

The Level of Adiponectin in Polycystic Ovary Syndrome Patients Suffering Metabolic Syndrome

Sara Jafari ^{*1}, Mitra Niafar ², Sajjad Hejazi ³

^{1*}Resident of Internal Medicine, Imam-Reza Hospital, Endocrine Research Team, Tabriz University of Medical Sciences, Tabriz, Iran

²Associated Professor of Endocrinology and Metabolism, Imam-Reza Hospital, Endocrine Research Team, Tabriz University of Medical Sciences, Tabriz, Iran

³Department of Anatomy, Tabriz branch, Islamic Azad University, Tabriz, Iran

*Corresponding author: sara_jafari@yahoo.com

Abstract: Polycystic ovary syndrome is one of the most common endocrine disorders which occurs in 6.5-8 percent of in reproductive women and is characterized by creating disorder in ovulation and hyperandrogenism. Adiponectin is one of the cytokines which is secreted by an adipose tissue; it has an anti-inflammatory effect and decreases when polycystic ovary and metabolic syndromes occur. The present study was aimed at assessing the level of Adiponectin in polycystic ovary syndrome patients who suffered metabolic syndrome. **Method:** The study was an analytic-descriptive one. Ninety polycystic ovary syndrome patients, 45 of whom also suffered metabolic syndrome, were selected as the study participants. Their level of Adiponectin and some other endocrine biomarkers were assessed and compared with each other. **Results:** Mean age of the studied patients was 24.61±6.9. Patients' mean systolic blood pressure was 22.98±18 mmHg. The mean waist diameter in the patients was 87.2±13.34 cm. The mean level of triglyceride was 115.42±74.53mg/dl. Mean level of HDL was 48.34±16.75 mg/dl. Patients' mean level of fasting blood glucose was 90.65±7.98 mg/dl. Mean BMI was 26.89±6.01 kg/m². Level of Adiponectin was 11.03±3.56 mg/dl and 8.01±2.69 mg/dl in patients suffering polycystic ovary syndrome and those with polycystic ovary and metabolic syndromes, respectively. **Conclusion:** The results of the present study and comparing them with those of other studies showed that level of Adiponectin in patients suffering polycystic ovary syndrome is lower compared to laboratory indices which specify the normal range. Moreover, suffering metabolic syndrome in patients with polycystic ovary syndrome reduces level of Adiponectin; and comparing these two showed that there was a significant statistical difference between them (P=0.00).

[Sara Jafari, Mitra Niafar, Sajjad Hejazi. **The Level of Adiponectin in Polycystic Ovary Syndrome Patients Suffering Metabolic Syndrome.** *Life Sci J* 2013;10(7s):573-577] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 90

Keywords: polycystic ovary syndrome, metabolic syndrome, Adiponectin

Introduction:

Polycystic ovary syndrome is one of the most common endocrine disorders which occurs in 6.5-8 percent of in reproductive women and is characterized by creating disorder in ovulation and hyper-androgens. This syndrome associates with conditional risk caused as a result of resistance to insulin. These conditions include type 2 diabetes, metabolic syndrome, and cardio-vascular events [1, 2]. Therefore, in dealing with polycystic ovary syndrome not only treating infertility and hirsutism is significant but also considering problems involved with health resulted from resistance to insulin is important. This issue necessitates further pathophysiological study and investigation of different diseases associated with this syndrome [3]. One of the conditions associated with the syndrome (polycystic ovary syndrome) is metabolic syndrome that involves (1) Impaired glucose tolerance; (2) High blood pressure; (3) Obesity; (4) Increase of Triglyceride, and (5) decrease of HDL [1]. Increase in inflammatory cytokines like interleukins and

reduction of anti-inflammatory interleukins like Adiponectin are among the laboratory markers in metabolic syndrome [2]. The present study was aimed at assessing the level of Adiponectin in polycystic ovary syndrome patients who suffered metabolic syndrome. The most important new point to be mentioned here is that it seems that no investigation has ever considered the possible relation between level of Adiponectin in polycystic ovary syndrome patients and metabolic syndrome; which has been dealt in the present study. The main purpose of the study is to assess the level of Adiponectin in polycystic ovary syndrome patients who suffered metabolic syndrome; which has been conducted in an analytic-descriptive way. Introducing the level of Adiponectin as the metabolic syndrome marker in polycystic ovary syndrome patients without other characteristics of metabolic syndrome is one of the practical purposes of the study.

Materials and Method

Participants of the study were women who had referred to endocrine clinics affiliated with

Tabriz University of Medical Sciences in 2010-2012 and were examined by a single specialist. The sample size was determined according to the results of a study conducted by Dorte *et al.* Considering the first type of error as 0.005 and possibility of 80 percent for difference of 0.7 units in Adiponectin in the two groups, 45 participants were assigned to each group and a total number of 90 women were chosen as the sample of the study. Polycystic ovary syndrome patients were studied based on Rotterdam criteria that includes the following three factors: (1) oligomenorrhea or amenorrhea (chronic anovulation); (2) clinical hyperandrogenism; (3) appearance of PCO in sonography. All patients were examined regarding metabolic syndrome criteria according to ATP III criteria. These criteria include blood sugar higher than 100 mg/dl, triglyceride higher than 150 mg/dl, waist diameter higher than 88 cm, systolic blood pressure over 130 mmHg, and HDL lower than 50 mg/dl. Metabolic syndrome patients were diagnosed if they had 3 of these criteria. Finally, the level of Adiponectin in both polycystic ovary syndrome patients and patients with polycystic ovary and metabolic syndromes was assessed.

The factors for selection of the participants included suffering polycystic ovary syndrome. And factors for crossing out the participants from the study included: (1) consumption of metformin and contraceptive pills in the last three months; (2) pregnancy; (3) the participant's unwillingness to enter the study.

After the patients were selected and examined regarding the selection criteria, based on ATP II criteria they were divided into two groups, one with and one without metabolic syndrome. The level of Adiponectin was assessed for both groups and statistically analyzed after being recorded in the forms that had been prepared for that purpose.

Ethical Considerations:

all the information collected from the patients is confidential and their names or addresses are not mentioned anywhere. Before the research started, all parameters had been explained to the patients and written consent was received from them (the form of the written consent is provided in appendix section). The participants were permitted to leave the study whenever they wanted to. In addition, patients were not charged for the examinations.

Statistical Analysis:

All collected data were analyzed through SPSS 17.0 software. Descriptive statistics (frequency, percentage, mean \pm standard deviation) was applied. Two Samples T-test was utilized to compare two independent means and comparison of dependent means was conducted through Paired Samples T-test.

Significance value P was considered to be below 0.005.

Results:

In the present study, 90 polycystic ovary syndrome patients, 45 of whom also suffered metabolic syndrome, were studied. The results of the conducted analyses are as follows.

1. Age:

The study involved 90 patients who aged 13-39. Mean age of the patients was 24.61 ± 6.19 .

2. Patients' Systolic Blood Pressure

Among the 90 studied patients, the minimum systolic blood pressure and the maximum one were respectively 90 and 180. Mean systolic blood pressure was 122.98 ± 18 mmHg.

3. Patients' Waist Diameter

Measuring the patients' waist diameter showed that the minimum waist diameter and the maximum one were 60 and 120 cm, respectively. The mean waist diameter was 87.02 ± 13.34 cm.

4. Level of Triglyceride

The highest level and the lowest level of triglyceride were respectively 39 mg/dl and 419 mg/dl with a mean value of 115.42 ± 74.53 mg/dl.

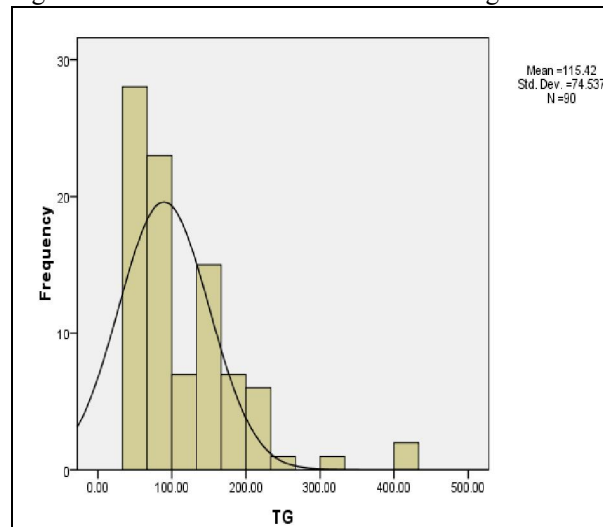


Figure 1. Patients' Triglyceride Level

5. Patients' Level of Blood HDL

The highest level and the lowest level of patients' blood HDL were respectively 125 mg/dl and 30 mg/dl. Mean level of blood HDL was 48.34 ± 16.75 .

6. Patients' Fasting Blood Glucose

The minimum and the maximum fasting blood glucose were respectively 67 mg/dl and 109 mg/dl with a mean value of 90.65 ± 7.98 mg/dl.

7. Level of Blood Cholesterol

The minimum and the maximum levels of blood cholesterol were 2.5 mg/dl and 305 mg/dl,

respectively. The mean level of blood cholesterol was 183.76 ± 51.14 mg/dl.

8. Patients' Height

The minimum and maximum heights were respectively 145 and 175 cm with a mean value of 161.54 ± 5.36 .

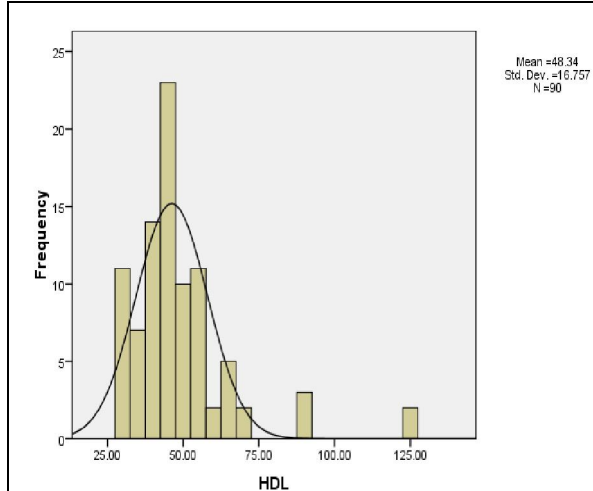
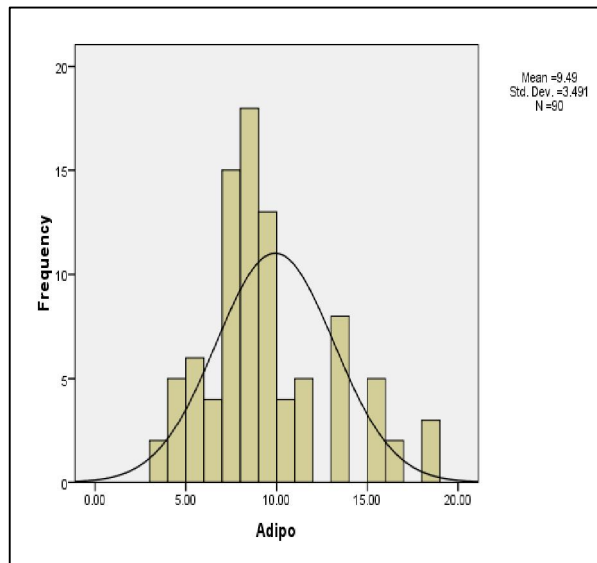


Figure 2. Patient's HDL Level

Figure 3. Level of Adiponectin in all Investigated



Patients

9. Patients' Weight

The minimum weight was 46 kg and the maximum was 128 kg. Mean weight of the patients was reported to be 70.06 ± 15.03 .

10. Testosterone

The minimum level of testosterone was 0.13 mg/dl and the maximum was 1.20 mg/dl with mean value of 0.56 ± 0.09 mg/dl.

11. Clinical Hyperandrogenism

Seventy-eight participants were diagnosed with symptoms of clinical hyperandrogenism and 12 without it.

12. Sonographic Appearance of PCO

From among the investigated participants, 72 individuals had normal sonographic appearance and 18 had sonographic appearance in favor of polycystic ovary syndrome.

13. Existence of Oligomenorrhea or Menorrhoea

A total number of 67 patients had oligomenorrhea or menorrhoea and 23 did not.

14. Level of Adiponectin in Polycystic Ovary Syndrome Patients

Among the 90 investigated individuals, the minimum and maximum amounts of Adiponectin were respectively 3.10 and 18.50 mg/dl with a mean value of 9.449 ± 3.49 .

15. Level of Adiponectin in polycystic ovary syndrome patients without metabolic syndrome

From among 45 patients whose polycystic ovary syndrome criteria were positive but their metabolic syndrome was negative, the minimum and maximum levels of Adiponectin were respectively 5.9 and 18.5 mg/dl with a mean value of 11.03 ± 3.5 mg/dl.

16. Level of Adiponectin in polycystic ovary syndrome patients with metabolic syndrome

From among 45 patients whose polycystic ovary and metabolic syndromes criteria were positive, the minimum and maximum levels of Adiponectin were respectively 3.10 and 16.00 mg/dl with a mean value of 8.01 ± 2.69 mg/dl.

17. Comparing Adiponectin Level in the Two Groups

Comparison of Adiponectin level in polycystic ovary syndrome patients without metabolic syndrome and those suffering from it showed that Adiponectin level in polycystic ovary syndrome patients with metabolic syndrome is significantly lower than those without metabolic syndrome ($P=0.00$).

18. Patients' BMI

Mean BMI of the patients was 26.89 ± 6.01 kg/m².

19. The Relation between Adiponectin and Testosterone Levels

Regression test was applied to see whether there was any relation between testosterone and Adiponectin increase or not. Pearson correlation coefficient was -0.164 for this study which showed that as the level of testosterone increases, Adiponectin level decreases in a linear way.

20. The Relation between Adiponectin and Fasting Blood Glucose

Regression test was utilized to check the relation between Adiponectin and fasting blood

glucose. In the present study, R value was 0.082 that proved no certain relation.

21. The Relation between Adiponectin and Cholesterol

Regression test was applied to check the relation between cholesterol increase and Adiponectin increase. Pearson correlation coefficient for this test was -0.254 and since there was only one variable, R was also 0.254 . The results showed that as blood cholesterol increases, blood Adiponectin level drops. These two; however, have no linear relation.

22. The Relation between Adiponectin and HDL

Regression test was used to figure out the relation between Adiponectin and HDL. R value for this test was 0.048 that proved no relation between these two variables.

23. The Relation between Adiponectin Level and TG

Regression test was applied to measure the relation between Adiponectin level and TG. According to Pearson correlation coefficient for this test was -0.469 , it can be concluded that as TG increases, Adiponectin level decreases. This relation; however, is not linear.

24. The Relation between Adiponectin and Patients' Waist Diameter

Pearson correlation coefficient for this measurement was -0.385 .

25. The Relation between Adiponectin Level and Patients' Weight

As the patients' weight increases, their Adiponectin level will decrease. However, this relation is no a linear one ($R = -0.432$).

26. The Relation between Adiponectin Level and Patients' BMI

As the patients' BMI increases, Adiponectin decreases. This relation; however, is no linear ($R = -0.297$).

Discussion:

The role of Adipocytikines especially Adiponectin that is one of the secretory hormones from fat tissues in appearance of PCO has drawn much attention [14]. Adiponectin is a new Adipocytikine that is especially and amply found in fat cells of human body [4]. Adiponectin regulates energy homeostasis and has anti-inflammatory and anti-atherogenic effects [5]. This cytokine is a collagen-like protein that is nowadays known as specific protein in fat cells and is in reverse relation with BMI [6]. In the present study, Adiponectin level in 90 polycystic ovary syndrome patients, 45 of whom suffered metabolic syndrome, was investigated. Mean Adiponectin level in all investigated patients was 9.449 ± 3.49 mg/dl. Mean Adiponectin level in patients with both syndromes of

polycystic ovary and metabolic was 8.01 ± 2.69 and it was 11.03 ± 3.56 mg/dl in patients with only polycystic ovary syndrome. As mentioned in results section, statistically these values are significantly different. Polycystic ovary syndrome can solely reduce Adiponectin level; which is proved in the present study. The new point; however, is that concomitant metabolic syndrome in patients with PCO can more reduce Adiponectin level. This finding is proved by the results and the fact that Adiponectin level was significantly lower in patients' with both syndromes compared to those with only polycystic ovary syndrome. According to the study findings, it seems that low level of Adiponectin is related to other metabolic syndrome markers and as a result the patients are encouraged to control other markers, for instance they try to lose weight, decrease waist diameter, and control lipid status which in turn heighten Adiponectin level. In their study, Glinborg *et al* have measured some biomarkers like Adiponectin, Leptin, and Ghrelin in polycystic ovary syndrome patients. They have reported Adiponectin level to be significantly lower in polycystic ovary syndrome patients than those who do not have the disease. In the present study, 90 women with polycystic ovary syndrome were investigated and their Adiponectin level was measured and compared to its normal level that was assessed laboratory standards. The results showed that their mean Adiponectin level is lower than the standard one. Moreover, as the patients' waist diameter increases, Adiponectin level drops. The same finding can be concluded from the collected and analyzed data [3].

O'Conner *et al* have also measured Adiponectin level in hirsute women with polycystic ovary syndrome. They concluded that Adiponectin level is lower than the normal level in these individuals; which is in agreement with the results of the present study [9]. In another study conducted in 2005, Adiponectin level in polycystic ovary syndrome was measured without considering the patients' BMI, their resistance to insulin was reported to be lower than the control group patients. This is in agreement with the present study findings [15]. Moreover, in the present study Adiponectin level in metabolic syndrome patients was significantly lower than those without this syndrome. This finding is in quite line with a study conducted in China to measure Adiponectin level in patients with polycystic ovary and metabolic syndromes. In this study, the relation between some metabolic factors with Adiponectin level was also regarded. The results showed that as fasting blood glucose, triglyceride, cholesterol, testosterone increase and HDL decreases, Adiponectin level drops; which is in line with findings of Wang's study [10]. In another research

conducted by Escobar *et al*, Adiponectin level in polycystic ovary syndrome patients' serum was measured. The results proved a low level of Adiponectin for these patients, which is in line with the present study [11]. In another review study over 15 articles from 1997 to 2009, it was concluded that Adiponectin level in patients with polycystic ovary and metabolic syndromes is lower than normal individuals, this is in line with the findings of the present study [17].

Conclusion:

The results of the present study and comparing them with those of other studies show that polycystic ovary syndrome is one of the causes that reduce Adiponectin level which is one of the secretory anti-inflammatory factors in fat tissues. In addition, polycystic ovary syndrome itself reduces Adiponectin level that can result in further reduction of Adiponectin if associated with metabolic syndrome. This fact is proved by the significant difference between Adiponectin level in polycystic ovary syndrome patients with and without metabolic syndrome.

References:

- 1-Ehrmann A, et al. (2005). Prevalence and Predictors of the Metabolic Syndrome In Women with Polycystic Ovary Syndrome. *The Journal of clinical Endocrinology and Metabolism*, 91(1),48-53.
- 2-Toulis K.A, et al. (2009). Adiponectin levels in women with polycystic ovary syndrome: a systematic review and a meta-analysis. *Human Reproduction update*, 15(3),297-307.
- 3-Glntborg D, et al. (2006). Evaluation of metabolic risk markers in polycystic ovary syndrome, Adiponectin, Ghrelin, Leptin and body composition in hysute PCOS patient and control. *European Journal of endocrinology*, 155,337-345.
- 4-Maeda K, et al. (1996). cDNA cloning and expression of a Novel adipose specific collagen like factor. *Biochem Biophys res Commun*, 221, 286-289.
- 5-Lenchik L, et al. (2003). Adiponectin as a novel determinant of bone mineral density and visceral fat bone. *European Journal of endocrinology*, 33(4),646-651.
- 6-Matsubara M, et al. (2002). Inverse relationship between plasma adiponectin and Leptin concentration in normal wheight and obese women, *Eur J endoc*, 147,173-180.
- 7-Reaven G M. (2005). The insulin resistance syndrome: Definition and dietary approach to treatment. *Annu rev Nutr*, 25,391-406.
- 8-Hotamisligi GS, Shargill NS. (1993). Adipose expression of tumor necrosis factor alpha. *Science*, 259,87-91.
- 9-O'Conner A, et al. (2010). High –Molecular-Weight adiponectin Is Selectively Reduced in Women with polycystic Ovary Syndrome independent of Body Mass Index and Severity of Insulin resistance. *J clin Endocrinol Metab*, 95(3),1378-1385.
- 10-Wang J, et al. (2008). Adiponectin and Metabolic Syndrome in middle aged and elderly Chinese. *Obesity*, 16,172-178.
- 11-Escobar-Morreale H, et al. (2006). Adiponectin and reesistin in PCOS: a clinical, biochemical and molecular genetic study. *Human Reproduction*, 21(9),2257-2265
- 12-Groth SW. (2010). Adiponectin and polycystic ovary syndrome. *Bio Res nur*, 12(1),62-72.
- 13-Bik W, et al. (2007) The relationship between metabolic status and levels of adiponectin and ghrelin in lean women with polycystic ovary syndrome *Gynecol Endocrinol*, 23(6),325-31.
- 14- Carmina E, Orio F, Palomba S, Cascella T, Longo RA, Colao AM, Lombardi G and Lobo RA (2005). Evidence for altered adipocyte function in polycystic ovary syndrome. *Eur J Endocrinol*, 152,389–394.
- 15-Trujillo ME, Scherer E. (2005). Adiponectin – journey from an adipocyte secretory protein to biomarker of the metabolic syndrome. *Journal of internal medicine*, 257,167-175.
- 16-Bik W, et al. (2007). The relationship between metabolic status biomarkers and PCO. *gynecol endocrinol*, 23(6),325-331.
- 17-Groth SW (2010). Adiponectin and PCO. *Bio Res Nurs*, 12(1):62-72.
- 12-Groth SW. (2010). Adiponectin and polycystic ovary syndrome. *Bio Res nur*, 12(1),62-72.
- 13-Bik W, et al. (2007). The relationship between metabolic status and levels of adiponectin and ghrelin in lean women with polycystic ovary syndrome *Gynecol Endocrinol*, 23(6),325-31.
- 14- Carmina E, Orio F, Palomba S, Cascella T, Longo RA, Colao AM, Lombardi G and Lobo RA (2005). Evidence for altered adipocyte function in polycystic ovary syndrome. *Eur J Endocrinol*, 152,389–394.
- 15-Trujillo ME, Scherer E. (2005). Adiponectin – journey from an adipocyte secretory protein to biomarker of the metabolic syndrome. *Journal of internal medicine*, 257, 167-175.
- 16-Bik W, et al. (2007). The relationship between metabolic status biomarkers and PCO. *gynecol endocrinol*, 23(6),325-331.
- 17-Groth SW (2010). Adiponectin and PCO. *Bio Res Nurs*, 12(1):62-72.

5/15/2013