



## INSULIN RESISTANCE AND DEPRESSION ASSOCIATION IN WOMEN

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### ABSTRACT

**Introduction:** In this study, we tried to find the co-relation between insulin resistance in depression in women. Many studies have been conducted with both men and women and these studies have showed controversial results. **Methods:** A total of 248 women were taken. 138 participants were diagnosed to have major depression and were on anti-depression treatment. All participants were tested for insulin resistance. Insulin resistance was diagnosed using The American Association of Clinical Endocrinologists Clinical Criteria. **Results:** It was found that out of 138 patients with depression, 78 patients had insulin resistance and 60 patients did not have insulin resistance. In the control group, 57 participants had insulin resistance and 53 did not have insulin resistance. On performing the chi square test, the p value came out to be 0.01. This value is less than 0.05 and hence the difference in the observation was significant and not due to chance. **Conclusion:** There is a strong positive association between insulin resistance and depression in women. Female patients with insulin resistance are highly prone to develop depression.

### INTRODUCTION

Insulin resistance is a determinant of free fatty acids in the blood. This is associated with tryptophan metabolism and brain serotonin concentration.<sup>[1,2]</sup> Hence, a higher level of serotonin is seen in patients who are insulin resistant. This makes it more likely to have depression in patients who are insulin resistant.

It is believed that the hypothalamic-pituitary-adrenal axis is hyperactive in insulin resistance as this leads to excess circulatory cortisol. 40-60% people with major depressive disorder have an hyperactive hypothalamic-pituitary-adrenal axis. This is believed to be a positive co-relation between insulin resistances in depression patients.<sup>[3]</sup> Currently, there is an ongoing controversy regarding co-relation between insulin resistance and depression. The results between many studies are conflicting.

### METHODS

This is a cross-sectional study. In this study, we took a total of 248 patients. All participants were women. 138 participants were taken who were diagnosed with major

depression patients. DSM-5 criteria was used to diagnose all the participants with depression. The most common used anti-depressant medicine was single drug SSRI in these patients. Rest 110 participants were healthy individuals and without any symptoms of depression. Participants with kidney disease, liver disease, heart conditions, other psychiatric conditions were excluded from the study. Detailed history and physical examination of all the participants was taken. All participants were tested for insulin resistance. Insulin resistance was diagnosed by using The American Association of Clinical Endocrinologists clinical criteria. The criteria are as follows:

- BMI of 25 kg/m<sup>2</sup> or higher.
- Triglyceride level of 150 mg/dL or higher.
- HDL-C level of less than 40 mg/dL in men or less than 50 mg/dL in women.
- Blood pressure of 130/85 mm Hg or higher.
- Glucose level of more than 140 mg/dL 2 hours after administration of 75 g of glucose.
- Fasting glucose level of 110-126 mg/dL.

All the observations obtained were analysed statistically.

## RESULTS

The results from the study are given in the two tables below. Table.

**Table 1: Baseline characteristics.**

	Depression present	Depression absent
Age (years)	38± 5.8	37±4.7
Height(cm)	162±5.6	163±6.4
Weight(kg)	59±6.8	61±7.1
BMI	21.5±2.7	21.9±2.6
Total Cholesterol	184±14.38	189±13.94

Baseline characteristics of all the participants are shown in the table 1. The average age of the participants with depression was 38± 5.8 years. In the control population, the average age was 37±4.7. The average height in the participants with depression was 162±5.6cms. In the control population, the average height was 163±6.4. The

average weight of the participants with depression is 59±6.8kgs and in the control population was 61±7.1kgs. The BMI was 21.5±2.7 and 21.9±2.6 in depression group and control group respectively. Total cholesterol was 184±14.38 mg/dl and 189±13.94 mg/dl in depression group and control group respectively.

**Table 2: Insulin resistance and depression co-relation.**

	Depression	No-depression
Insulin resistance present	78	57
Insulin resistance absent	60	53
Total	138	110

It was found that out of 138 patients with depression, 78 patients had insulin resistance and 60 patients did not have insulin resistance. In the control group, 57 participants had insulin resistance and 53 did not have insulin resistance. On performing the chi square test, the p value came out to be 0.01. This value is less than 0.05 and hence the difference in the observation was significant and not due to chance.

## DISCUSSION

IN the present study, we examined the a co-relation between insulin resistance and depression in women. We saw that there is a positive co-relation between insulin resistance and depression in women. This was partially mediated by waist circumference. The study by Everson-Rose et al<sup>[4]</sup> and Pan et al<sup>[5]</sup> also reported the same conclusion that there is a co-relation between insulin resistance, waist circumference and depression.

The exact mechanism as how insulin resistance is co-related to depression is not known. One theory is that deprssion contributes to disruptions in glucose metabolism, central adiposity and diabetes mellitus type 2 is thought to develop due to activation of HPA axis. The HPA axis is sensitive to many factors. These factors include physical factors like alcohol and smoking, psychosocial and socioeconomic factors like divorce, unemployment, work-related stress, poor education and poverty. The function of HPA axis is to serve as a protective mechanism of action to maintain allostasis. However, intense chronic activation can lead to permanent derangements of the HPA axis and increase to susceptibility to disease. Some studies on primates have

showed that exposure to moderate psychological stress is followed by a depressive reaction and the development of adverse metabolic indicators including insulin resistance and fat accumulation. As this was a cross-sectional study, we were not able to determine the presence of a causal relationship between the development of depression and insulin resistance via the same mechanism discussed above.

There is also a possibility that obesity is a cause for the etiology for depression. A study showed that there is co-relation between obesity and depression in women. This was a cross-sectional study and the association was weak. In order to properly prove this, a cohort study has to be performed which are lacking.<sup>[6]</sup> Another possible mechanism is that depression leads to disruptions in glucose metabolism and central adiposity and this is due to behavioural factors like physical inactivity and poor dietary behaviors. In our study, these factors however did not substantially matter for the accusations. It is not sure whether the antidepressants exert a direct effect on glucose metabolism leading to insulin resistance or whether the effects are due to side effects like increased appetite and weight gain or sedation remains unclear. Studies regarding anti-depressants show that some anti-depressants can be either therapeutic in normalizing glucose homeostasis or can have opposite effects in glucose homeostasis.<sup>[7]</sup> Thus, in this study we saw insulin resistance leads to depression in women. However, there are some limitations in this study. The population in this study consisted only of females. The population was only 248 participants. Further studies

should be done with more number of participants and with male population also.

## CONCLUSION

There is a strong positive association between insulin resistance and depression in women. Female patients with insulin resistance are highly prone to develop depression.

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