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Study on nutrition status of pregnant women having PCOS

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Abstract
The most prevalent endocrine condition in females with a high frequency is polycystic ovary syndrome (PCOS). Resulting from hormonal abnormalities, swollen ovaries and tiny cysts on the edge. Thought to be brought on by a confluence of hereditary and environmental variables, the aetiology of polycystic ovarian syndrome (PCOS) is yet unknown. The most frequent hormonal disorder in women is PCOS. An endocrine condition known as PCOS affects several physical processes, impairing development, metabolism, and mental health. In 1935, Stein and Leventhal made the discovery of PCOS after studying a lady who had hirsutism, obesity, irregular menstruation, and cysts in her ovaries. These women were originally referred to as "freaks" or "bearded women/ladies" ten years ago. It is believed that the hormones androgen, testosterone, progesterone, and oestrogen are uncontrolled with PCOS.

Keywords: PCOS, swollen ovaries, tiny cyst, freaks, hormone androgens, testosterone

Introduction
The most prevalent endocrine condition in women is polycystic ovary syndrome (PCOS), which has a prevalence of between 6 and 10% (National Institutes of Health standards 2015) and as high as 15% when the more inclusive Rotterdam criteria are used. Early in a woman's reproductive years is often when PCOS is first discovered. Although there are many different clinical manifestations, oligo- or anovulation, clinical or biochemical hyperandrogenism, and the existence of polycystic ovaries are frequently seen. The cause of the syndrome is still unknown, and the heterogeneity in phenotypic expression makes it difficult to provide therapeutic care for and conduct research on this illness (Palomba *et al*., 2010) [13]. A meta-analysis recently demonstrated that PCOS has impacts on reproductive function that extend beyond infertility (oligoanovulation or anovulatory dysfunction) and involve pregnancy. Pregnant women with PCOS have a greater prevalence of obstetric and neonatal problems (Boomsma *et al*., 2006) [2] When PCOS (polycystic ovarian syndrome) is diagnosed in the mother, there are a number of pregnancy issues that have been reported. Pregnancy-induced hypertension (PIH), spontaneous miscarriage, gestational diabetes, pre-eclamptic toxaemia, and the delivery of small-for-gestational-age (SGA) infants are among those with an increased frequency (Homburg. 2006) [8].

Retrospective analyses have provided the majority of the evidence, and frequently the series are short. Although this makes it difficult to establish firm conclusions, it nonetheless serves as a foundation for additional research into the actual occurrence of these pregnancy issues and how to prevent them in women with PCOS. When feasible, evidence-based medicine will be cited here; if not, the finest recent research will be cited (Homburg. 2006) [8] PCOS is regarded as a complex condition with a variety of genetic, metabolic, endocrine, and environmental problems even though the cause is still not fully known (Franks *et al*., 2006) [5] There is mounting evidence that suggests PCOS has an impact on a woman's entire life course. It can start in utero in genetically predisposed individuals, clinically present at puberty with menstrual disorders, and persist throughout the reproductive years with persistent menstrual disorders, infertility, and obesity. In order to lower the chances of potential long-term problems including type 2 diabetes, hypertension, and endometrial cancer, early diagnosis is essential since it enables close follow-up (Haoula *et al*., 2012) [7]. Insulin resistance is now widely acknowledged as one of the major contributing causes to this complicated condition, presenting mostly in obese or overweight women but frequently even in lean PCOS women. Insulin resistance is characterized as the body's needing more insulin than usual to perform its metabolic functions (Armanini *et al*., 2022) [1].

It is believed to support hyperandrogenism by interacting synergistically with luteinizing hormone (LH) on ovarian steroidogenic enzymes and on the liver's synthesis of sex hormone-binding globulin (SHBG) (de Leo V., 2022) [4]. Even after conception, PCOS predisposes the parturient to a number of unfavourable pregnancy outcomes, according to mounting research. Preterm delivery, gestational diabetes, hypertensive diseases of pregnancy, spontaneous abortion, and perhaps foetal development anomalies are among the latter. Similar to metformin therapy, which is the initial line of treatment, weight loss has a favourable impact on fertility. Although there is limited evidence, it is possible to continue taking metformin during the first trimester to lower the abortion rate. There are no teratogenic consequences of metformin. Pre-eclampsia and gestational diabetes (GDM) are certainly more common during pregnancy, however the data situation does not support continued metformin use to lessen pregnancy problems. In GDM research, mothers saw less weight gain and children treated to metformin had less macrosomia. However, follow-up studies have revealed that these beneficial benefits may be linked to a child's long-term metabolic risk (Schäfer-Graf *et al*., 2022) [15].

The current study's objective was to assess the nutritional health of pregnant PCOS patients.

Review of Literature

Pregnancy and PCOS

Insulin resistance and hyperandrogenism are the metabolic characteristics of PCOS women. Intrinsic insulin resistance is present at baseline in a sizeable portion of slim PCOS women. The extra adipose tissue in those with superimposed obesity contributes to greater insulin resistance. With the start of pregnancy, the first insulin resistance appears to become worse. Women with PCOS are more likely to experience pregnancy difficulties. In a population-based cohort research, women with PCOS were more likely to be obese and to utilise assisted reproductive technology than those without the diagnosis (Roos *et al*., 2011) [14]. Preeclampsia and extremely preterm delivery were both substantially linked to PCOS, and the risk of gestational diabetes was more than quadrupled. Mothers with PCOS were more likely to have babies that were big for gestational age, at risk for aspirating meconium, and with low Apgar scores (7) at five minutes (Roos *et al*., 2011) [14]. Two meta-analyses that were performed to assess the risk of pregnancy and neonatal issues in women with PCOS supported this increased risk of difficulties during pregnancy (Kjerulff *et al*., 2011) [9].

Gestational diabetes mellitus and PCOS

40% to 50% of PCOS pregnancies are complicated by GDM (Veltman *et al*., 2010) [19]. When pancreatic cells are unable to combat a woman's PCOS-related intrinsic insulin resistance in addition to the superimposed insulin resistance of pregnancy, it intervenes in the pregnancy. The majority of studies have demonstrated that GDM frequently complicates PCOS pregnancy more than a typical pregnancy. Some of these may have increased the actual risk because obesity was a confounding factor in some of them. According to Urman *et al*., women with PCOS have an increased risk of gestational diabetes regardless of body mass index (Urman *et al*., 1997) [18]. Li, *et al*. found that non-obese/non-overweight PCOS women had an elevated risk of GDM and preeclampsia, and this risk appeared to be caused by PCOS itself rather than by obesity (Li *et al*., 2011) [12]. However, PCOS women exhibited a similar risk of GDM or PIH to normal controls with same age and weight (Haakova *et al*., 2003) [6]. According to a recent systematic review and meta-analysis, the result that women with PCOS had a greater chance of developing GDM appears dubious (Toulis, *et al*. 2009) [17].

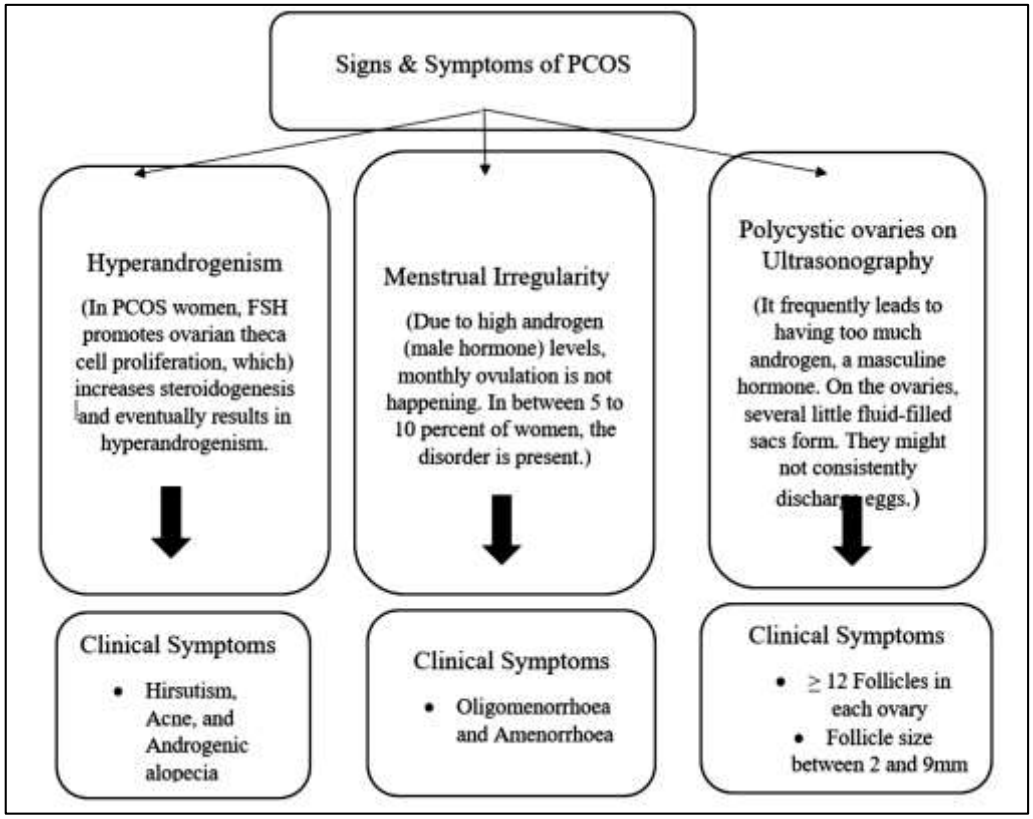


Fig 1: Signs and symptoms in patients with PCOS (Rotterdam, 2004; Chhabra *et al*., 2005; Legro *et al*., 2013) [3, 11]

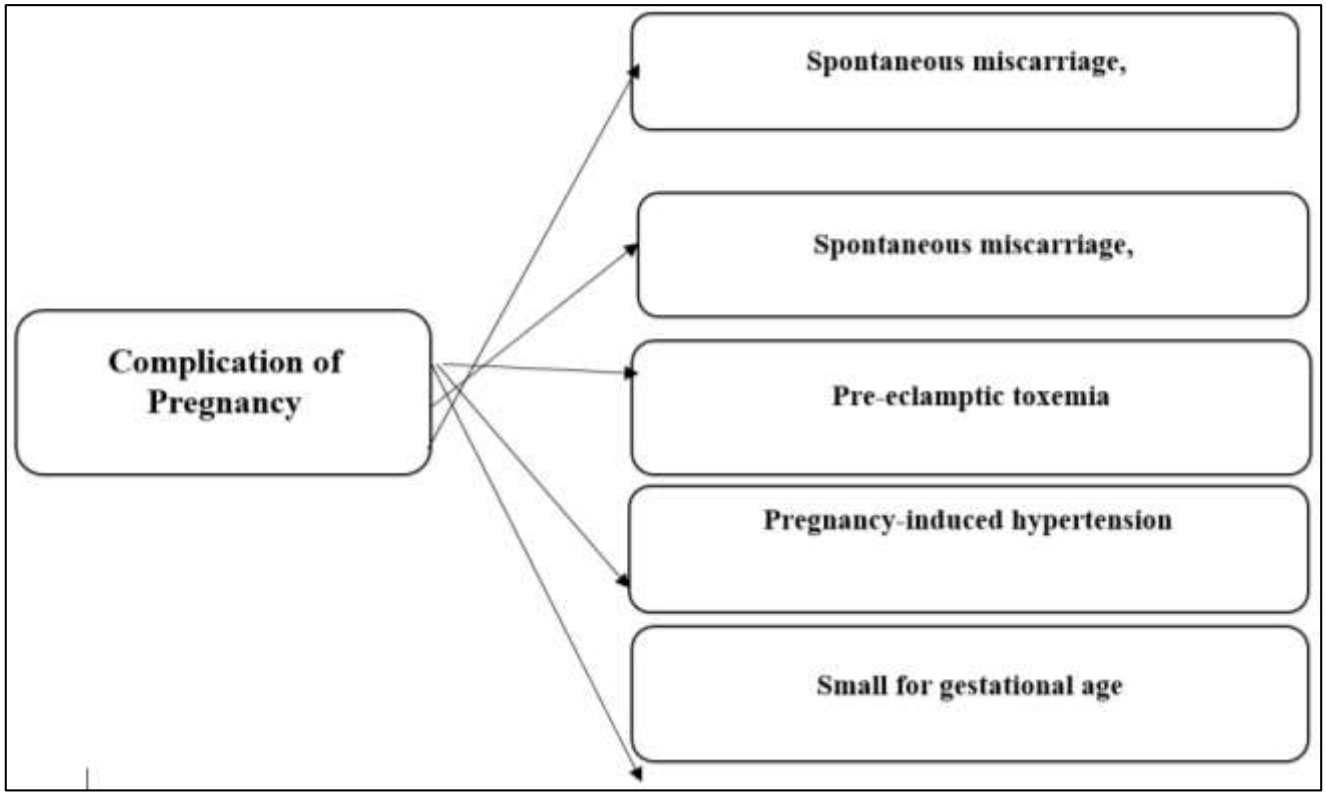


Fig 2: Complications of pregnancy in womens with PCOS (Homburg, 2006) [8].

Diet has an impact factor on PCOS

Table 1: Including specific food sources in a PCOS diet

Food to added	Food to be avoided
▪ High fiber foods ▪ Lean protein ▪ Cruciferous vegetables ▪ Greens and red peppers ▪ Beans and lentils ▪ Almonds ▪ Berries ▪ Sweet potatoes ▪ Winter squash ▪ Pumpkin ▪ Tomatoes ▪ Kale ▪ Spinach ▪ Olive oil ▪ Fruits such as blueberries, and strawberries ▪ Fatty fish high in omega 3 fatty acids, such as salmon and sardines	▪ Refined carbohydrates, ▪ pastries and white bread. ▪ Fried foods ▪ Fast food. ▪ Sugary beverages, such as sodas and energy drinks. ▪ Processed meats, ▪ sausages ▪ Solid fats, including margarine, shortening, and lard. ▪ Excess red meat, such as steaks, hamburgers, and pork.

Methodology

This chapter deals with the description and various steps adopted to collect and organize data for the present study.

The prevalence study is conducted on 100 pregnant women's randomly selected from a multispecialty hospital. The survey method based on standard one-on-one questionnaire and by using a frequency distribution table by due visits to hospital.

Selection of sample and sample size

The prevalence and diet study of 100 pregnant women are selected as sample sizes that are ready to co operate. Simple random sampling is used for the selection of sample.

Research Design

The subjects of the study were selected randomly for one on one questionnaire.

Intervention

The subjects were randomly selected and one on one questions were asked to check the prevalence of PCOS in pregnant women analyse on the nutrition requirement of pregnant women having PCOS.

Outcome of Study

The result analysis gives us the normal dietary intake of a pregnant women and pregnant women having PCOS and it also shows the prevalence of PCOS in pregnant women. It also helps in providing a better dietary management and helps in the understanding epidemiological determinants of PCOS in correlation to pregnancy which will help in overall health and betterment of future.

Through the dissertation analysis over consumption of junk food has lead to having PCOS in pregnant women and the impact of PCOS in pregnant women is abortion.

The history of pregnant women having PCOS (before pregnancy) shows high significance on to overweight and irregular periods as the reason for PCOS.

Diet modification to an extent can help to control PCOS in pregnant women avoiding further complications during pregnancy.

Strict diet planning can help in avoiding complications and allow for an easier pregnancy and can have a significant effect on the overall health and well-being.

Statistical analysis and Interpretation

In this chapter, statistical analysis and data interpretation are described. The most crucial stage of the research process is data analysis and interpretation, which includes computing

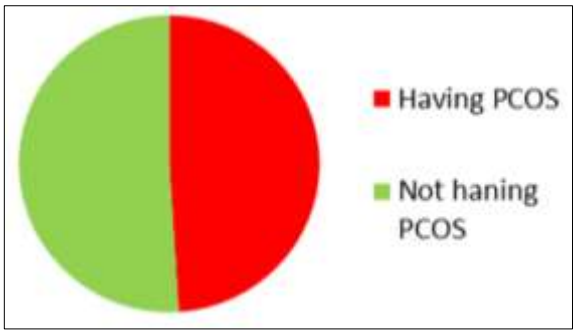
various metrics and looking for patterns of links between different data groupings. In this instance, the study objectives are taken into consideration while data are analysed and evaluated. Compilation, editing, categorization, and presentation of data all fall under the category of analysis and interpretation of data (King *et al*., 2000) [10].

As the data obtained does not address the study's research objectives or test its hypotheses, the analysis of the data is meant to provide a meaningful description of the data. In order to identify trends and patterns of the connection, the data utilised must undergo a methodical analysis (King *et al*.,2000) [10].

The study subjects were analysed in terms of bar graphs, pie charts, percentage and chi-square technique. The collected data was organised, tabulated, summarised and analysed based on the objectives and hypothesis by using correlation and chi-square technique.

Prevalence of PCOS in pregnant woman

Having PCOS	49
Not having PCOS	51
Total	100

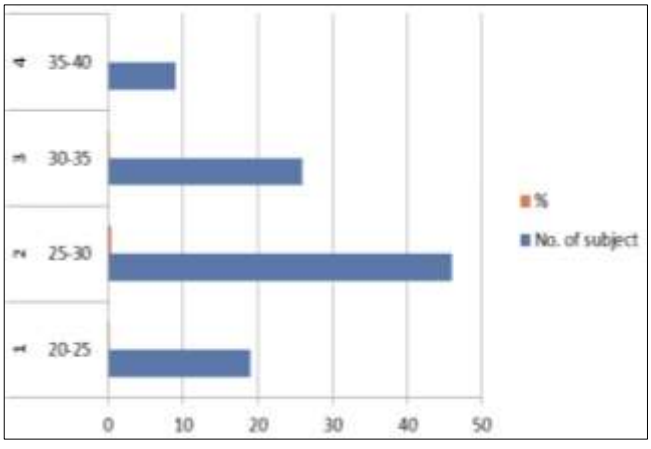


Prevalence of PCOS in pregnant woman

- Out of the total 100 pregnant women, 49 pregnant women have PCOS and the remaining 51 do not have PCOS.

Age groups of pregnancy

Sl. No	Age	No. of subject
1.	25-30	
2.	30-35	
3.	35-40	
4.	40-45	

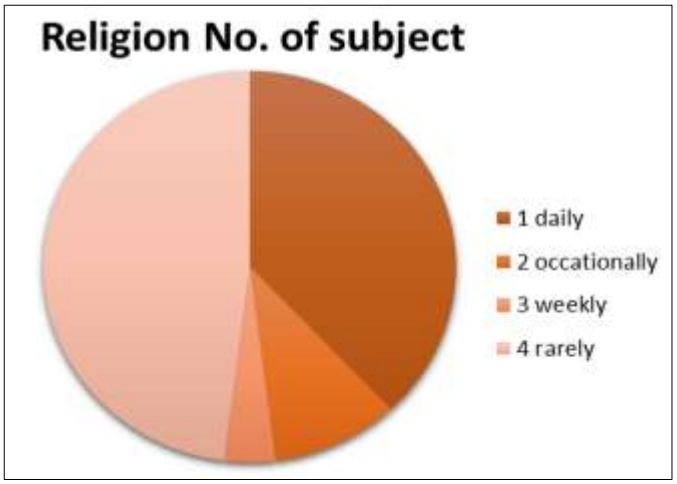


Shows the percentage and no of subject

- Out of the 100 samples taken most pregnant women were from age group between 25 to 30 years and the least being the age group 35 to 40 years.

Frequency of exercise

Sl. No	Exercise	No. of Subject
1.	Daily	38
2.	Occasionally	10
3.	Weekly	4
4.	Rarely	48



Religion No. of subject

Out of the 100 samples 48 pregnant women exercise rarely and 38 pregnant women exercise daily.

CHI- Square technique

A chi-squared test (symbolically represented as $\chi 2$) is basically a data analysis on the basis of observations of a random set of variables. Usually, it is a comparison of two statistical data sets (Karl Pearson, 1900)

The test, especially Pearson's chi-squared test and its variations, is valid if the test statistic is chi-squared distributed under the null hypothesis. If there is a statistically significant discrepancy between the predicted frequencies and the observed frequencies in one or more categories of a contingency table, it may be determined using Pearson's chi-squared test.

The Formula for Chi Square Is

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where:

c = degrees of freedom

O = observed value(s)

E = expected value(s)

Data correlation using the chi-square technique

There are 100 people in the total sample size for the correlation research. The two categories used are the impact of PCOS on pregnant women and the causes of PCOS in pregnant women. This study examines the relationship between the cause of PCOS and its effects on pregnant women.

These are the causes of PCOS
1) Excessive use of convenience and junk food
2) Inactivity
3) Being obese

Effect of PCOS
1) Unusual periods
2) Abortion

Crosstabulation between irregular periods and junk food

IP * Junk Crosstabulation

			Junk		
			N	Y	Total
IP	N	Count	73	11	84
		% within IP	86.9%	13.1%	100.0%
		% within Junk	84.9%	78.6%	84.0%
	Y	Count	13	3	16
		% within IP	81.2%	18.8%	100.0%
		% within Junk	15.1%	21.4%	16.0%
Total		Count	86	14	100
		% within IP	86.0%	14.0%	100.0%
		% within Junk	100.0%	100.0%	100.0%

IP * Reg_Ex Crosstabulation

			Reg_Ex		
			N	Y	Total
IP	N	Count	50	34	84
		% within IP	59.5%	40.5%	100.0%
		% within Reg_Ex	82.0%	87.2%	84.0%
	Y	Count	11	5	16
		% within IP	68.8%	31.2%	100.0%
		% within Reg_Ex	18.0%	12.8%	16.0%
Total		Count	61	39	100
		% within IP	61.0%	39.0%	100.0%
		% within Reg_Ex	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.357[a]	1	.550		
Continuity Correction[b]	.042	1	.838		
Likelihood Ratio	.334	1	.563		
Fisher's Exact Test				.693	.3
N of Valid Cases[b]	100				

*There is no significance or correlation between irregular periods and Crosstabulation between irregular periods and Exercise

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.481[a]	1	.488		
Continuity Correction[b]	.171	1	.679		
Likelihood Ratio	.492	1	.483		
Fisher's Exact Test				.583	.3
N of Valid Cases[b]	100				

*There is no correlation OR significance between irregular periods and exercise

Crosstabulation between Irregular Periods and Overweight

IP * Over_wt Crosstabulation

			Over_wt		Total
			No	Yes	
IP	N	Count	1	83	84
		% within IP	1.2%	98.8%	100.0%
		% within Over_wt	33.3%	85.6%	84.0%
	Y	Count	2	14	16
		% within IP	12.5%	87.5%	100.0%
		% within Over_wt	66.7%	14.4%	16.0%
Total		Count	3	97	100
		% within IP	3.0%	97.0%	100.0%
		% within Over_wt	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.907[a]	1	.015		
Continuity Correction[b]	2.660	1	.103		
Likelihood Ratio	4.042	1	.044		
Fisher's Exact Test				.066	.0
N of Valid Cases[b]	100				

*There is a slight significance and correlation between irregular periods and overweight.
X2 value = 5.91* (1≤ 0.05)

Crosstabulation between abortion and junk food
***There is no correlation or significance between abortion and junk food**

Abor* Junk crosstabulation

			Junk		Total
			N	Y	
Abor	N	Count	69	13	82
		% within Abor	84.1%	15.9%	100.0%
		% within Junk	80.2%	92.9%	82.0%
	Y	Count	17	1	18
		% within Abor	94.4%	5.6%	100.0%
		% within Junk	19.8%	7.1%	18.0%
Total		Count	86	14	100
		% within Abor	86.0%	14.0%	100.0%
		% within Junk	100.0%	100.0%	100.0%

Chi square test

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.300[a]	1	.254		
Continuity Correction[b]	.585	1	.444		
Likelihood Ratio	1.562	1	.211		
Fisher's Exact Test				.455	.2
N of Valid Cases[b]	100				

Crosstabulation between abortion and exercise
***There is no correlation or significance between abortion and exercise**

Abor * Reg-Ex Crosstabulation

			Reg_Ex		
			N	Y	Total
Abor	N	Count	50	32	82
		% within Abor	61.0%	39.0%	100.0%
		% within Reg_Ex	82.0%	82.1%	82.0%
	Y	Count	11	7	18
		% within Abor	61.1%	38.9%	100.0%
		% within Reg_Ex	18.0%	17.9%	18.0%
Total		Count	61	39	100
		% within Abor	61.0%	39.0%	100.0%
		% within Reg_Ex	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1 sided)
Pearson Chi-Square	.000[a]	1	.991		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.000	1	.991		
Fisher's Exact Test				1.000	.6
N of Valid Cases[b]	100				

Crosstabulation between abortion and overweight

Abor * Over-wt Crosstabulation

Abor * Over_wt Crosstabulation

			Over_wt		
			No	Yes	Total
Abor	N	Count	2	80	82
		% within Abor	2.4%	97.6%	100.0%
		% within Over_wt	66.7%	82.5%	82.0%
	Y	Count	1	17	18
		% within Abor	5.6%	94.4%	100.0%
		% within Over_wt	33.3%	17.5%	18.0%
Total		Count	3	97	100
		% within Abor	3.0%	97.0%	100.0%
		% within Over_wt	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (sided)
Pearson Chi-Square	.493[a]	1	.483		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.419	1	.517		
Fisher's Exact Test				.452	.4
N of Valid Cases[b]	100				

*There is no correlation or significance between abortion and overweight.

Crosstabulation between abortion and pregnant women having PCOS

			PCOS		
			N	Y	Total
Abor	N	Count	51	31	82
		% within Abor	62.2%	37.8%	100.0%
		% within PCOS	100.0%	63.3%	82.0%
	Y	Count	0	18	18
		% within Abor	.0%	100.0%	100.0%
		% within PCOS	.0%	36.7%	18.0%
Total		Count	51	49	100
		% within Abor	51.0%	49.0%	100.0%
		% within PCOS	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1 sided)
Pearson Chi-Square	22.847[a]	1	.000		
Continuity Correction[b]	20.426	1	.000		
Likelihood Ratio	29.841	1	.000		
Fisher's Exact Test				.000	.0
N of Valid Cases[b]	100				

*There is a high significance and correlation between abortion and the pregnant women having PCOS.
X2 value = 22.85** ($p \leq 0.001$)

This signifies that most common impact for pregnant women having PCOS is abortion

Crosstabulation between junk food and pregnant women having PCOS

PCOS * Junk Crosstabulation

			Junk		
			N	Y	Total
PCOS	N	Count	51	0	51
		% within PCOS	100.0%	.0%	100.0%
		% within Junk	59.3%	.0%	51.0%
	Y	Count	35	14	49
		% within PCOS	71.4%	28.6%	100.0%
		% within Junk	40.7%	100.0%	49.0%
Total		Count	86	14	100
		% within PCOS	86.0%	14.0%	100.0%
		% within Junk	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1 sided)
Pearson Chi-Square	16.944[a]	1	.000		
Continuity Correction[b]	14.654	1	.000		
Likelihood Ratio	22.362	1	.000		
Fisher's Exact Test				.000	.0
N of Valid Cases[b]	100				

Crosstabulation between overweight and pregnant women having PCOS

PCOS * Over_wt Crosstabulation

			Over_wt		
			No	Yes	Total
PCOS	N	Count	1	50	51
		% within PCOS	2.0%	98.0%	100.0%
		% within Over_wt	33.3%	51.5%	51.0%
	Y	Count	2	47	49
		% within PCOS	4.1%	95.9%	100.0%
		% within Over_wt	66.7%	48.5%	49.0%
Total		Count	3	97	100
		% within PCOS	3.0%	97.0%	100.0%
		% within Over_wt	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1 sided)
Pearson Chi-Square	.386[a]	1	.534		
Continuity Correction[b]	.001	1	.972		
Likelihood Ratio	.393	1	.531		
Fisher's Exact Test				.614	.4
N of Valid Cases[b]	100				

*There is no correlation or significance between overweight and pregnant women having

Result and Conclusions

From the survey and statistical analysis it is evident that PCOS has high prevalence making a whopping 49 cases out of the 100 samples.

Pregnancy is itself a difficult period where the body, mind has to go through different changes and extreme care must be taken in terms of diet, exercise and many more.

The reason for PCOS in pregnancy through the analysis has been overconsumption of junk and convenience food. The impact of PCOS in pregnant women is linked with abortion.

PCOS being a lifestyle disease can be controlled by diet modification and proper exercise.

So through dietary modification and exercise PCOS can be kept in control and can subside to an extent preventing further complications during pregnancy or parturition which will help in the betterment of life.

Statistical Analysis

From the overall analysis there were three significant results and the other correlations were not significant.

The data that showed significance was:

1. *There is a slight significance and correlation between irregular periods and overweight.

X2 value = 5.91* (1≤ 0.05)

2. *There is a huge significance and correlation between junk food and pregnant women having PCOS.

X2 value = 16.94** (p≤0.001)

This signifies that the most common reason for having PCOS in pregnancy is overconsumption of fast/junk and convenience food.

3. *There is a high significance and correlation between abortion and the pregnant women having PCOS.

X2 value = 22.85** (p≤0.001)

This signifies that most common impact for pregnant women having PCOS is abortion

Conclusions

Women with PCOS, have considerably lower BMRs than healthy women. As was previously said, there are a lot of unsolved concerns regarding PCOS. However, other investigations are being done on this issue and anticipate different angles. While some doctors are investigating potential reasons, others are attempting to identify the best diet and exercise regimens for managing or treating PCOS. While others try to find a solution to avoid getting PCOS. There is no long-term treatment for it because it is an irreversible sickness or disease. The only options available to enhance health are lifestyle changes and medicine. Making a good food/bad food list and frequently following it with exercise and medicine is one of the greatest strategies to do this.

Ethical approval

Ethical clearance taken from institutional ethics committee

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