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Assessment of Glucosylated Hemoglobin, Glucose and Body Mass Index in Sudanese Women with Polycystic Ovarian Syndrome in Khartoum State

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Abstract: Back ground*: Polycystic ovary syndrome (PCOS) is endocrine disorders in women of reproductive age. Characterized by metabolic abnormality and a wide spectrum of clinical features such as, obesity, menstrual abnormalities and hyperandrogenism.* ***Objectives:*** *The aim of this study was to assess the levels of Random blood glucose (RBS) and HbA_{1c} among Sudanese Women with poly cystic ovary syndrome (PCOS).* ***Methods:*** *Analytical case control, hospital based study was conducted from March to April 2018, involving fifty Sudanese women who had been diagnosed with polycystic ovary syndrome, chosen from Omdurman Maternal Hospital, in Khartoum State, like cases, fifty age-matched healthy women were recruited as controls. The ages from 20 to 41 years).Blood samples were collected and the levels of RBS and HbA_{1c} were measured, using atomic absorption spectrophotometer (BUCK SCINTIFIC 210/211 VGP VER3.94C). Data analysis was carried out, using SPSS version, 21. Mean values were calculated and independent t-test was used to compare mean values in case versus the control group. Pearson's correlation was used to find the relationship between RBS, HbA_{1c} and age.* ***Results:*** *The result showed that, 60% of patients at age range between 20-30 years, while 40% of patients at age range between 31-41 years. The result found 20% of patients over weight, 22% obese, while 58% had normal weight. There was significant increase in the mean levels of RBS, HbA_{1c} and BMI in women with PCOS, compared to control groups. The mean ± SD: (101.2±18.19 versus 86.24±12.05,p- value = 0.000) for RBS, (5.20±0.59 versus 4.80±0.37 , p- value =0.000) for HbA_{1c} , (25.33±4.67 versus 22.09±3.52 , p- value= 0.037) for BMI. There were no correlation between HbA1c, RBS and age in women with polycystic ovary syndrome (r= 0.162, p- value=0.260) (r=0.190,p-value=0. 187) respectively. There were no correlation between HbA1c, RBS and BMI (r=0.089, p- value = 0.540)(r= 0.041, p-value= 0.777) respectively.* ***Conclusion:*** *The levels of RBS and HbA_{1c} were increased in Women with PCOS compared to healthy women.*

Keywords: Polycystic Ovary Syndrome , HbA_{1c} , RBS , BMI , Sudanese

Introduction:

Polycystic ovary syndrome (PCOS) is characterized by hyperandrogenism, ovulatory dysfunction and polycystic ovaries [(1)]. According to the World Health Organization, it was estimated that 116 million women (3.4%) have PCOS with prevalence ranging from 2.2% to 26% globally[(2)]. Hyperinsulinemia was noted in 50% to 70% of PCOS patients and played a central role in the development of further complications. In spite of hyperinsulinemia, there is an increased prevalence of insulin resistance (IR) in PCOS patents which can lead to increased glucose tolerance and type 2 diabetic mellitus (T2DM). Increased insulin leads to increased androgen production from the ovarian thecal cells and this hyperandrogenemia is responsible for androgenic obesity. The prevalence of obesity in PCOS ranges from 38% to 87%. It was reported that, in obese PCOS women, the prevalence of insulin resistant was higher than obese women without PCOS in the control group[(3)] . As well as resistance to insulin are seen in these patients. Existence of PCOS cold increase the likelihood of creation of such cases as type II diabetes, higher blood pressure, increase cholesterol, serum triglyceride, along with reduced HDL or the same good cholesterol, higher level of protein C-reactive (one of the indications of cronoray6 ailments), metabolic syndrome, nonalcoholic fatty liver, sleep apnea and abnormal uterine bleeding. Specifically, if this ailment is accompanied by obesity, the side effects will be aggravating. Although scientists do not know about the absolute cause of the polycystic ovaries syndrome (PCOS), such factors as higher insulin, inflammatory reactions, heredity and development disorders in feta; periods could contribute to this [(4, 5)]. Hemoglobin, like all other proteins in the body, is combined with sugars, including glucose. This combination, until the red globule is alive (almost 120 days), sustains and this process comprises the hemoglobin A1C Test. This test, in fact, determines the blood sugar concentration in a time period of past 2-3 months. Put it simple, as blood sugar concentration rises, sugar is connected to the blood hemoglobin (which is the protein carrying oxygen inside red globules). Hemoglobin has different types which, in natural states, 95-97% of which is comprised by A1C. When sugar is connected to this kind of hemoglobin, it is called glycosylated hemoglobin or HbA_{1c} . In this hemoglobin, glucose is connected to the end N- terminal amino acid valine of the beta chain of hemoglobin of hemoglobin A. The aim of

measuring hemoglobin A1C is to preserve the blood sugar concentration in a natural range or close to it in a diabetic person. It is clear that this issue contributes to reduced chronic side effects of blood sugar rise. These side effects include progressive famine of body members like livers, eyes, cardiovascular systems and nerves. Measuring hemoglobin A1C is done for two reasons: first for diagnosing the existence of diabetes in the person and second for assessing the efficacy of the treatment in the person affected with diabetes. A1C is reported in percentage form. In non-diabetic persons, the level of hemoglobin A1C, which is combined with glucose, is less than 6%. In people affected with diabetes, this percentage varies in terms of diabetes control way and blood sugar. Hemoglobin A1C less than 7% indicates diabetes and blood sugar has been controlled and volumes higher than 8% illustrates that the person needs to revise his own diabetes treatment method. Therefore, the goal to successfully treat diabetes is to reach hemoglobin A1C to less than 7 percent. Previous study reported that ; Hba1concentration was higher in polycystic ovary syndrome patients compared to control group, p- value = 0.002 [(6)]. Another study found that obesity lead to insulin resistance in adult women with polycystic ovary syndrome [(7).]

Materials and Methods:

Study design: This was analytical case control, hospital based study.

Study area and period of study: Blood samples were collected from Omdurman Maternal Hospital, in Khartoum State, from March to April 2018.

Study population: Fifty Sudanese women with polycystic ovary syndrome, aged between 20-41 years, were recruited as cases and fifty normal women with normal were enrolled as controls. The cases and control were age-matched.

Inclusion criteria: Omdurman Maternal Hospital -Women with polycystic ovary syndrome and healthy women serve as control , were included.

Exclusion criteria: All patient with disorder that can result in menstrual irregularity and hyperanadrogenism including adrenal or ovarian tumors, thyroid dysfunction ,congenital adrenal hyperplasia ,hyperprolactinemia , Cushing syndrome , were excluded.

Ethical consideration: The study was approved by the ethical committee of Medical Laboratory Science, Clinical Chemistry Department–Alneelain University. Informed consent was obtained from all the participants.

Data collection: Demographic data was collected by using questionnaire.

Sampling: About 3 ml of random venous blood was collected from each participant (from the arm), into plain sample tubes. After formation of clot at room temperature, the samples were centrifuged for 10 minutes at 3000 rpm. Then, the serum was obtained and analyzed.

Method of the assay of glucose and HbA_{1c}: The Levels of serum glucose and HbA_{1c} were measured by using atomic absorption spectrophotometer (BUCK SCINTIFIC 210/211 VGP VER3.94C).

Quality control: Pathological and normal control sera were also used for the measurement of the metals, to assure accuracy and precision of results.

Data analysis: Data was analyzed using SPSS, version 21. The results were expressed as percentages, mean and SD. Independent t-test was used to compare mean values in case versus the control group. Pearson's correlation test was done to study the relationship between glucose , HbA_{1c} and age, p-value less than 0.05 were considered significant.

3. Results:

Hundred participants were enrolled in this study; 50 women with polycystic ovary syndrome with mean age± SD 30.18±3.78 years and 50 controls with mean age ±SD28.90±3.47 years, p- value = 0.081.

The result showed that 60% of patients at age range between 20-30 years, while 40% of patients at age range between 31-41 years, as in figure (1).

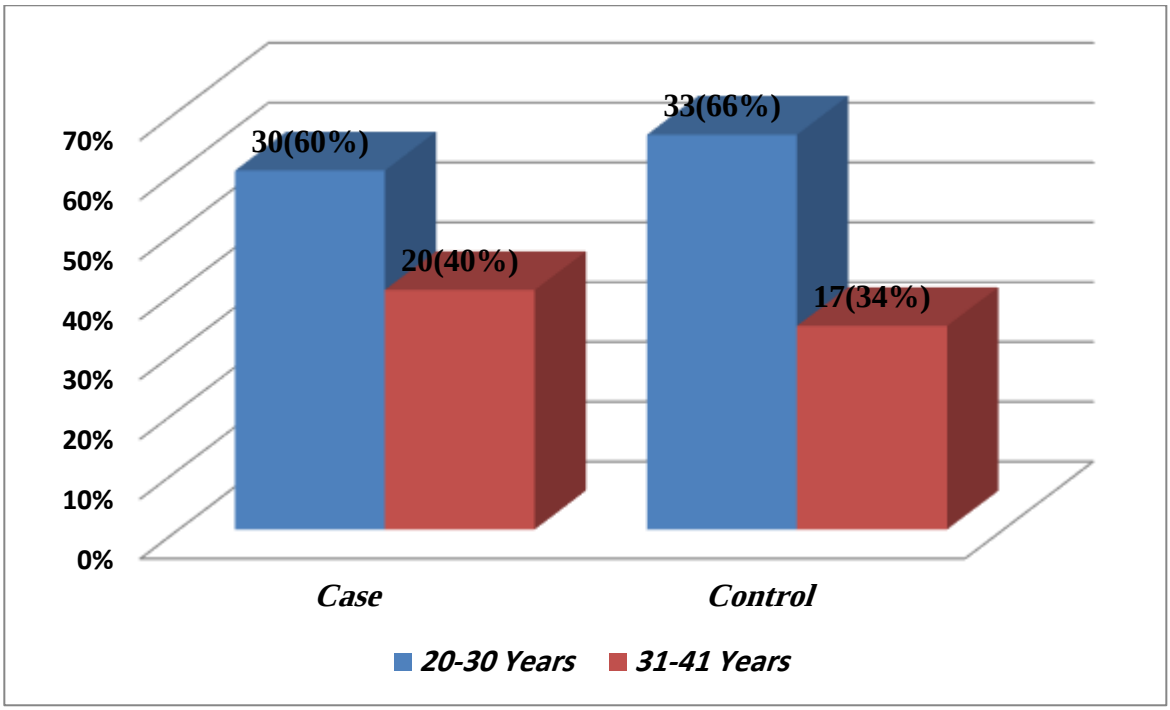

Figure (1) Distribution of age among study groups

The result found 20% of patients over weight, 22% obese , while 58% had normal weight as in figure (2).

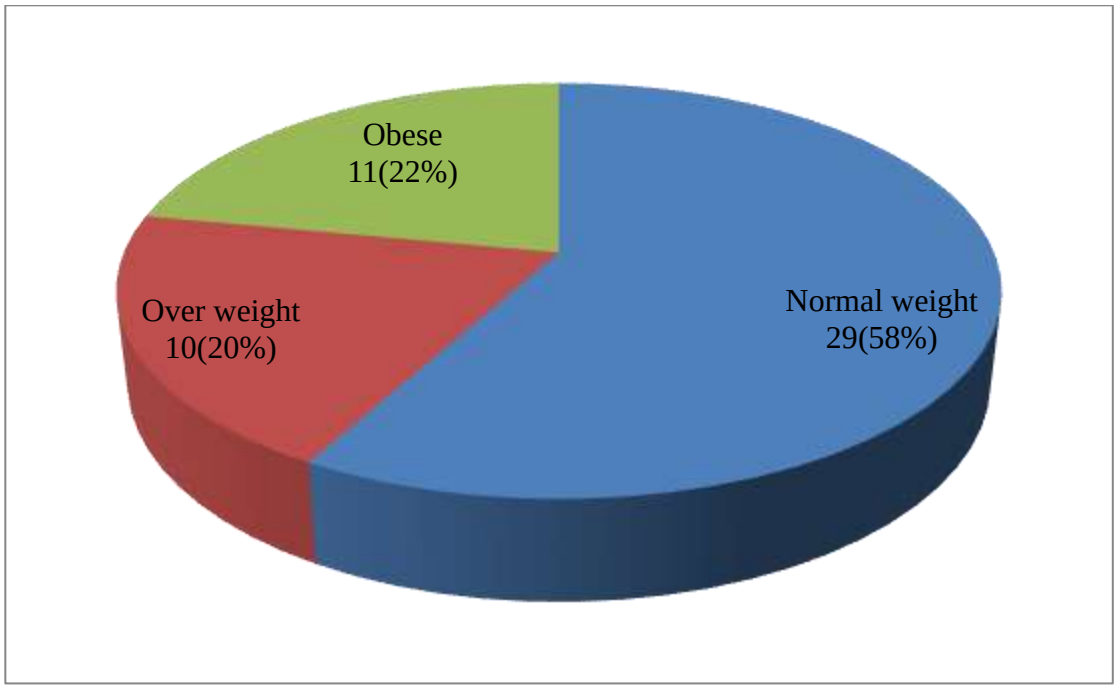

Figure (2): Distribution of BMI among cases

There were significant increase in the mean level of glucose, HbA1c and BMI in polycystic ovary syndrome women compared to control group, (101.2±18.19 versus 86.24±12.05,p- value = 0.000) for glucose, (5.20±0.59 versus 4.80±0.37 , p- value =0.000) for HbA1c, (25.33±4.67 versus 22.09±3.52 , p- value= 0.037) for BMI as in table (1)

Table (1): **Comparison of the levels of RBS, HbA_{1c} and BMI in cases versus controls**

Parameters	Case (Mean±SD)	Control (Mean±SD)	*P-value*
HbA1c	5.20±0.59	4.80±0.37	0.000
RBS	101.2±18.19	86.24±12.05	0.000
BMI	25.33±4.67	22.09±3.52	0.037

There were no correlation between HbA_{1c}, RBS and age in women with polycystic ovary syndrome (r= 0.162, p- value=0. 260) (r=0.190,p- value= 0.187) respectively as in figure (3.4)

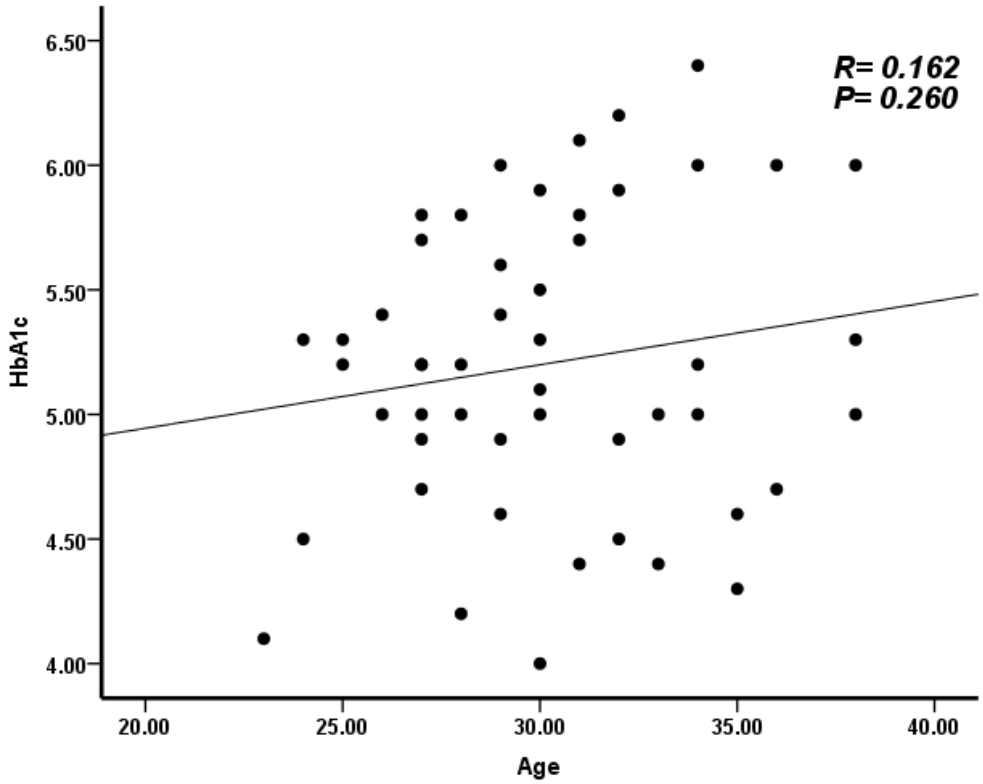

Figure (3): correlation between HbA1c and age (among patients)*p-value less than 0.05 considered as significant*

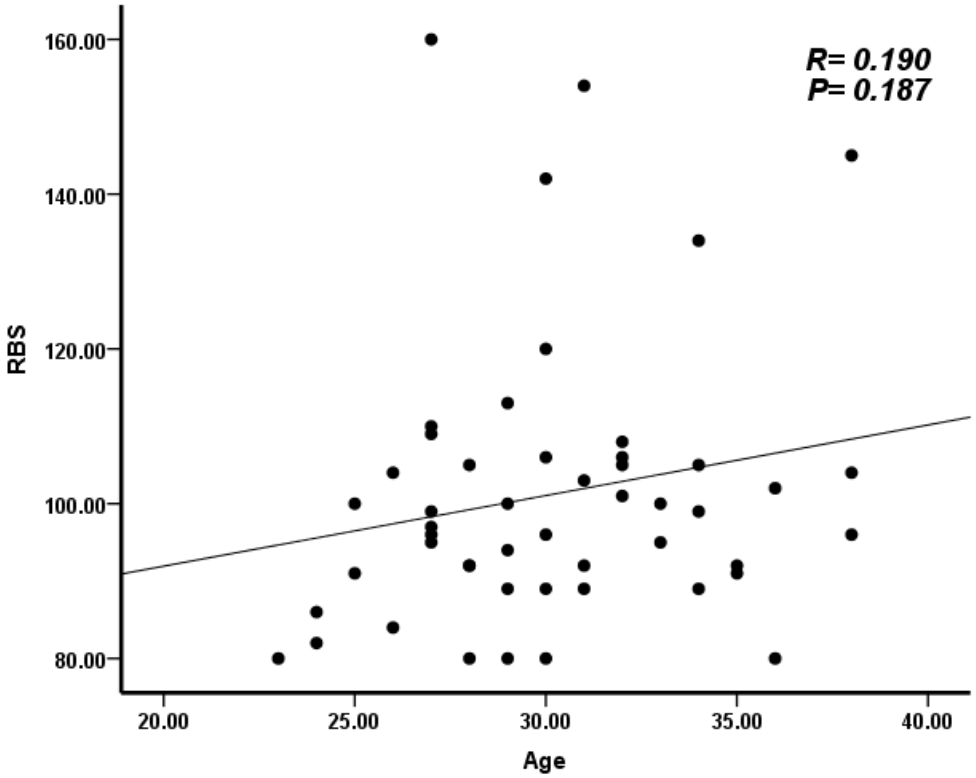

Figure (4): correlation between RBS and age (among patients) *p-value less than 0.05 considered as significant*

There were no correlation between HbA_{1c}, RBS and BMI (r=0.089, p- value = 0.540)(r= 0.041, p-value= 0.777) respectively as in figure (5,6)

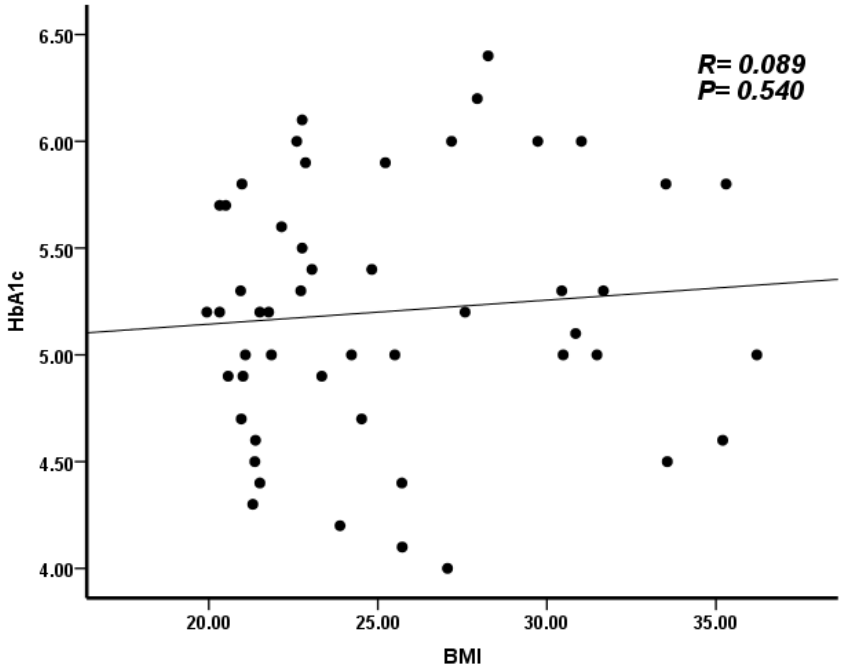

Figure (5): correlation between HbA1c and BMI (among patients) *p-value less than 0.05 considered as significant*

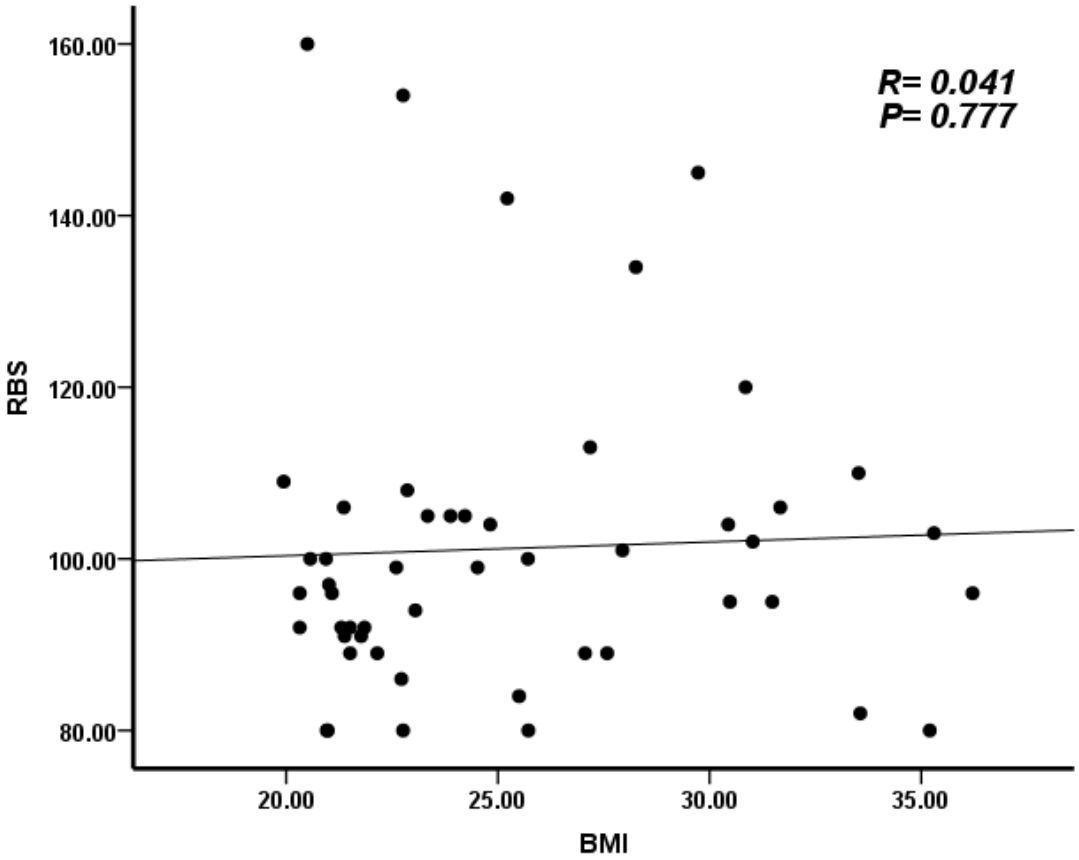

Figure (6): correlation between RBS and BMI (among patients) *p-value less than 0.05 considered as significant*

Discussion: Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders that occurs 4%-7% of women of reproductive age, and be associated with reproductive morbidity and increase risk for endocrine cancer, tybe2 diabetes mellitus, hypertension metabolic and cardiovascular disease. The risk are strongly linked to insulin resistance and are compounded by the common occurrence of obesity [(8)]. In the current study, the levels of RBS and HbA_{1c} showed a significant increase in women with polycystic ovary syndrome compared to healthy women (p-value 0.000). This might have occurred due to insulin resistant and are at an increased risk of development of NIDDM [(9)].This finding was in agreement with another previous studies done by Mortada *etal*., which showed that, 47.8% of women with polycystic ovary syndrome had pre diabetes (HbA_{1c} between 5.7 and 6.4), HbA_{1c} that would correlate with an increased risk for metabolic and cardiovascular disease [(10)].Also another results found that ; (33.3%) were in pre diabetic range (5.7-6.4%), (36.7%) were in diabetic range (≥ 6.5%) .[(11)]

This result found 20% of patients are overweight. This result in agreement with another result which found that, (26.7%) had history of sudden weight gain [(11)]. Also this result similar to another result which found that, the prevalence of obesity in the PCOS population ranges from 38% to 87%, this may be due to accumulation of fat in both subcutaneously and around viscera which in turn leads to obesity, increased BMI. [(12)].

The result of this study showed that, there was no correlation between HbA_{1c} and age in women with polycystic ovary syndrome (r= 0.162, p- value= 260) . This result parallel to another result, which reported, there was no correlation between HbA_{1c} and age [(13)].

This result different from another result in china , which showed that, HbA_{1c} levels gradually rose with increasing age. Therefore, HbA_{1c} levels is associated with age[(14)].Result of this study found , there was no correlation between RBS and age (r=0.190,p-value= 0.187) . This result resemble to another result, which reported; there was no correlation between RBS and age[(15)]. The result of this study found , there was no correlation between RBS and BMI (r=0.041, p-value=0.777). This result different from another result carried out by Randeva *et al* ., reported that, excess triglycerides enter into cells and activate proteins kinase C-ε and C-θ, ultimately reducing the glucose uptake. This leads to compensatory hyperinsulinemia which can stimulate excess fat deposition by hypertrophy and hyperplasia of adipose cells in the excess calorie environment. This is further aggravating IR by increasing obesity as a vicious cycle. This abnormal fat accumulation increases IR causing glucose intolerance and T2DM [(16)].

Result of this study reported that, there was no correlation between HbA1c and BMI (r=0.089,p-value=0.540). This result disagreed with another result , which concluded from their study, among Amazonian PCOS women, that HbA_{1c} was elevated in nearly 40% of PCOS patients and had positive correlation with BMI and metabolic factors [(17)] .

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