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Original article

An increase level of acylation stimulating protein is correlated with metabolic risk markers in North Indian obese women

Supriya Mishra[a], Vani Gupta[a,*], Sameeksha Mishra[a], Vandana Gupta[b], Abbas Ali Mahdi[c], Rekha Sachan[d]

[a] Department of Physiology, King George Medical University, Lucknow, India
[b] UPRIMS and R, Saifai Etawah, India
[c] Department of Biochemistry, King George Medical University, Lucknow, India
[d] Department of Obstetrics and Gynecology, King George Medical University, Lucknow, India

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ABSTRACT

Background and aims: The present study was to investigate the association between serum acylation stimulating protein (ASP) level with metabolic risk factors in North Indian obese women.
Methods: This is a case control study, total n = 322 women aged between 20 and 45 years (n = 162 with metabolic syndrome & n = 160 without metabolic syndrome) were recruited for the study according to National Cholesterol Education Program Treatment Panel (NCEPATP) guidelines. Serum ASP level were determined by enzyme linked immunosorbent assay.
Results: Results indicated that circulating ASP and other metabolic risk factors (waist circumference, triglycerides, fasting plasma glucose etc) were significantly higher in women with metabolic syndrome (WmetS) than in women without syndrome (WometS) ($p < 0.001$). Furthermore circulating ASP was significantly higher possitively correlated with waist circumference ($r = 0.51$, $p < 0.001$), triglyceride ($r = 0.56$, $p < 0.001$), glucose ($r = 0.70$, $p < 0.001$), and negatively correlated with high density lipoprotein ($r = -0.56$, $p < 0.001$) in women with metabolic syndrome.
Conclusions: Conclusively circulating ASP was found to be significantly associated with hyperlipidemia, obesity and obesity related disorders in North Indian obese women.

1. Introduction

Obesity is one of the important risk factor of metabolic syndrome [1]. Metabolic syndrome is the clustering of metabolic abnormalities such as Type 2 diabetes, cardiovascular diseases dyslipidemia and insulin resistance etc [2,3]. In addition, obesity is accompanied by other medical complication include fatty liver, cholesterol gallstones, sleep apnea, osteoarthritis, and polycystic ovary disease. Women of are often more likely to be overweight/obese in general because of hormonal factor play a part in weight gain and central obesity that increase mass of abdomen which is associated with the risk factors [4]. Adipose tissue is active metabolic regulator, which secretes various adipocytokines and hormones [5] alteration of these adipokines, plays a key role in the metabolic disorder

Acylation stimulating protein (ASP) is an adipose tissue drived lipogenic harmone, play a key role in regulating energy metabolism, which is identical to C3adesArg is a product of innate immunity [6], derived from the cleavage of complement C3 protein by carboxypeptidase. ASP is a bridging protein immunity and metabolism but recent findings have shown role of ASP in energy homeostasis and lipid metabolism [7]. ASP are responsible for stimulation of free fatty acid incorporation into adipose tissue by stimulating TG synthesis through activation of diacylglycerol acyltransferase and increases glucose transport through enhanced translocation of glucose transporters and inhibition of lipoprotein lipase (LPL) activity which reduction of triglyceride lipolysis in adipocytes through inhibition of hormone sensitive lipase [8,6]. Previous studies have shown that fasting circulating ASP levels are significantly increased in obese [8,9], however obesity is not necessary feature of elevated ASP levels, as ASP is increased in subjects with diabetes and polycystic ovary syndrome, even in the absence of obesity [10].

The study of ASP biology has open new insight into human physiology and driving the development of novel scientific

* Corresponding author.
E-mail address: vaniphysiology@gmail.com (V. Gupta).

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approaches regarding metabolic diseases. The outcome of this study shows that obesity is associated with increased circulatory level of serum ASP in North Indian obese women [11].

2. Materials and methods

A total of 322 women were enrolled in this study and consisted of 162 women with metabolic syndrome (WMetS) according to NCEP-ATP III criteria and a control group of 160 age matched healthy women without metabolic syndrome (WoMetS) who were non-alcoholic, non-diabetic, and who had no cardiac, respiratory, inflammatory, endocrine, or metabolic disease. Pregnant and lactating women with any gynaecological or obstetrical problems and women receiving medication such as hormone replacement therapy were excluded from this study. A structured form was completed to collect information regarding subjects' medical, personal, family, dietary, and menstrual history. This study was approved by the Ethics Committee of this Institute and the Indian Council of Medical Research, New Delhi, India and "all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research". Written informed consent was obtained from all participants.

2.1. Criteria for metabolic syndrome

The NCEP-ATP III criteria for metabolic syndrome [12] was based on simple clinical and biochemical parameters. The current subjects were classified as having metabolic syndrome if they had three or more risk factors, which included any 3 of the following: 1) waist circumference (WC) > 88 cm (35 in); 2) triglycerides (TG) $\geq$ 150 mg/dL (1.69 mM); 3) highdensity lipoprotein cholesterol (HDL-C) < 50 mg/dL (1.29 mM); 4) systolic blood pressure (SBP) $\geq$ 130 mmHg or diastolic blood pressure (DBP) $\geq$ 85 mmHg; and 5) fasting plasma glucose (FPG) $\geq$ 110 mg/dL (6.1 mM).

2.2. Anthropometric measurements

Anthropometric variables, body mass index (BMI), waist circumference (WC) and blood pressure (BP) were determined in all the subjects. WC was measured at the narrowest point superior to the hip and was divided by the circumference of the hips measured at their greatest gluteal protuberance. BMI was calculated as the ratio of body weight to body height squared and was expressed in kg/m2. BP was evaluated using an appropriate cuff size, measured by physician.

2.3. Blood collection and biochemical analysis

Blood samples for measuring the biochemical parameters were obtained in the morning after 12 h of fast on the 10th day to rule out the hormonal variation because of menstruation. Serum and plasma were separated from 6.0 ml of the blood, plasma glucose was estimated by glucose oxidase-peroxidase method (Randox Laboratories Ltd., Antrim, UK) and serum lipid profile was estimated by enzymatic method (Randox Laboratories Ltd., Antrim, UK). Serum Insulin was estimated by Immuno-radiometric assay method (Immunotech Radiova, Prague) Insulin resistance was also calculated by homeostatic model assessment index (HOMA Index) [13] using the equation

$$\text{HOMA Index} = [\text{fasting Insulin } (\mu U/l) \times \text{fasting glucose (mmol/l)}/22.5]$$

If subjects had no clinical and biological criteria of Insulin resistance, a laboratory diagnosis of IR was made on the basis of HOMA Index $\geq$ 3.6 [13].

2.4. Determination of serum ASP level

The serum concentration of ASP was measured with ASP Elisa kit (MYBIO, Catalogue-MBS012694), according to the manufacturer's protocol.

2.5. Statistical analysis

Statistical analysis was carried out using the software graph pad Prism version 5.03 (24). Quantitative variables are presented as the mean ± standard deviation. Unpaired *t*-test was performed to assess the difference in biochemical parameters among the two groups. All statistical tests were two-tailed, and $p < 0.05$ was chosen as the level of significance. Pearson's correlation was performed to observe the correlation of ASP with the metabolic risk markers.

3. Observation and result

Observation of present study shows, total n = 322 women that n = 162 women with metabolic syndrome (study group: WMetS). and n = 160 women without metabolic syndrome (control group: WoMetS).

3.1. Anthropometric and biochemical parameters in women with and without metabolic syndrome

Differences between women with metabolic syndrome and women without metabolic syndrome (Table 1) in terms of and anthropometric and biochemical parameters. Statistically significant($p < 0.001$) high values for BMI (31.27 ± 5.34 *vs.* 24.66 ± 2.97, $p < 0.001$), TC (178.3 ± 33.6 *vs.* 148.24 ± 82.9, $p < 0.001$), FPI (14.41 ± 9.25 *vs.* 7.01 ± 3.91, $p < 0.001$), HOMA-IR (3.98 ± 3.44 *vs.* 1.59 ± 0.93, $p < 0.001$), and ASP (23.41 ± 2.90 *vs.* 16.39 ± 3.91, $p < 0.001$), were observed in study group compared to control group.

Table 1
Anthropometric and biochemical parameters in women with and without metabolic syndrome.

Anthropometric & biochemical parameters	Study Group (n = 162)	Control Group (n = 160)	p- value
Age	32.81 ± 3.57	33.49 ± 2.83	0.593
BMI	31.27 ± 5.34	24.66 ± 2.97	<0.001*
TC (mg/dl)	178.3 ± 33.6	148.24 ± 82.9	<0.001*
FPI	14.41 ± 9.25	7.01 ± 3.91	<0.001*
HOMA-IR	3.98 ± 3.44	1.59 ± 0.93	<0.001*
ASP (nM/l)	23.41 ± 2.90	16.39 ± 3.91	<0.001*

Data are presented as mean ± SD, A value of $^*\mathbf{p < 0.05}$ was considered statistically significant **BMI:** Body Mass Index; **TC:** Total Cholesterol; **FPI:** Fasting Plasma Insulin; **HOMA-IR**: Homeostatic Model Assessment – Insulin Resistance **ASP**: Acylation Stimulating Protein.

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