REVIEW OF LITERATURE

CORRELATION OF ADIPONECTIN AND POLYCYSTIC OVARY SYNDROME:

- Amer, Hanaa A, Abo-Shady et al. (2017) explained the role of serum adiponectin levels in women with polycystic ovary syndrome. PCOS was found to correlate with low adiponectin levels, independently of BMI.

- Polak, Czyzk Simoncini et al. (2017) discussed that Adiponectin, Leptin are the new markers of insulin resistance in PCOS. PCOS patients are very much prone to insulin resistance independent of obesity. Test related to IR was not reliable [25, 26].

- Aleksandra, Jovanovska, Beti et al. (2016) discussed the levels of adiponectin and leptin in PCOS patients, as well as their association with other components of the syndrome. There was a significant negative correlation between adiponectin, body mass index (BMI), and waist circumference [27, 28].

- Chin chen, Ming-1 Hsu et al. (2015) had done an analysis in Polycystic ovary syndrome that Adiponectin and Leptin in obese and Lean women and stated that Adiponectin was negatively correlated with insulin resistance, body mass index (BMI), The adiponectin to leptin ratios were significantly lower in PCOS women than in those without PCOS. [27, 29, 30, 31].

- Jaiprakash (etal) 2014 discussed the relation between serum adiponectin and clinical characteristics, biochemical parameter in Indian women with polycystic ovary. Age and adiponectin correlated significantly and inversely. Obese patients had lower mean adiponectin levels than normal weight [32, 33, 34, 35].

- Itoh H, Kawano Y, Furukawa Y et al. (2013) stated the role of serum Adiponectin levels in women with PCOS Serum adiponectin levels were significantly lower in obese women than in normal, 65% of patients with PCOS were included in the lower adiponectin group (p < 0.05). In addition, gonadotropin levels were increased, dependent on the adiponectin levels in women with PCOS [36].

- Nagalla, Maha Adel Al-Ayadhi et al. (2012) [37] found that Serum levels of insulin, leptin, adiponectin, cholesterol, triglyceride, A/L and L/A ratios were compared in women with PCOS and controls to investigate tentative and potential diagnostic markers for women with PCOS. Insulin was significantly higher in PCOS cases than controls. In PCOS cases Leptin was little higher in PCOS cases than in controls.
- Louise Manneras-Holm, Henrik Leonhardt, Joel et al. (2011) PCOS women have a higher waist-to-hip ratio, enlarged adipocytes and reduced adiponectin level. Adipose tissue present in abdomen its volume and its distribution did not differ in the groups, PCOS women had large size of adipocytes amount of waist-to-hip ratio is also higher, adiponectin level is reduced.

- Sharifi F, Hajihosseni R, Mazloomi et al. (2010) showed that there is decreased adiponectin levels in polycystic ovary syndrome Independent of body mass index. There was no significant difference between the adiponectin concentrations of non-lean women with PCOS and that in lean women with PCOS. Adiponectin levels were significantly lower in normal non-lean women compared with normal lean women. A weak but significant negative correlation was found between adiponectin and insulin levels in all the subjects. [38,39].

- Toulis KA, Goulis DG, Farmakiotis et al. (2009) stated that Women with PCOS demonstrated significantly lower adiponectin levels are associated with the IR observed in women with PCOS, compared with controls. IR, but not total testosterone, was found significant among biological parameters explored in the meta-regression model. Hypoadiponectinaemia was present in both lean and obese women with PCOS when compared with non-PCOS. [40,41].

- Aroda V, Ciaraldi TP, Chang SA et al. (2008) discussed that serum adiponectin levels and its organisation into multimers in women with PCOS and relationships between glucose tolerance and insulin resistance and come to the conclusion that there is a defined correlations between glucose tolerance, insulin action, and circulating adiponectin levels in all subjects. Subjects with PCOS had less of their circulating adiponectin organized into high molecular weight (HMW) multimeric complexes. Glucose-intolerant subjects with PCOS also had less intracellular HMW adiponectin. [42,43]

- Glintborg D, Andersen M et al. (2006) stated that adiponectin levels were significantly decreased in obese PCOS patients compared with weight-matched controls. During multiple regression analysis, testosterone correlated positively with adiponectin and negatively with ghrelin independent of BMI, WHR and total fat mass. [44,45]

- Sepillian V, Nagaamani M et al. (2005) investigate the relationship of adiponectin to obesity and insulin resistance in women. Adiponectin levels were lower in women with PCOS compared with controls. There was a significant negative correlation between adiponectin levels and fasting insulin levels. There was no correlation
between BMI and serum adiponectin in women with PCOS, while there was a negative correlation in controls[46,47].

- Spranger J, Mohlig M, Wegewitz U et al (2004) investigate the determinants of circulating adiponectin levels and their role in insulin resistance in PCOS women and contribute to the maintenance of insulin resistance independent from adiposity[48,49].

- Francesco Orio, Stefano Palomba et al (2003) stated that both in PCOS and controls, serum adiponectin levels were lower in obese than normal-weight women, without any difference between PCOS and controls. Results confirm that adiponectin concentrations change according to variations of fat mass. Panidis, Kourtis et al (2003) observed lower serum adiponectin levels in PCOS patients in obese women with PCOS[50,51,52,53].

RELATION OF leptin IN POLYCYSTIC OVARY SYNDROME

- Zheng SH, Du DF et al (2017) have done the systemic reviews and stated that parameter such as body mass index (BMI), insulin resistance (IR), and total testosterone, influence leptin level. Leptin levels were significantly higher in patients with PCOS than in controls. Elevated leptin levels are detected in women with PCOS compared with non-PCOS controls. Higher leptin levels may be correlated with IR, metabolic disorder, infertility, and even cardiovascular disease risk in PCOS, which may contribute to the etiology and development of PCOS[54,55].

- Nasrin jalilian, Lida haghazari et al (2016) believed that leptin and body mass index in polycystic ovary syndrome are quiet related. Mean BMI of the PCOS and control groups. Elevated leptin levels are detected in women with PCOS compared with non-PCOS controls. [56,57].

- Nasser, Elham Sharif et al (2015) stated that leptin as well as Free Leptin Receptor is associated with PCOS in Young women. PCOS is associated with hyperleptinemia and increased free leptin index. Decreased sOB-R could be a compensatory mechanism for the defective action of leptin[58,59].

- Azhar, Nomaar, Nisreen et al (2014) discussed the Serum Leptin levels in obese woman with PCOS and its relation to insulin resistance. Serum leptin levels in PCOS patients were significantly higher than that in the control group. In PCOS patients there was a positive correlation between leptin and BMI, and there was no correlation between leptin and other hormonal indices in PCOS patients[60,61].

- J Chakrabarti (2013) stated the interrelationship between Serum Leptin Level with BMI, insulin and with circulating testosterone in PCOS women. Positive correlation was
observed between serum leptin, BMI, and insulin in both the groups. PCOS women also had significantly elevated androgens and fasting levels of insulin. Hyperleptinemia in PCOS women appears to be due to the positive correlation between serum leptin, BMI, and insulin[62,63].

- Golbahar, Das, Gumaa et al (2012) Leptin-to-adiponectin, adiponectin-to-leptin ratios, and insulin are specific and sensitive markers associated with polycystic ovary syndrome: a case-control study from Bahrain. Insulin was significantly higher in PCOS cases than controls. In addition, L/A ratios were significantly higher in PCOS cases than in controls whereas A/L ratios were significantly lower in PCOS cases than in control.[64,65].

- Pehlivanov & Mitkov (2009) discussed and correlate with clinical and biochemical indices of insulin resistance in polycystic ovary syndrome Serum leptin levels in PCOS patients were higher than in the control group independently of BMI, WHR and waist circumference. No correlation between leptin and other hormonal indices in PCOS patients[66,67].

- Susanne Hahn, Uwe, Beate et al (2006) assessed the relation of PCOS with insulin resistance and high incidence of obesity. They assessed the correlation of metabolic and endocrine parameters with Leptin and the soluble leptin receptor (sOB-R) and found that in PCOS patients, no correlation was found between leptin or sOB-R and parameters of hyper-androgenism[68,69].

- Erturk E, Kuru N et al (2004) stated that Serum leptin concentrations were significantly correlated with body mass index. Lean patients with PCOS had a significant correlation between leptin concentrations and obesity parameters, they did not show any significant correlation with insulin resistance parameters. There are a few studies that show excessive leptin levels in PCOS.[70,71].

- Calvar, Intebi, Bengolea et al (2003) discussed that there is a direct correlation with Leptin in patients with PCOS and insulin resistance. IR are analyzed separately from non IR PCOS patients, there is a clear relationship between IR PCOS and hyperleptinemia, regardless of the BMI. The present study strongly supports bi-directional relationship between fat and carbohydrate metabolisms under a very particular physiopathological condition (PCOS)[72,73].

- Muhittin H, Mulazim et al (2002) discussed that. Leptin levels were found to be higher in obese patients with PCOS compared to obese controls. Leptin levels have a positive correlation body mass index, both in patients with PCOS and the controls.[65]. Brzechffa et al[66] found that leptin level were higher in patients with PCOS compared to controls. In similar studies some investigator reported leptin levels
were higher in patient with PCOS compared to controls[67] some reports says that there were no differences[74,75,76]

**CORRELATION OF OXIDATIVE STRESS IN PCOS**

- Chantal ,,Andrea etal(2017) come to conclude that the plasmatic and intracellular markers of oxidative stress in normal weight and obese patients with polycystic ovary syndrome and investigated OS in PCOS and relationship with hormonal and metabolic intracellular MDA levels were significantly higher in normal weight PCOS or N-PCOS than controls [77,78].
- Ozer A,Bakacak M etal(2016) stated that increased oxidative stress is associated with insulin resistance and in Pcos. This group had higher malondialdehyde The Pcos patients with IR had significantly higher malondialdehyde,. The patients with PCOS are under oxidative stress and this oxidative stress seems to be the highest in patients with IR . Despite the prominent increase in the oxidative stress, there was a variation in the antioxidant response[79,80].
- Archana shirsath,Neela Aundhakar etal(2015) analyse oxidative stress in females having PCOS and correlate oxidative stress by measuring serum Malonyldialdehyde-(MDA) levels and antioxidant levels and concluded that their is a strong correlation in PCOS patient compared with healthy controls and also concluded that PCOS patients may lead to complication of disease like infertility as well as other systemic disorder ,diabetes mellitus,dyslipidemia and cardiovascular disorder[81,82].

- Varalakshmi Desai, Namburi etal(2014) stated the oxidative stress in non obese women with PCOS .In this study non obese women was taken and the changes in the lipid peroxidation product(MDA) and total antioxidant capacity(FRAP) is an index of antioxidant status along with fasting glucose,insulin and uric acid levels were measured and conclusively found that Serum MDA levels were increased in the study group compared with controls and FRAP levels were decreased in the study group compared to controls. Oxidative stress further increases the CVD risk in these women. [83,84].

- Mora Murri ,Manuel Luque-Ramírez etal (2013) declared that there is Circulating markers of oxidative stress and polycystic ovary syndrome Circulating markers of oxidative stress are abnormal in women with PCOS independent of weight excess[85,86].
- Karabulut AB,Cakmak etal(2012)investigated the relationship between PCOS and oxidative stress and concluded the MDA levels were significantly higher in the study group compared to the those of control imbalanced oxidative/antioxidative status[87,88].
- Kusku N K and VarA et al. (2009) compared PCOS patients with healthy controls. Level of MDA in blood , was found to be significantly higher in the PCOS group. PCOS
subjects had significantly elevated concentration of plasma MDA independent of obesity [89].

- Kusku et al. (2009) demonstrated that SOD levels were significantly higher in a PCOS group compared with a control group. PCOS patients were further divided into two subgroups: IR and IR+. Levels of SOD in blood were higher in both subgroups compared with the control. This elevation may have been due to the body’s defense mechanisms [90].

- M.Karadeniz, M Erdogan et al. (2008) [91] MDA levels in PCOS patients were similar to those of control. Furthermore, MDA levels were found to be similar in a PCOS patient group where the homeostatic model assessment (HOMA)-IR. Level of MDA in PCOS patients with insulin resistance in has no effect on MDA levels. Zhang et al. (2008) demonstrated that serum MDA levels in PCOS patients were significantly higher than those of controls [92].

- Zhang et al. (2008) concluded that the level of SOD in serum of PCOS patients was significantly lower than that in the control group. The study did not capture other patients’ characteristics, making it difficult to comment as to why SOD level was lower in this selected PCOS group [93, 94, 95].