



## STUDY OF SERUM INSULIN AND INSULIN RESISTANCE IN PRE AND POST-MENOPAUSAL WOMEN IN TERTIARY CARE HOSPITAL, JODHPUR (RAJASTHAN)

### Biochemistry

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### ABSTRACT

**INTRODUCTION:** Menopause refers to the termination of the reproductive life in women. It represents a period of accelerated physical, physiological and neuroendocrine aging in women. It coincides with an increase in several co-morbidities which include insulin resistance. An increase in insulin resistance is associated with an increased risk of diabetes, cardiovascular disease, breast cancer and metabolic syndrome.

**MATERIAL AND METHOD:** 50 pre-menopausal women were compared with 50 post-menopausal women who visited the Obstetrics and Gynaecology OPD, MDM Hospital, Jodhpur (Rajasthan) for fasting glucose and insulin. Homeostatic model assessment of insulin resistance (HOMA-IR) was also calculated to find out insulin resistance.

**RESULT AND DISCUSSION:** Statistically highly significant increase ( $p < 0.0001$ ) in the mean of serum glucose, insulin and HOMA-IR index was observed in post-menopausal women as compared to pre-menopausal women. Menopausal transition and post-menopausal state are considered as vulnerable periods for developing metabolic syndrome.

**CONCLUSION:** Post-menopausal women are at higher risk for developing metabolic abnormalities that leads to several complications. These factors may increase risk of developing glucose intolerance in these females leading to metabolic syndrome in future.

### KEYWORDS

Insulin Resistance, Menopause, HOMA-IR index.

#### INTRODUCTION:

Menopause is best defined as the absence of menses for 12 consecutive months. Menopause is a transition phase from the reproductive to the non-reproductive phase in a woman's life. Menopause can also occur as a result of surgery, when the ovaries are removed for other medical reason. The hormonal alterations during the menopausal transition characterised by high levels of follicle stimulating hormone (FSH), luteinizing hormone (LH) and low level of estrogen can trigger fluctuations in blood sugar level. (1) In addition to being associated with the termination of the reproductive life in women, menopause coincides with an increase in several co-morbidities, which include insulin resistance. (2)

Hyperinsulinemia is generally considered to reflect the presence of insulin resistance and is a surrogate marker of insulin resistance. Insulin resistance is defined as a resistance to the metabolic effects of insulin, including the suppressive effects of insulin on endogenous glucose production; the stimulatory effects of insulin on peripheral (predominantly skeletal muscle) glucose uptake and glycogen synthesis and the inhibitory effects of insulin on adipose tissue lipolysis.

The decline in adiponectin with the intra-abdominal weight gain at menopause play an important role in the development of insulin resistance after menopause. There is a strong epidemiological evidence that the insulin resistance confers a significantly increased risk of cardiovascular disease which is independent of other cardiovascular risk factors. (3)

The prevalence of the metabolic syndrome increases with menopause and partially explains the acceleration of cardiovascular diseases in menopausal females.

Thus, this study was planned to evaluate serum insulin resistance and compare the two groups to explore the utility of these parameters in predicting the risk of development of metabolic disorders.

#### AIM & OBJECTIVES:

To evaluate and compare the levels of insulin and insulin resistance in pre- and post-menopausal women to predict the risk of developing metabolic syndrome.

#### MATERIAL & METHODS:

The present study was conducted on 50 pre-menopausal and 50 post-menopausal women attending Obstetrics & Gynaecology Out Patient Departments, MDM Hospital, Jodhpur (Rajasthan).

**Time Duration:** The study period was 6 months in 2020.

#### INCLUSION CRITERIA:

- Pre-menopausal women [Age group 18-45 years] having no known medical condition.
- Post-menopausal women who had attained their menopause having no known medical condition.

#### EXCLUSION CRITERIA:

- Patients who did not give written informed consent form.
- Subjects on hormone replacement therapy (HRT).
- Subjects with surgical removal of ovaries.
- Subjects with any concurrent illness like chronic liver disease, diabetes mellitus, thyroid disorder, cardiovascular diseases, liver cirrhosis, jaundice were excluded.
- Subjects who were smokers and alcoholics.
- Subjects suffering from COVID-19 in last three months.

Ethical Clearance was sought from the institutional ethical committee. An informed consent was taken from all the pre- and post-menopausal subjects. All samples were evaluated in duplicate and mean of the values were taken for statistical analysis.

#### Following parameters were investigated in all the subjects:

- Fasting serum glucose by GOD-POD method (4)
- Serum insulin by ELISA (5)
- Serum Insulin Resistance calculation using HOMA-IR formula (6)

$$IR = \frac{\text{Fasting blood glucose (mmol/L)} \times \text{Fasting Insulin } (\mu\text{IU/mL})}{22.5}$$

#### RESULT & DISCUSSION:

In postmenopausal women, an increase in insulin resistance is associated with increased risk of Diabetes mellitus, cardiovascular diseases and sometimes breast cancer also. Insulin Resistance is a subnormal response to both endogenous and exogenous insulin (7). In

this study it was observed that mean fasting serum glucose in pre-menopausal subjects and post-menopausal subjects were  $87.10 \pm 9.79$  and  $101.18 \pm 11.80$  mg/dl, respectively. Mean serum fasting insulin of pre-menopausal subjects and post-menopausal subjects were  $11.03 \pm 2.21$  and  $23.89 \pm 3.37$   $\mu$ IU/ml, respectively. The mean HOMA-IR index of pre-menopausal women and post-menopausal women were  $2.37 \pm 0.58$  and  $6.04 \pm 1.46$ , respectively.

**Table 1: Mean Values of various biochemical parameters studied among pre- and post-menopausal women**

S. No.	Biochemical Parameters	Pre-menopausal women (50) Mean $\pm$ SD (Range)	Post-menopausal women (50) Mean $\pm$ SD (Range)
1.	Fasting Serum Glucose	87.10 $\pm$ 9.79 (70-104)	101.18 $\pm$ 11.80 (74-119)
2.	Serum Insulin	11.03 $\pm$ 2.21 (8.50-16.05)	23.89 $\pm$ 3.37 (18.13-29.88)
3.	HOMA-IR	2.37 $\pm$ 0.58 (1.62-3.95)	6.04 $\pm$ 1.46 (3.37-8.77)

**Table 2: Statistical analysis of various parameters among pre- and post-menopausal women**

S. No.	Biochemical Parameters	t-value	p-value
1.	Fasting Serum Glucose	6.49	<0.0001 (HS)
2.	Serum Insulin	22.50	<0.0001 (HS)
3.	HOMA-IR	16.47	<0.0001 (HS)

\*HS- Highly Significant

A statistically highly significant increase in the mean fasting serum glucose, insulin and HOMA-IR index were observed in post-menopausal women ( $p < 0.0001$ ) in comparison to pre-menopausal women.

The results of this study are in agreement with the study of **Jesmin S et al (2013)**, **Marjani A et al (2011)**, **Duru BN et al (2014)**, they also reported a significant increase in fasting glucose ( $p < 0.001$ ) in **post-menopausal women compared to pre-menopausal women. (8,9,10)**

Our results are also in accordance with the study of **Yeasmin N et al (2017)**, **Appiah D et al (2014)**, they also observed a highly significant increase in fasting serum insulin in post-menopausal subjects as compared with pre-menopausal subjects. (1,11)

**Eman MA et al (2015)** also reported a significant increase in HOMA-IR index ( $p < 0.0001$ ) in post-menopausal women as compared to pre-menopausal women. (12)

#### SUMMARY & CONCLUSION:

Hyperinsulinemia in post-menopausal subjects suggests insulin resistance and can lead to the development of metabolic abnormalities. HOMA-IR index was significantly high in post-menopausal women. Insulin resistance has been suggested as an important risk factor in the development of diabetes mellitus leading to metabolic syndrome. Thus, insulin resistance is so pervasive today that it mandates evaluation of nearly every woman.

It is concluded that menopause seems to be associated with increase in insulin resistance and post-menopausal women are at higher risk for developing metabolic abnormalities that leads to increased chances of type 2 diabetes mellitus, cardiovascular complications and metabolic syndrome. Women with menopause symptoms must reverse their insulin resistance in order to find relief from other comorbidities.

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