



# Pregnancy Outcome in Women with Polycystic Ovary Syndrome

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## Abstract

**Background/Purpose** Pregnant women with polycystic ovary syndrome seem to be prone for adverse maternal and perinatal outcomes, but there is no conclusive evidence. Indian data evaluating the pregnancy outcome in women with polycystic ovary syndrome are sparse. This study was proposed to evaluate the pregnancy outcome in women with polycystic ovary syndrome.

**Methods** This descriptive study on 135 pregnant women with polycystic ovary syndrome was carried out in a tertiary care hospital in South India from January 2016 to October 2017. Data regarding present pregnancy, polycystic ovary syndrome and maternal/ perinatal outcomes were analysed using SPSS version 20. Categorical variables studied were parity, various maternal and perinatal outcomes.

**Results** The mean age was 26.8 years, 77% had high BMI, and 88% had history of primary infertility. The mean age was 26.8 years, 77% had high BMI, and 88% had history of primary infertility. The proportion of hypertensive disorders of pregnancy was (17.8%), PROM (18.5%), low APGAR score at 5 min (13%), gestational diabetes (13%), miscarriage (2.2%), preterm delivery (10.4%), caesarean delivery (30.4%), low birth weight babies (2%), macrosomia (0.7%), PPRM (8%), perinatal mortality (2%) and NICU admission (20%).

**Conclusion** The proportion of hypertensive disorders of pregnancy, PROM, low birth weight babies, low APGAR score at 5 min was found to be higher, but the proportion of GDM, miscarriage, preterm delivery, meconium stained liquor, caesarean delivery, small for gestational age/IUGR, macrosomia, PPRM, perinatal mortality, NICU admission and congenital anomalies was found to be either similar or lower in pregnant women with PCOS in our study to those described in the general pregnant population.

**Keywords** PCOS · Pregnancy outcome · Maternal outcome · Perinatal outcome

## Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age. It is estimated that 6 to 15% of women suffer from this disease [1],

diagnosed by any two of the following three criteria: menstrual irregularity with oligo-anovulation, hyperandrogenism and polycystic ovarian features on ultrasound [2]. Pregnant women with PCOS seem to be prone for adverse maternal and perinatal outcomes [1, 3–13]. Adverse maternal outcomes include high chance of miscarriage, increased risk of gestational diabetes mellitus, high risk of development of hypertensive disorders of pregnancy and appear to be more prone for preterm delivery and operative delivery.

Perinatal risks described in the literature are small for gestational age babies, macrosomia, meconium aspiration syndrome, low APGAR score at 5 min, NICU admission and perinatal mortality. One study has shown that the PCOS pregnant women have a high chance of developing congenital anomalies [4] although this has not been shown in other studies. But some studies have also shown either no difference or lower incidence of specific outcomes when compared to women without PCOS [3–13]. Thus, there is no

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conclusive evidence regarding the outcome of these pregnancies. Indian data evaluating the pregnancy outcome in women with polycystic ovary syndrome are sparse [11, 13] and are of small sample size. Thus, this study was proposed to evaluate the pregnancy outcomes in women with PCOS.

## Materials and Methods

This descriptive study was carried out in the Department of Obstetrics and Gynaecology, JIPMER, Puducherry, from January 2016 to October 2017. The study protocol was approved by Postgraduate Research Monitoring Committee [No: PGMRC/OG/1/2015] and Ethics Committee of JIPMER [IEC/SC/2015/23/845]. Women diagnosed with PCOS according to Rotterdam's criteria who were willing to participate in our study were recruited from obstetrics OPD and antenatal ward of JIPMER. After obtaining an informed consent from them, a detailed interview schedule containing socio- demographic details, menstrual/marital/obstetric/past/personal/ family history was taken. A detailed history regarding PCOS, time of diagnosis of polycystic ovary syndrome, criteria considered such as oligomenorrhea, ultrasound findings and testosterone levels in women with PCOS was noted. History of infertility and treatment taken for PCOS was recorded. Physical examination including height, weight, BMI, blood pressure, acanthosis nigricans and hirsutism was noted. The pregnancy was followed up monthly up to delivery. Maternal complications, mode of delivery and perinatal outcome were recorded as mentioned below.

Data were entered in MS Excel and analysed using SPSS version 20. Continuous variables included age, weight, gestational age and were expressed as mean  $\pm$  SD as appropriate. Categorical variables studied were parity, various maternal and perinatal outcomes, and data were expressed as proportions.

## Results

Total number of pregnant women with PCOS who delivered in JIPMER and participated in our study were 135. The mean age of women in our study was 26.83 years. The percentage of elderly pregnant women in our study was 3.7%, and there were no teenage pregnancies. Majority (52%) had finished high school, 29% had completed higher secondary, and 19% were graduates. Out of total 135 participants, majority (67%) belonged to low class, 28% were in middle class, and 5% belonged to high class according to modified Prasad's classification. Mean height, weight and BMI were 155 cm, 66.69 kg and 27.15 kg/m<sup>2</sup>, respectively. Sixty-three percent (63%) of the study population were over-weight in

our study, and 15% were obese. The proportion of Acanthosis nigricans was found to be 5.2% among study population.

Fifty-three percent (53%) of women presented with history of infrequent menstrual cycles, and 42% had polycystic ovaries on ultrasound findings. Eleven percent (11%) had features of clinical and/or biochemical signs of hyperandrogenism according to Rotterdam's criteria for the diagnosis of PCOS. Almost 94% of the women had undergone treatment for PCOS prior to conception. Majority 57 (42%) of women had conceived on metformin, and 9 (7%) women had undergone ovarian drilling.

Majority (88%) of the women had primary infertility, and 12% had secondary infertility and were primigravida. Almost 62% of women conceived spontaneously, while 38% women conceived after treatment either with ovulation inducing drugs or intrauterine insemination/in vitro fertilization. Nine percent (9%) was twins, 0.7% triplets, and 90.3% were singleton pregnancies in our study.

Maternal outcome of these pregnancies is summarized in Table 1. Fourteen percent (14%) of women had gestational hypertension, and 4% had pre-eclampsia. Thirteen percent

**Table 1** Maternal outcome in study population

Characteristic	Frequency (n)	Percentage (%)
<b>Maternal outcomes</b>		
<i>Medical</i>		
<b>Hypertension</b>		
Gestational hypertension	19	14.1
Pre-eclampsia	5	3.7
<b>Diabetes</b>		
GDMA1	8	5.9
GDMA2	10	7.4
<i>Obstetric</i>		
Abortion	3	2.2
IUGR/ SGA	3	2.2
Rupture of membranes		
PPROM	11	8.1
PROM	25	18.5
Preterm labour	14	10.4
<i>Delivery</i>		
<b>Period of gestation</b>		
Preterm	14	10.4
Term	119	88.1
Post-term	2	1.5
<b>Nature of labour</b>		
Induced	68	50.5
Spontaneous	58	6.6
<b>Mode of delivery</b>		
SVD	80	59.2
Instrumental delivery	14	10.4
Caesarean section	41	30.4

(13%) of women were diagnosed to have gestational diabetes mellitus out of which 6% were on diabetic diet and 7% needed metformin/insulin. Two women had spontaneous miscarriages, one in the second trimester and the other in the first trimester. One patient had an induced abortion in second trimester at 19 weeks due to cystic hygroma. Almost 27% of the participants presented with rupture of membranes, out of which 19% had rupture of membrane at term gestation and 8% had preterm rupture of membranes. Approximately 10% of women had preterm labour. 2.2% of the women who delivered at term had small for gestational age babies.

Ten percent (10%) of women were preterm at the time of delivery, and 2% were post-term. Half the women (50%) underwent induction of labour; 43% went into spontaneous labour; and 7% had elective LSCS. Majority of the women (59%) were delivered by spontaneous vaginal delivery. Ten percent (10%) of women were delivered by instrumental delivery and 30% by caesarean section.

Perinatal outcome of pregnant women with PCOS is shown in Table 2. Majority of the babies (97%) were born healthy and alive. Two percent (2%) were still born, out of which one mother had gestational diabetes with hypertension. One baby died on postnatal day 5 due to respiratory distress with low birth weight. Majority of the babies born had weight in the range of  $\leq 1,000$  g (3%), 2,500–2,999 g (31%), 26% babies had weight in the range of 3,000–3,499, and 7.4% were  $\geq 3,500$  g. Majority of the babies (86%) were

born with APGAR value  $\geq 8/9$ . Thirteen percent (13%) had low APGAR score due to respiratory distress. Meconium stained liquor was observed in 7.4% of our study population, and there were no cases of meconium aspiration in our study. Almost 20% of the babies were admitted to NICU either due to low birth weight or respiratory distress. Out of NICU admission, 15 (10.06%) babies required bag and mask ventilation and 3 babies were intubated. Out of 149 fetuses delivered, 2 (1.3%) were diagnosed to have anomalies. One foetus had cystic hygroma, and the pregnancy was terminated at 19 weeks. The other baby, second of twin pregnancy was delivered at 37 weeks of gestation by spontaneous vaginal delivery, diagnosed to have hypoplasia of lungs postnatally and was on ventilatory support. The baby was taken home against medical advice.

## Discussion

There are several studies which have evaluated pregnancy outcomes in women with PCOS, but the findings are inconclusive. The mean age of women in our study was 26.8 years with age distribution ranging from 21 to 44 years. The elderly pregnant women were 3.7%, and there were no teenage pregnancies which is comparable to other studies [4, 5, 8, 9, 11, 12]. Majority of the pregnant women with PCOS in our study (52%) had finished high school, 29% had completed higher secondary, and 19% were graduates which is similar to another study [9].

The mean BMI among women pregnant with PCOS in our study group was 27.15 kg/m<sup>2</sup>. A higher mean BMI of 30.8 kg/m<sup>2</sup> was seen in overweight women with PCOS when compared to normal weight women in another retrospective cohort study [5]. Sixty-three percent of the study population were over-weight in our study, and 15% were obese which is lower when compared to another population-based study which had 61% prevalence of obesity [9]. A small retrospective Indian study in 110 pregnant women with PCOS showed a lower prevalence of overweight women (58%) in their results [12].

The proportion of Acanthosis nigricans in women with PCOS in our study was 5.2%, and 80.5% women were diagnosed to have hypothyroidism. There is no mention of Acanthosis in other studies. Primigravida in our study were 88.1%, which is much higher when compared to other studies, which had a prevalence ranging from 47 to 81% [5, 9, 11]. Almost 62% of women conceived spontaneously, while 38% women conceived after treatment either with ovulation inducing drugs or assisted reproductive technology in our study. This is in contrast to other studies which had a lower rate of spontaneous conception of 29% [11] and a higher pregnancy rate of 71.4% with use of OI and ART [13]. In another Australian study in 2,566 PCOS

**Table 2** Perinatal outcome

Characteristic	Frequency (n)	Percentage (%)
<b>Status of newborn</b>		
Alive	146	97.8
Still birth	2	1.5
Neonatal death	1	0.7
<b>Birth weight of newborn (grams)</b>		
< 1000	4	2.7
1001–1499	9	6.0
1500–1999	14	9.4
2000–2499	27	18.1
2500–2999	46	30.9
3000–3499	38	25.5
3500–3999	10	6.7
> 4000	1	0.7
<b>APGAR score</b>		
0/0	2	1.3
< 8/9	19	12.8
> or = 8/9	128	85.9
<b>Meconium stained liquor</b>		
	11	7.4
<b>NICU admission</b>		
	29	19.5
<b>Congenital anomaly</b>		
	2	1.3

women the proportion of women who had conceived after in vitro fertilization was 8% similar to our study [4].

In pregnant women with PCOS the proportion of multi-fetal pregnancy was 10% in our study which is similar to a study done in Finland on 99 PCOS women [14]. But it is much higher when compared to an Australian study (3.3%) [4]. The proportion of hypertension and preeclampsia in our study of pregnant women with PCOS was found to be 14.1% and 3.7%, respectively, similar to other studies [3, 11, 13]. However, a lower incidence of hypertension 2.4% to 11% [3, 5, 12] and higher percentage of preeclampsia of 8–12% has also been demonstrated [4, 5]. A 2–fourfold increase in hypertension/preeclampsia has been described in five metaanalyses on pregnancy outcome in women with PCOS [6–10].

Diagnosis of GDM during pregnancy in women with PCOS in our study was 13% which is similar to another Indian case–control study on 56 PCOS women [11]. But a lower incidence of GDM ranging from 7.2% to 8% has been found in other studies [4, 5, 13]. Two other studies in contrast showed a higher incidence of GDM of 22% in PCOS pregnant women [3, 12]. A two–threefold increased risk of GDM in pregnant women with PCOS is described in metaanalyses so far [6–10]. The percentage of miscarriage in the present pregnancy in women with PCOS in our study was 2.2%, which is less as compared with previous studies which found an incidence ranging from 8.1% to as high as 20% [4, 12, 13].

The proportion of SGA/IUGR babies in women with PCOS in our study was 2% similar to another Indian retrospective study [12]. This is lesser when compared to other studies which found a higher incidence of SGA/IUGR babies ranging from 8% to 13% [3, 4]. No difference in risk of SGA/IUGR has been demonstrated in some studies [6, 9]. A 1.5–twofold increased risk has been found in some studies when compared to normal pregnant women [8, 10, 15]. The women who had rupture of membranes at preterm or term gestation in our study was 8% and 18.5%, respectively. The incidence of rupture of membranes at term was much higher compared to another Indian retrospective study on 110 PCOS women of 8% [12], whereas the incidence of preterm rupture of membranes was similar to a metaanalysis [8].

The incidence of preterm delivery was 10.4% in our study, which is similar to one Indian prospective study on 56 PCOS women [13]. This is much lesser when compared to other studies which have found a higher incidence ranging from 13.9 to 19.2% [3–5, 12]. A 1.3–3.9fold increased risk of preterm delivery in pregnant women with PCOS has been described in several metaanalyses [6–10]. The percentage of women who underwent caesarean delivery or assisted vaginal delivery in our study was 30.4% and 10.4%, respectively. The incidence of caesarean section was lower in our study

when compared to other studies which showed a higher prevalence 39–64% [3–5, 11, 12]. No difference in risk has been demonstrated in one metaanalysis of 27 studies involving 4982 PCOS women [7]. However, a 1.2–1.9fold increased risk has been shown in other metaanalyses [8, 10].

The proportion of macrosomia in our study was 0.7%. According to studies done so far a higher incidence of macrosomia in PCOS pregnant women ranging from 6 to 18% has been described [3–5, 12]. Women with PCOS have 1.2–1.5fold higher chance of having macrosomic babies according to metaanalyses [8–10]. Another prospective study done in India on 56 PCOS women found that the women who were on metformin therapy had no macrosomia babies [13]. In our study the incidence of low birth weight babies, very low birth weight babies, extreme low birth weight babies was 27.4%, 6% and 2.7%, whereas in two other studies the incidence of low birth weight babies was lower (4.9–11.4%) [4, 5].

In our study 13% of babies born to pregnant women with PCOS had APGAR of <8/9 at 5 min which is higher when compared to another Australian study which found an incidence of 4.2% [4]. But a 1.4fold increased risk of having low APGAR was found in a population-based cohort study on 3787 PCOS women [9]. The incidence of meconium stained liquor in our study was 7.4% which is slightly higher when compared to other studies which found an incidence ranging from 3.2 to 3.6% [3, 12]. However, according to two metaanalyses, there is a 1.2–2.3fold increased risk of having meconium stained liquor during delivery [8, 9].

In our study (97%) of babies were born healthy and alive. Two percent were still born, which is similar to an Australian study and another retrospective study (3%) [3, 4]. NICU admission of babies born to pregnant women with PCOS in our study was 20%. A lower incidence of 8%–14% has been described in some studies [3, 4], whereas a higher incidence of 25%–30% has been found in other studies [5, 7, 12]. A 2.3fold higher chance of NICU admission has been reported in a metaanalysis of 27 studies on 4982 PCOS women [7]. In our study the incidence of congenital anomalies was 1.3% which is almost similar to two other Indian studies and a metaanalysis [8, 12, 13], but a high prevalence of 6% was found in a study done in Australia which found that offspring born to PCOS mothers may have cardiovascular and urogenital defects [4]. In our study, one foetus had cystic hygroma and the other baby born to twin gestation mother was diagnosed to have hypoplasia of lungs. The incidence of neonatal deaths in our study was 0.7% which is similar to another study on 1789 women with PCOS [4], but lower when compared to a retrospective matched cohort study [3]. A 1.5–1.8fold increased risk has been described in two other metaanalyses [8, 9].

Thus, overall the proportion of adverse maternal and perinatal outcomes appears to be in agreement with some studies but differs to other trials carried out in pregnant women with

PCOS. This is one of the very few studies from India with a relatively larger sample size to provide information on the pregnancy outcome in women with PCOS. Also our study included pregnancies that were both spontaneously conceived as well as by assisted reproductive technology and included both singleton and multiple pregnancies. The limitations of the study were that since the study population was recruited from a tertiary hospital, the pregnancy outcome may not reflect all pregnant women with PCOS, and there was no comparison with a control pregnant population without PCOS.

The proportion of hypertensive disorders of pregnancy, PROM, low birth weight babies, low APGAR score at 5 min was found to be higher, but the proportion of GDM, miscarriage, preterm delivery, meconium stained liquor, caesarean delivery, small for gestational age/IUGR, macrosomia, PPRM, perinatal mortality, NICU admission and congenital anomalies was found to be either similar or lower in pregnant women with PCOS in our study to those described in the general pregnant population [16].

## Conclusions

The data in our study throw more light on the current thinking of the maternal and perinatal problems faced by PCOS mothers, in which some of our results support and others refute some of the risks in pregnancy in women with PCOS. Further larger cohort studies with longer follow-up are needed to study the strength of association of PCOS with the conflicting adverse maternal and perinatal outcomes of pregnancy.

## Compliance with Ethical Standards

**Conflict of interest** The authors Amandeep Mann, Haritha Sagili, Murali Subbaiah report no conflict of interest.

**Human and Animal Rights** All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

**Informed Consent** Informed consent was obtained from all patients for being included in the study.

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