PREGNANCY COMPLICATIONS AND OUTCOMES IN WOMEN WITH POLYCYSTIC OVARIAN SYNDROME

Gona Aziz Rahim [a]

Submitted: 27/4/2022; Accepted: 18/7/2022; Published: 21/9/2022

ABSTRACT

Background

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder that has profound implications for women throughout their reproductive years. PCOS is associated with reproductive challenges, including difficulty in conceiving and pregnancy-related complications of miscarriage, hypertensive disorders, gestational diabetes and prematurity, and increased cesarean section(C/S) rate.

Objectives

To determine the pregnancy-related complications and outcomes in women with PCOS and to find the risk of these complications in obese and overweight.

Patients and Methods

Prospective cohort study was conducted in a Maternity teaching hospital and private hospitals and clinics in Sulaymaniyah City Jan. 2018 to Dec. 2021. Involved 313 women with PCOS trying to conceive. PCOS women were diagnosed by having two of the following three criteria, known as Rotterdam criteria (oligo-ovulation or anovulation, clinical or biochemical hyperandrogenism, and polycystic ovaries as seen by ultrasound scan), with the exclusion of other causes of androgen excess and menstrual cycle irregularity or amenorrhoea. They are followed a few months before conception, pregnancy and delivery. Way of conceiving (natural or by induction of ovulation), adverse pregnancy outcomes, and complications like early pregnancy loss, Pregnancy-induced hypertension (PIH), pre-eclampsia (PET), Gestational diabetes mellitus (GDM), preterm delivery, and mode of delivery were recorded. The risk of these complications in obese and overweight compared to normal weight cases was recorded.

Results

This study included 313 women with PCOS, pregnancy complications were PIH (12.1%), PET (2.2%), GDM (10.5%), pre-term delivery (4.5%), Miscarriage (19.5%), ectopic pregnancy (1.9%), biochemical pregnancy (1.6%), intrauterine fetal death(IUFD) 0.3%, the relation of these complications with pregnancy outcomes showed significant results with p-value of 0.04, 0.02, and 0.01 for PIH, PET, and GDM respectively. These complications were more in obese and overweight PCOS pregnant women than in normal-weight PCOS, but these associations were not significant.

Conclusion

Women with PCOS are at increased risk of adverse pregnancy outcomes; pre-pregnancy education, hormonal status regulation, diet and lifestyle changes, and weight loss with better follow-up of these women during pregnancy may decrease these complications. Introducing specific guidelines for pregnant women with PCOS may be beneficial.

Keywords: *PCOS, Pregnancy outcomes, Pregnancy complications, Overweight PCOS, Obese PCOS, Normal wt PCOS.*

[a] Obstetrician and Gynecologist, Maternity Teaching Hospital in Sulaymaniyah City, Kurdistan Region, Iraq.
Correspondence: gonaaziz19@gmail.com

https://doi.org/10.17656/jsmc.10367

INTRODUCTION

Polycystic ovarian syndrome (PCOS) was initially described in 1935 by Stein and Leventhal as a syndrome consisting of amenorrhea, hirsutism, and obesity associated with enlarged polycystic ovaries. It is the most common endocrine disorder to affect women during their reproductive years, with a prevalence of 15-20%, and it runs in families and affects approximately 50% of first-degree relatives. It is a condition that presents with ovarian and metabolic disease. PCOS is a heterogeneous condition, a diagnosis described by (Rotterdam- 2003 and Androgen Excess and PCOS Society-2010 criteria)[1-5].

Symptoms include hyperandrogenism (hirsutism assessed by modified Ferriman-Gallwey tool MFG, acne, alopecia), menstrual disturbance, infertility, obesity, and may be asymptomatic, with polycystic ovaries on ultrasound. Endocrine disturbances seen in women with PCOS include increased fasting insulin (not routinely measured); insulin resistance or impaired glucose tolerance assessed by glucose tolerance test GTT); increased androgens (total and free testosterone, free androgen index), increased androstenedione and dehydroepiandrosterone sulfate (DHEAS). However, the last two tests provide limited information on PCOS diagnosis, increase or normal LH and normal FSH, decrease in sex hormone-binding globulin SHBG (results in elevated free androgen index), and increase in estradiol and estrone (neither measured routinely as an extensive range of value). Possible late sequelae include diabetes mellitus, dyslipidemia, hypertension, cardiovascular disease, endometrial hyperplasia, and carcinoma [1, 2, 5].

Women with PCOS may conceive naturally or, if they have anovulatory infertility, by ovulation induction, which accounts for approximately 80-90 percent of women with anovulatory infertility, which comprises about a third of those attending the infertility clinic. In addition to anovulation, other factors may contribute to subfertility in women with PCOS, including the effect of obesity, metabolic, inflammatory, and endocrine abnormalities on oocyte quality and fetal development. Many studies have compared pregnancy outcomes between women with PCOS and controls. They have found that women with PCOS demonstrated a significantly higher risk of developing gestational diabetes, pregnancy-induced hypertension, pre-eclampsia, adverse neonatal outcomes, and preterm birth. In addition, their babies had a significantly higher risk of admission to a neonatal intensive care unit and higher perinatal mortality, unrelated to multiple births. The potential mechanisms for these problems include obesity, altered glucose metabolism, and disturbance in uterine blood flow, so women who are obese are more likely to experience miscarriage and other pregnancy complications. Therefore, careful pregnancy monitoring is required in PCOS cases [1].

Justification for the study

There is an increasing incidence of PCOS in our community, impacting conception and pregnancy. Therefore, it is aimed to determine the association of pregnancy-related complications and PCOS in women in our community and to compare the risk of these complications in obese, over-weight with normal wt PCOS.

PATIENTS AND METHODS

A prospective cohort study was conducted in a maternity teaching hospital, private hospitals, and private clinics in Sulaymaniyah city/ Kurdistan/Iraq from January 2018 to December 2021 on 313 women with PCOS trying to conceive. PCOS cases were diagnosed by having two of the following three Rotterdam criteria (oligo-ovulation or anovulation, clinical or biochemical hyperandrogenism, and polycystic ovaries as seen by ultrasound with 12 or more follicles measuring 2-9mm through the entire ovary or an ovarian volume of ≥ 10 cm^3) with the exclusion of other causes of androgen excess or menstrual cycle irregularity or amenorrhoea [1,2]. These women were followed a few months before conception, throughout pregnancy to delivery, standard anthropometry (weight, height, and BMI according to WHO criteria [6], blood pressure measurement, and a transvaginal ultrasound scan of the uterus and ovaries (including antral follicle count) were performed by experienced ultrasonologists. The hormonal profile was measured and analyzed as described elsewhere, and random blood sugar measurements were done. The women were enrolled at the pre-pregnancy visit and given folic acid tablets like any woman without PCOS. Those not conceived naturally were given infertility treatment, including metformin tablets and ovulation induction.

In this study, women enrolled received antenatal care during their pregnancy, follow-up of maternal weight, blood pressure, random blood sugar, hemoglobin concentration, general urine examination, and an oral

glucose tolerance test (OGTT) according to WHO was performed at 24 to 26 weeks of gestation to exclude GDM [7]. In addition, ultrasound examination assessed Gestational age with crown-rump length measurement at the end of the first trimester, fetal growth assessment done by abdominal examination, and sometimes by ultrasound scan. Exclusion criteria include the women's refusal to be enrolled in the study, missed follow-up cases, smoking, multiple gestations, pre-gestational DM, chronic hypertension, thyroid disease, and other chronic diseases like rheumatic diseases and renal failure.

The development of pregnancy-related complications, like early pregnancy loss, PIH, PET, GDM, preterm birth, and IUFD, and their relation to obesity was also recorded. Other pregnancy outcomes related to the above complications and obesity were observed. Mode of delivery in term and preterm cases and its relation to the above difficulties and obesity were also recorded. The connection of the above parameters to the way of conceiving (natural or by treatment) was also recorded.

After data collection and before data entry and analysis, the study questions were coded. Data entry was performed using an excel spreadsheet then the statistical analysis was performed by the SPSS program, version 24.0 (IBM SPSS Statistical Package for the Social Sciences). The data presented in tabular forms show the frequency and relative frequency distribution of different variables among the other groups. Chi-square tests were used to compare the categorical data between these groups.

Different types of Bar charts were used to describe some study variables diagrammatically. P values of 0.05 were used as a cut-off point for the significance of statistical tests.

The manager approved the proposal to study at the Maternity Teaching Hospital in Sulaymaniyah. However, informed consent was taken from the women involved in the study, and all information related to the participants was kept confidential.

RESULTS

Three hundred thirteen women with PCOS followed a few months before conception, during, and after pregnancy. Table no.1 shows the characteristic of study participants; most age distributions were 25-34 years, about 63.9%. Most study participants (87.2%) were housewives compared to 12.5% employees and 0.3% students. More than one third (36.7%) were primi-gravida, 53.7% multi-gravida and 9.6% gravida 5 and more. About 45% were nulliparous, 33.2% were part one, and 22% were part two and more.

Nearly three quadrants (74.1%) had no miscarriage, 20.5% had one-two miscarriages, and 5.4% had a recurrent miscarriage. Regarding BMI, only 11.8% had normal BMI (less than 25), 44.4% were overweight (25-29.9), and 43.8% were obese (30-and more); these indicate that PCOS women are mostly obese and overweight in this community. About 70.0% of women were conceived by treatment, and the rest conceived. Naturally, this result means that the rate of infertility is very high in PCOS women in our community.

Table 2 shows the impact of pregnancy on study participants in PCOS cases; 12.1% had PIH, 2.2% had PET, and 11.8% had GDM. About pregnancy outcomes, 72. 2% delivered at term or post-term, 4.5% delivered at preterm, 19.5% miscarried, 1.9% had an ectopic pregnancy, 1.6% had biochemical pregnancy, and one case (0.3%) had IUFD, which was macerated stillbirth, these results show that although term pregnancies are more in PCOS cases, the rate of miscarriage is high. The mode of delivery in term and preterm cases (241 patients) was NVD (spontaneous and induction of labor) in 29% and C/S (elective and emergency) in 71%.

Table 3 show the participant characteristic and pregnancy outcomes. Although the effect of nutritional status on pregnancy outcome is insignificant, with a p-value of 0.24, the rate of miscarriage, biochemical ectopic pregnancy, and preterm labor was higher in obese and overweight cases. There was no significant effect of parity on pregnancy outcome with a p-value of 0.83, but the miscarriage and preterm deliveries were more in nulliparous cases. The age of the women had no significant effect on pregnancy outcome with a p-value of 0.18, although miscarriage was more in the 35-44 age group (28.6%).

PIH and PET significantly affected pregnancy outcomes in PCOS cases with a p-value of 0.046 and 0.02, respectively. GDM also significantly affected pregnancy outcomes with a p-value of 0.01. These are also shown in Figures 1 and 2.

The way of conceiving (natural or by treatment) does not affect pregnancy outcomes significantly, with a p-value of 0.94.

Table 4 shows the relation of the BMI of study

participants with pregnancy outcomes and complications, 5 cases (13.5%) of average weight, 15 cases (10.8%) of overweight, and 18 cases (13.1%) of obese PCOS had PIH with a p-value of 0.81 which is not significant.

Four cases (2.9%) of overweight, three patients (2.2%) of obese PCOS had PET, and no case of PET was reported in normal weight cases with a p-value of 0.57, which is not significant. 2 cases (5.4%) of normal weight, 16 patients (11.5%) of overweight, and 19 cases (13.9%) of obese PCOS had GDM with a p-value of 0.36. Although insignificant, PIH, PET, and GDM were more in obese and overweight PCOS cases. The effect of nutritional status on pregnancy outcomes was also not significant, with a p-value of 0.51. However, miscarriage was more common in obese and overweight PCOS cases (19.9%, 21.7%).

Table 5 shows that cases conceived by treatment had more pregnancy complications than cases conceived naturally. However, the effect was insignificant as the p-value of all complications (PIH and PE, GDM, Miscarriage) were (p-value=0.06, 0.25, 0.73), respectively. C/S was more in cases conceived by treatment than those created naturally, but it is insignificant (p-value= 0.10), as shown in Figure 3.

Table 1. The characteristics of study participants.

		Frequency	%
Age (Years)	Mean ± SD	28.1 ± 5.2	
	16 - 24	78	24.9
	25 - 34	200	63.9
	35 - 44	35	11.2
Occupation	Employee	39	12.5
	Housewife	273	87.2
	Students	1	0.3
Gravida	Primi-gravida	115	36.7
	Gravida 2 – 4	168	53.7
	gravida five and more	30	9.6
Para	Nulli-parus	140	44.7
	Para one	104	33.2
	Para two and more	69	22.0
Miscarriage	None	232	74.1
	One – Two miscarriage	64	20.5
	Recurrent miscarriages	35	5.4
BMI	Mean ± SD	29.50 ± 4.17	
	Normal < 25	37	11.8
	Overweight (25 - 29.9)	139	44.4
	Obese (30 - 39.99)	137	43.8
Conceive by treatment	Yes	220	70.3
	No	93	29.7
Total		313	100

Table 2. The impact of pregnancy on study participants.

		Frequency	%
Pregnancy-induced Hypertension	Yes	38	12.1
	No	275	87.9
Pre-eclampsia	Yes	7	2.2%
	No	306	97.8
Gestational Diabetes Mellitus	Yes	37	11.8
	No	276	88.2
Mode of delivery	NVD	70	29.0
	C/S	171	71.0
Pregnancy outcome	Ectopic	6	1.9%
	Delivery at term	226	72.2
	Preterm	14	4.5%
	Miscarriage	61	19.5
	Biochemical pregnancy	5	1.6%
	IUFD	1	0.3%
Total		**311**	**100**

Table 3. The characteristics status of study participants and pregnancy outcomes.

		Fate of pregnancy					
		Ectopic or biochemical pregnancy	**Delivery at term (or post-term)**	**Preterm**	**Miscarriage (or IUFD)**	**Total**	**P value**
Nutritional status	Normal	0 (0%)	32 (86.5%)	1 (2.7%)	4 (10.8%)	37 (100%)	0.24
	Overweight	4 (2.9%)	101 (72.7%)	4 (2.9%)	30 (21.6%)	139 (100%)	
	Obese	7 (5.1%)	93 (67.9%)	9 (6.6%)	28 (20.4%)	137 (100%	
Parity	Nulliparous	4 (2.9%)	98 (70.0%)	8 (5.7%)	30 (21.4%)	140 (100%)	0.83
	Para one	3 (2.9%)	78 (75.0%)	4 (3.8%)	19 (18.3%)	104 (100%)	
	Para two and more	4 (5.8%)	50 (72.5%)	2 (2.9%)	13 (18.8%)	69 (100%)	
Age	16 - 24 Years	4 (5.1%)	60 (76.9%)	0 (0%)	14 (17.9%)	78 (100%)	0.18
	25 - 34 Years	5 (2.5%)	145 (72.5%)	12 (6.0%)	38 (19.0%)	200 (100%)	
	35 - 44 Years	2 (5.7%)	21 (60.0%)	2 (5.7%)	10 (28.6%)	35 (100%)	
PIH	Yes	0 (0%)	34 (89.4%)	2 (5.3%)	2 (5.3%)	38 (100%)	0.046
	No	11 (4%)	192 (69.8%)	12 (4.4%)	60 (21.8%)	275 (100%)	
PET	Yes	0 (0%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	7(100%)	0.02
	No	11 (3.6%)	222 (72.5%)	12 (3.9%)	61 (19.9%)	306 (100%)	
GDM	Yes	0 (0%)	32 (86.5%)	4 (10.8%)	1 (2.7%)	37 (100%)	0.01
	No	11 (4.0%)	194 (70.3%)	10 (3.6%)	61 (22.1%)	276 (100%)	
Conceive by treatment	Yes	7 (3.2%)	158 (71.8%)	10 (4.5%)	45 (20.5%)	220 (100%)	0.94
	No	4 (4.3%)	68 (73.1%)	4 (4.3%)	17 (18.3%)	93 (100%)	
Total		**11 (3.5%)**	**226 (72.2%)**	**14 (4.5%)**	**62 (19.8%)**	**313 (100%)**	

Table 4. BMI of study participants during pregnancy concerning pregnancy outcomes and complications

		Nutritional status			Total	P value
		Normal	Overweight	Obese		
Pregnancy induced HT	Yes	5 (13.5%)	15 (10.8%)	18 (13.1%)	38 (12.1%)	0.81
	No	32 (86.5%)	124 (89.2%)	119 (86.9%)	275 (87.9%)	
PET	Yes	0 (0%)	4 (2.9%)	3 (2.2%)	7 (2.2%)	0.57
	No	37 (100%)	135 (97.1%)	134 (97.8%)	306 (97.8%)	
Gestational Diabetes Mellitus	Yes	2 (5.4%)	16 (11.5%)	19 (13.9%)	37 (11.8%)	0.36
	No	35 (94.6%)	123 (88.5%)	118 (86.1%)	276 (88.2%)	
Fate of pregnancy	Post term	0 (0%)	2 (1.4%)	1 (0.7%)	3 (1.0%)	0.41
	Delivery at term	32 (86.5%)	99 (71.2%)	92 (67.2%)	223 (71.2%)	
	Preterm	1 (2.7%)	4 (2.9%)	9 (6.6%)	14 (4.5%)	
	Miscarriage	4 (10.8%)	30 (21.6%)	27 (19.7%)	61 (19.5%)	
	Other	0 (0.0%)	4 (2.9%)	8 (5.8%)	12 (3.8%)	
Total		**37 (100%)**	**139 (100%)**	**137 (100%)**	**313 (100%)**	

Table 5. The relation of conception by treatment with pregnancy complications and outcomes

		Conceive by treatment		Total	P value
		Yes	No		
PIH and PET	Yes	37 (16.8%)	8 (8.6%)	45 (14.4%)	0.06
	No	183 (83.2%)	85 (91.4%)	268 (85.6%)	
Gestational DM	Yes	29 (13.2%)	8 (8.6%)	37 (11.8%)	0.25
	No	191 (86.8%)	85 (91.4%)	276 (88.2%)	
Miscarriage	Yes	44 (20.0%)	17 (18.3%)	61 (19.5%)	0.73
	No	176 (80.0%)	76 (81.7%)	252 (80.5%)	
Mode of delivery	NVD	43 (19.5%)	26 (28.0%)	69 (22.0%)	0.25
	CS	124 (56.4%)	46 (49.5%)	170 (54.3%)	
	Not completed pregnancy	53 (24.1%)	21 (22.6%)	74 (23.6%)	
Total		**220 (100%)**	**93 (100%)**	**313 (100%)**	

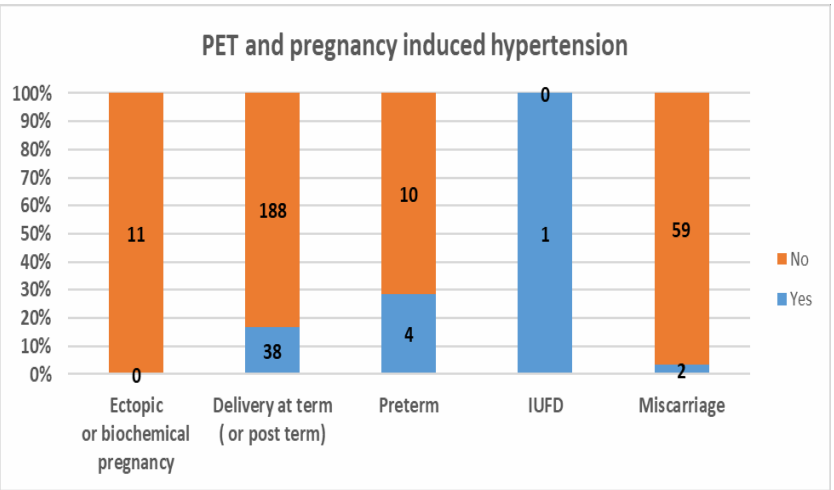

Figure 1. Relation of pregnancy-induced hypertension and pre-eclampsia with pregnancy outcomes.

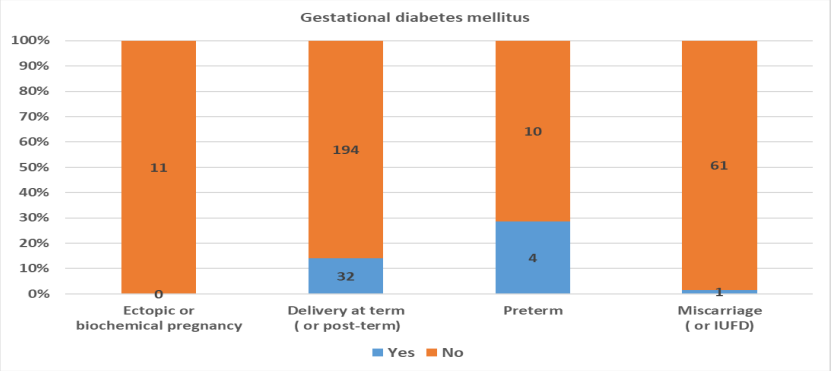

Figure 2. Relation of gestational diabetes mellitus and pregnancy outcomes.

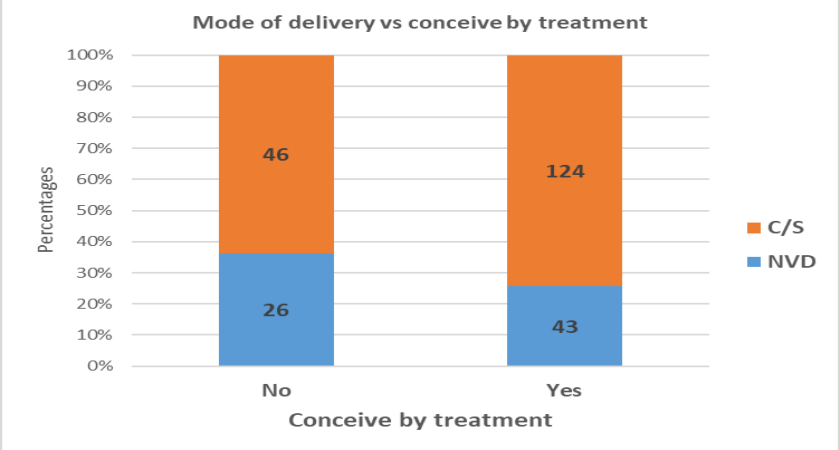

Figure 3. Mode of delivery concerning conception by treatment.

DISCUSSION

This study is one of many studies done on different populations and ethnicity to assess the relationship between maternal PCOS and adverse pregnancy outcomes and the impact of obesity on these outcomes. As PCOS continues to become increasingly recognized in the clinical setting, with more women with PCOS achieving a successful pregnancy, this population needs to understand pregnancy outcomes. Because many women with PCOS have a hormonal imbalance and insulin resistance and are overweight and obese, the joyous time of pregnancy can pose an additional concern to these women as they are at high risk of early pregnancy complications like miscarriage, complications such as GDM, PIH, and pre-eclampsia, preterm labor, higher C/S rate.

This observational study assesses the possible correlation between PCOS and the risk of adverse pregnancy outcomes.

Most of the women were in 25-34 years age distribution with a mean ± SD of (28.1 ± 5.2), which is going with a study done by Scheider D et al. and wang Y et al., which found the average age of (31.2 ±4.4), (30.8± 3.9) in PCOS women respectively [8,14], a systematic review done by Yu HF et al. shows the average age of under 33 years [17], Mann A et al. showed mean age of 26.8 years [30]. Pregnancy at an advanced age (>35) in PCOS cases was11.2%, which is not comparable with the study by Roos N et al. that reported 19.9% for this age group in the Swedish population [9]. This difference may be because of their culture concerning childbirth at an advanced age.

Most women in this study were grvida 2-4 (53.7%), with 36.7% being primigravida; it is compared to a study done by Wang Y et al., who recorded average gravidity of 2.0±1.1[14]. Women with PCOS in this study are primarily nulliparous (44.7%), with 33.2% para one, and 22.0% were part two and more; this agrees with studies done by Scheider D et al., Roos N et al., De Wilde M A et al. as nulliparity is also high in these studies, they report nulliparity in 63.8%,53.0%, 74% respectively in PCOS women [8, 9, 12]. Most cases in this study were overweight and obese (44.4% and 42.5%, respectively), and 1.3% were morbidly obese with a mean ± SD of 29.50 ± 4.17. This is going with studies done by Scheider D et al., Roos N et al., Qin J Z et al., and Mann A et al. they report obesity in 39.6%, 60.6%, 60-80%, and 77%, respectively [8,9,27,30], studies done by Mills G et al., Hart R and Doherty D A., show a contrary result for obesity in PCOS women (22.3, 16%) respectively [11,22]. De Wilde M A et al., Wang Y et al., and Yu HF et al. recorded average BMI of 24.6kg/m2, 23±2.6, and less than 29 kg/m2, respectively [12,14,17]. Palomba S et al. also recorded an increased rate of obesity in PCOS women [15].

70.3% of women with PCOS receive fertility treatment for successful conception, while in the study done by Scheider et al., 54% of cases received that treatment [8]. On the other hand, a study done by Mann et al. recorded a history of primary infertility in 88% [30]. These differences may be because the range of symptoms and impact of PCOS on the patients are wide.

The rate of PIH and PET were was12.1% and 2.2% in this study, respectively; they are near to studies done by Schneider D et al., Wang T et al., Bjercke S et al., and Mann A et al. who reported 10.8%, 13.94%, 11.5%, 17.8% for a hypertensive disorder of pregnancy respectively [8,16,18,30]. At the same time, a study by Kashyap S and Claman P shows a 31.8% risk of PIH in PCOS cases [20]. A study by Nielsen J H et al. showed similar results for PIH in pregnant PCO and non-PCO women (8.5%, 8.9%), respectively [19]. In a study done by Radon P A et al., 22.7% of PCOS pregnant women developed PET [13], which may relate to the small sample size in their study. In studies done by Schneider D et al. and Ghazeeri GS et al., 5.8% and 10-30% were PIH, respectively, and 4.9% and 8-15% were PET, respectively (8,10).

These differences may also be because of a wide range of symptoms and impact among PCOS patients and the convenient sampling technique. While our finding near a meta-analysis done by Palomba S et al. shows 12.7% and 8 % for PIH and PET, respectively [15], in a study done by Christ et al., 5% had PET [21].

The rate of GDM was 11.8% in PCOS pregnant women. It is lack prevalent in comparison to studies done by Ghazeeri GS et al., Randon P A et al., Wang T et al., Villarroel A-C et al., which show 5-40%, 41%, 14.7%, 20.26%, 35.2% for GDM in pregnant PCOS respectively [10,13,16,31]. In contrast, studies done by Palomba S et al., Bjercke S. et al., Mann A et al. show 14.7%, 7.7%, 13% for GDM [15,18,30]. Roos N et al. said that GDM is more than double in pregnant PCOS than in non-PCOS women [9]. A large percentage in Radon's study may

relate to the small sample size in his research.

The miscarriage rate during this prospective study was 19.5%, which goes with the study done by Palomba S. et al., who recorded 20% for pregnant PCOS women [15], in studies done by Wang Y et al., Jakubowicz D J et al. miscarriage in PCOS pregnant women was 34%, 30-50% respectively [14,32]. These differences may be because of other factors of miscarriage, as in our society, the proportion of working mothers may be less than those in these two mentioned studies. A study by Hart R and Doherty D A demonstrates a miscarriage rate of 11.1% in PCOS women [22]. A study by Muharram R et al. shows 9.72% of Miscarriages in PCOS women undergoing IVF [29]. Our finding difference may be because of sample size or sampling techniques. A study done by Mann et al. shows 2.2% of miscarriages in PCOS women, which is a conflicting result and does not agree with our study [30]. The rate of ectopic pregnancy in this study is 1.9%, near the study by Muharram R et al., who show 1.39% of ectopic pregnancy in PCOS women undergoing IVF [29].

Preterm delivery was 4.5% in this study, which is near to the study done by Ghazeeri GS et al., who recorded 6-15% for preterm birth [10]; it does not agree with studies done by Wang T et al., Christ J P et al., Doherty D A et al., Mann A et al. who demonstrate 13.35%,11%, 15.5%, 10.4% for preterm birth respectively [16,21,23,30]. In addition, Muharram R et al. show 2.78% preterm birth in PCOS women undergoing IVF [29].

C/S rate of 71% seen in this study which is a very high percentage which is near to the study done by Wang T et al.(16), who demonstrate 64.1%, but disagrees with the study done by Bjercke S et al., Mann A et al. who show 40.3%, 30.4% for C/S in PCOS women respectively [18,30].

The large percentage of C/S in our study may relate to the small sample size, higher number of infertilities in the study cases who conceive by the treatment, which lead to more anxiety about the baby by the women and requesting C/S, and a trend toward C/S by the most obstetrician in our community, also increased rate of C/S on request in this community.

Studies were done by Mills G et al., Liu Q et al., Boomsma C M et al., Katulski K et al., Qin J Z et al., Kjerulff L E et al., Jakubowicz DH et al., D'Alterio M N et al., Tolstrup J et al., and Joham AC et al., Tanvir KM et al. show results near to this study, all recorded increase risk of hypertensive disease of pregnancy, GDM, preterm labor, increase the rate of C/S, and some of them recorded increased rate of early pregnancy loss [11,24-28,32-36].

In our study, obesity in PCOS women increased the rate of early pregnancy loss, hypertension of pregnancy, gestational DM, and increased C/S rate. However, it was not significant. Also, studies done by Ghazeeri GS et al., Liu Q et al., Dahan M H et al., Homburg R et al., and Linne Y showed an increased risk of this complication in obese PCOS [10,24,37-39].

In conclusion, women with PCOS are at increased risk of adverse pregnancy outcomes; these complications are more among PCOS who are obese; this information is vital in clinical practice for the management of pregnancy in women with PCOS; however, it's essential to keep in mind that most women with PCOS have uneventful pregnancies.

These women should be given notice of the additional risks their pregnancies have. Stronger surveillance and attention should be provided and screening for these complications during pregnancy and parturition. Also, it is necessary to establish guidelines for supervision during pregnancy and parturition to prevent these complications.

However, to manage pregnancy more effectively in a woman with PCOS, hormonal status regulation, diet and lifestyle changes, and weight loss before pregnancy should be implemented.To reduce pregnancy complications, more studies should be addressed to study the management of polycystic women before and during pregnancy.

REFERENCES

1. Adom H Balen. Polycystic ovary syndrome. In: Luesley DM, Kilby MD, Obstetrics & Gynaecology, An Evidence-based Text for the MRCOG. 3rd ed. Taylor & Francis Group. Publishing; UK London, 2016.P. 654-61.

2. Adom Balen. Polycystic ovary syndrome and secondary amenorrhoea. In: Edmonds K, Lees C, Bourne T,. Dewhurst's Textbook of Obstetrics and Gynaecology. 9th ed. John Wiley & Sons Ltd. Publishing; UK oxford 2018.P.632-52.

3. Lobo RA. Polycystic ovary syndrome. In: Lobo RA, Gershenson DM, Lentz GM, Valea FA, Philadelphia. Comprehensive Gynecology. 7th ed. Elsevier, Inc. Publishing; 2017.P. 881-96.

4. Carson SA.Amenorrhea and abnormal uterine bleeding. In: Ling FW, Snyder RR, Carson SA, Fowler WC, Philadelphia. Step-Up to obstetrics and gynecology. 1st ed. Wolters Kluwer Health Publishing; 2015.P. 303-18.

5. Monash Centre for health research and implementation (MCHRI). International evidence-based guideline for the assessment and management of polycystic ovary syndrome. Australia, Melbourne. Monash University. Budget strategy and outlook 2018. Budget paper no. 38-43,2018. [Internet] Monash: MCHRI; 2018. Available from: monash.edu/medicine/sph pm/mchri/PCOS.

6. World Health Organization. Geneva. Obesity and overweight. Budget strategy and outlook 2021. Budget paper no. 1,2021. [Internet] Genova: WHO; 2021. Available from https://www.who.int.

7. World Health Organization. Geneva. Diagnostic criteria and classification of hyperglycemia are first detected in pregnancy. Budget strategy and outlook 2013. Budget paper no. 5,2013. [Internet] Genova: WHO; 2013. Available from https://www.who.int.

8. Schneider D, Gonzalez JR, Yamamoto M, Yang J, Lo J C. The Association of Polycystic Ovary Syndrome and Gestational Hypertensive Disorders in a Diverse Community-Based Cohort. Journal of Pregnancy. 2019.

9. Roos N, Sahlin L, Ordeberg G E, Falconer H, Kieler H, Stephansson O. Risk of adverse pregnancy outcomes in women with polycystic ovary syndrome: population-based cohort study. BJ journal. 2011; 343: d6309.

10. Ghazeeri G S, Nassar AH, Younes Z, Awwad J T. Pregnancy outcomes and the effect of metformin treatment in women with polycystic ovary syndrome: an overview. Acta Obstet Gynecol Scand. 2012; 91(6): 658-78.

11. Mills G, Badeghiesh A, Suarthana E, Baghlaf H, Dahan M H. Polycystic ovary syndrome as an independent risk factor for gestational diabetes and hypertensive disorders of pregnancy: A population-based study of 9.1 million pregnancies. EMJ. 2020; 6(1):29-32.

12. De Wilde M A, Ruiter M L, Veltman-Verhulst S M, Kwee A, Laven J S, Lambalk C B, et al. Increased complications in singleton pregnancies of women previously diagnosed with polycystic ovary syndrome predominantly in the hyperandrogenic phenotype. Fertility and sterility J. 2017;108(2):0015-0282.

13. Radon P A, McMahon M J, Meyer W R. Impaired glucose tolerance in pregnant women with polycystic ovary syndrome. Obstet Gynecol. 1999; 94(2):194-7.

14. Wang Y, Zhao X, Zhao H, Ding H, Tan J, Chen J, et al. Risks for gestational diabetes and pregnancy-induced hypertension are increased in polycystic ovary syndrome. Biomed Res Int. 2013;2013:182582.

15. Palomba S, Wilde M. A, Falbo A, Koster M P H, La Sala G B, Fauser B C J M. Pregnancy complication in women with polycystic ovary syndrome. Human Reproductive Update. 2015;21(5):575-92.

16. Wang T, Fu H, Chen L, Xu Y. Pregnancy complication among women with polycystic ovary syndrome in china: a meta-analysis. J of the south-central university. Medical science. 2017;42(11): 1300-10.

17. Yu HF, Chen H, Gong J, Roa D P. Association between polycystic ovary syndrome and the risk of pregnancy complication: Systematic review and meta-analysis. Medicine(Baltimore). 2016; 95(51): e 4863.

18. Bjercke S, Dale P O, Tanbo T, Storeng R, Ertzeid G, Abyholm T. Impact of insulin resistance on pregnancy complication and outcome in women with polycystic ovary syndrome. Gynecol. Obstet. Invest. 2002; 54(2): 94-8.

19. Nielsen J H, Birukov A, Jensen R C, Kyhl H B, Jorgensen J S, Anderson M S, et al., Blood pressure and hypertension during pregnancy in women with polycystic ovary syndrome: Odense child cohort. Obstetrics & Gynecology. 2020; 99(10):1354-63.

20. Kashyap S, Claman P. Polycystic ovary disease and the risk of pregnancy-induced hypertension. J Repr. Med..2000;45(12):991-4.

21. Christ J P, Gunning M N, Meun C, Eijkemans M J, Rijn V, Gouke J, et al.Pre-conception characteristics predict obstetrical and neonatal outcomes in polycystic women ovary syndrome. J. Clin. Endocrinol& Metab. 2019;104(3);809-18.

22. Hart R, Doherty D A. Using data linkage, the potential implications of a PCOS diagnosis on a woman's long-term health. J. Clin. Endocrinol. Metab. 2015;100(3);911-19.

23. Doherty D A, Newnham J P, Bower C, Hart R. Implication of polycystic ovary syndrome for pregnancy and offspring health. Obs. Gynecol. 2015;125(6):1397-1406.

24. Liu Q, Wang J, Xu Q, Kong L, Wang J. A retrospective cohort study of obstetric complications and birth outcome in women with the polycystic ovarian syndrome. J. Obstet. & Gynecol.2022;42(4): 574-79.

25. Boomsma CM, Eijkemans M J, Hughes EG, Visser G H A, Fauser B C J M, Macklon N S. A meta-analysis of pregnancy outcome in women with polycystic ovary syndrome. Hum. Reprod. Update. 2006;12(6):673-83.

26. Katulski K, Czyzyk A, Podfigurna-Stopa A, Genazzani AR, Meczekalski B. Pregnancy complications in polycystic ovary syndrome patients. Gynecol. Endocrinol.2015;31(2):87-91.

27. Qin J Z, Pang L H, Chen H Y. Obstetric complication in women with polycystic ovary syndrome: a systematic review and meta-analysis. Reprod. Biol. & Endocrinol. 2013;11(56):doi:10.1186/1477-7827-11-56.

28. Kjerulff L E, Sanchez-Ramos L, Duffy D. Pregnancy outcomes in women with polycystic ovary syndrome: a meta-analysis. Am J Obstet Gynecol. 2011;204(6):558. e1-6.

29. Muharram R, Danang P Y, Maidarti M, Harzif A K, Pratama G, Wiweko B, et al. Relationship between obstetric complications in women undergoing IVF with PCOS: A Retrospective cohort study. Research Square. 2020;https://doi.org/10.21203/rs.3.rs-49457/v1.

30. Mann A, Sagili H, Subbaiah M. Pregnancy outcome in women with polycystic ovary syndrome. J Obstet Gynecol India. 2020;70(5):360-65.

31. Villarroel A C, Echiburu B, Riesco V, Maliqueo M, Carcamo M, Hirschfeld C, et al. Polycystic ovary syndrome and pregnancy: clinical experience. Rev Med Chil.2007;135(12):1530-8.

32. Jakubowicz D J, Iuorno M J, Jakubowicz S, Roberts K A, Nestler J E. Effect of metformin on early pregnancy loss in the polycystic ovary syndrome. JCEM.2002;87(2):524-9.

33. D'Alterio M N, Sigilli M, Succu A G, Ghisu V, Lagana A S, Sorrentino F, et al. Pregnancy outcome in women with polycystic ovarian syndrome(PCOS). Minerva Obstet Gynecol. 2022;74(1):45-59.

34. Tolstrup J, Jonsdottir F, Ring C M, Andersen M, Ehlers J, Hedengran K, et al. Complication in pregnant women with polycystic ovary syndrome. Ugeskrift for Laeger. 2016;178(12);V05150439.

35. Joham A E, Palomba S, Hart R. Polycystic ovary syndrome, obesity, and pregnancy. Semin Reprod. Med. 2016;34(2):93-101.

36. Tanvir KM, Rahman M L. Pregnancy complications in women with PCOS: A Meta-analysis. Dhaka University Journal of science. 2021;69(2):82-7.

37. Dahan M H, Badeghiesh A, Mills G, Baghlaf H. The effect of obesity on pregnancy complication risks in women with polycystic ovary syndrome. Fertility and Sterility. 2021;116(3);53.

38. Homburg R. Pregnancy complications in PCOS. Best Pract Res Clin Endocrinol Metab.2006;20(2);281-92.

39. Linne Y. Effect of obesity on women's reproduction and complications during pregnancy. Obes Rev. 2004;5(3):137-43.