (table).

Medians and interquartile ranges of Beck's depression inventory 21 values in different glucose tolerance categories checked by oral glucose tolerance test in elderly Finns

	Normal glucose tolerance* (n=367)	Impaired glucose tolerance† (n=92)	Type 2 diabetes mellitus‡ (n=32)
Correlation between qualitative insulin sensitivity check index and Beck's depression inventory 21§	–0.037; P=0.492	–0.24; P=0.029	Not feasible
Beck's depression inventory 21 median (interquartile range)	5.0 (2.0-8.0)	6.0 (4.0-8.5)	6.0 (3.5-8.0)
Difference in median (95% confidence interval)	Control	1 (0 to 2)	1 (–1 to 2)
Wilcoxon rank-sum test P value	Control	0.015	0.380
		Control	0.639

*People with fasting glucose concentration of <6.1 mmol/l and 2 hour blood glucose concentration of <7.8 mmol/l in oral glucose tolerance test. Thus the normal glucose tolerance group includes also those with impaired fasting glucose (fasting glucose concentration 5.6-6.0 mmol/l).
†People with a fasting glucose concentration of <6.1 mmol/l and 2 hour blood glucose concentration of 7.8-11.0 mmol/l in oral glucose tolerance test.
‡ People with fasting glucose concentration of ≥6.1 mmol/l or 2 hour blood glucose concentration of ≥11.1 mmol/l in oral glucose tolerance test.
§Spearman partial correlation coefficient between qualitative insulin sensitivity check index and Beck's depression inventory 21 scores adjusting for body mass index, smoking, alcohol consumption, physical inactivity, sex, and basic education.

Comment

Insulin resistance (a low qualitative insulin sensitivity check index) and severity of depressive symptoms (Beck's depression inventory 21) were positively correlated, particularly in people with impaired glucose tolerance. Our findings are at variance with those of Lawlor and colleagues,[1] who suggested that a clinical diagnosis of diabetes in itself would be an explanation for their findings regarding diabetic patients. With our database, clinical diagnoses could not have affected the results, because we excluded patients previously diagnosed as having diabetes. Because in our study higher depression scores were already prevalent in those with impaired glucose tolerance without clinically manifest diabetes, our findings might be explained biologically—that is, by pathophysiological changes behind insulin resistance and depression.

Insulin resistance could develop as a consequence of an increased release of counter-regulatory hormones associated with depression.[2] This, however, is unconfirmed. The strengths of our study were that the qualitative insulin sensitivity check index has shown to be a reliable instrument in screening insulin sensitivity in epidemiological studies.[4] Also this was a population based study consisting of a representative sample of one whole age group. A limitation of our study is that the validity of the findings based on self reported Beck's depression inventory scales is inferior to those of structured diagnostic rating scales; thus, it cannot provide specific depression diagnoses. Neither could we test the causal hypothesis, because we did not know the full history of depression in the participants.

A figure showing the results is on bmj.com

What is already known on this topic

More than normal rates of depression can already be detected in patients with clinically manifest diabetes

The association between insulin resistance and depression is a sparsely studied area, and the few existing findings are contradictory

What this study adds

A positive correlation between insulin resistance and severity of depressive symptoms is present already in subjects with impaired glucose tolerance before the outbreak of type 2 diabetes mellitus

Contributors: MT conceived the study, reviewed the literature, and wrote the initial and subsequent drafts. SKK helped to conceive the study and revise the initial and subsequent drafts, and was overseer of the research group. JJ designed the statistical analyses, analysed the data, developed the figure, and helped draft the manuscript. ML and UR collected the data and contributed to the study design, interpretation, and revisions of the manuscript. VBMR helped revising the initial draft and contributed to revisions and discussions. MT is guarantor.

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