



Analysis of Health Risk Factors for Polycystic Ovarian Syndrome: A Case-Control Study

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is the commonest endocrine disorder at a reproductive age. It is associated with numerous reproductive, metabolic and psychological abnormalities.

Objectives: The purpose of this study was to assess the association of several risk factors with the occurrence of PCOS compared to normal control group.

Methodology: A case-control study conducted in females who admitted the Maternity and Pediatric Teaching Hospital (MPTH) and who attend the private Gynecological Clinic or their Outpatient Department (OPD) of Rania Medical City (RMC) hospital for routine checkup in Rania City for duration of March 2022 to October 2022. A total of 205 females were selected to participate in this study. 103 cases of PCOS who satisfied Rotterdam ESHRE/ASRM criteria and 102 cases of age-matched controls have been recruited. Special questionnaire was constructed and designed to measure associated risk factors of PCOS. A Chi-square analysis was applied and significant predictors identified for the prediction of risk factors.

Results: The mean (range) age of the PCOS group and controls was 27.11(14-49). Females with PCOS had higher BMI, higher prevalence of infertility, obesity, and mood disorder than controls. Results revealed a statistically significant difference in accordance of BMI, infertility, anxiety and negative body image ($P < 0.05$) between two groups. Whereas the risk of long-term consequences such as CVD and gynecological cancer were not detected. As well as metabolic risk profile were not associated with the occurrence of PCOS in present study.

Conclusion: PCOS is associated with the significant risk of development of obesity, infertility and mood disorder compared to normal control group. Screening for early detection of PCOS was crucial to assess the significance of interventions as a result prevent the health risks with this syndrome.

Keywords: PCOS, Risk factor, infertility, obesity, mood disorder.

INTRODUCTION

Polycystic ovarian syndrome was originally recognized in 1935 by Stein and Leventhal who noticed a syndrome in women accompanied by irregular menstruation, obesity, and cysts on the ovaries ⁽¹⁾. PCOS is a frequent gynecological endocrinopathy among reproductive aged women, characterized by menstrual irregularities, hirsutism and acne and obesity. Acanthosis nigricans, elevated serum LH levels, biochemical indications of hyperandrogenism, increased insulin resistance are additional frequent characteristics. Some of the patients don't have any symptoms ⁽²⁾. There have been many theories put up to date to explain the development of PCOS. The genetic and environmental factors contribute to this hormonal imbalance. As well as, obesity compounded by poor food and inactivity, increases PCOS ^(3, 24). Three sets of criteria have been developed for the diagnosis of PCOS: The National Institutes of Health criteria (1992), Rotterdam criteria (2003), and Androgen Excess Society criteria (2006). All three categories include polycystic ovarian morphology on transvaginal ultrasound, clinical and/or biochemical hyperandrogenism, and chronic oligo/anovulation, or different combinations of these disorder ⁽⁴⁾. Understanding the true health implications of PCOS is problematic due to the heterogeneous nature of this condition, disagreement over the diagnostic criteria, and confounding factors such as (obesity and long-term treatments with OCPs or metformin) ⁽⁵⁾. Numerous bodily systems are impacted by PCOS, as seen in the numerous and varied symptoms related with the disorder. A female may display a number of reproductive, metabolic, and psychological issues. Reproductive issues may include infertility and different pregnancy complication and clinical indicator of androgen excess. The metabolic syndrome, poor glucose tolerance (abnormal glucose metabolism), and insulin resistance are examples of metabolic

issues. diabetes mellitus type 2, and potentially cardiovascular disease ⁽⁶⁾. To date, however, there has been no nationally representative study on the risk factors associated with the occurrence of PCOS in the Rania region of northern Iraq. In this regard, the aim of the recent study was to assess the risk factors of PCOS among affected women in this region. Therefore, assessment the presence of associated risk factors is essential for planning substantial preventive health strategies, and close long-term follow-up and continually monitored of their menstrual function. In addition, identifies risk for potential metabolic, cardiovascular diseases, and psychological sequela.

AIMS OF THE STUDY

The purpose of this study was to assess the association of several risk factors with the occurrence of PCOS compared to normal control group.

METHODOLOGY

Present study was a convenience (a case-control) study conducted in females who admitted the Maternity and Pediatric Teaching Hospital (MPTH) and who attend the private Gynecological Clinic or their outpatient department at Rania Medical City (RMC) hospital for routine checkup in Rania City for duration of March 2022 to October 2022. A non-probability, purposive sample size of 205 females were selected to participate in this study. 103 cases of PCOS who satisfied Rotterdam ESHRE/ASRM criteria and 102 cases of age-matched controls have been recruited. Agreement to conduct the study was obtained from the scientific committee and research ethical committee at the College of Nursing/University of Raparin. Consent has been obtained from each participant after full explanation of the purpose of the study.

Inclusion Criteria

Females are including in the study based on the following criteria:

- Reproductive age (14-49 years) who attended the hospital and private clinic.
- Pregnant women.
- Diagnosis of PCOS by the consulting gynecologist/physician.

Data Collection

All women were directly interviewed by the researcher in accordance with the study questionnaire. The study questionnaire included demographics and a detailed history was taken from them regarding menstrual cycle status (regular, amenorrhea, oligomenorrhea or polymenorrhea) and features of hyperandrogenism (hirsutism, acne, acanthosis nigricans). Weight was recorded in kilograms and height in centimeters. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m²). Overweight was defined as a BMI between 25.0 and 29.9, and obese as 30.0 or higher according to World Health Organization categories. Pelvic ultrasound has been performed for all participants before diagnosed to find ultra-sonographic features of PCOS. All females asked about any health risks which were diagnosed by the doctor after the occurrence of PCOS.

Statistical Analysis

The data were coded, entered and analyzed by using Statistical Package for Social Sciences (SPSS, version 25). The data were presented as frequencies (f) and percentage %, mean \bar{x} , standard deviation (SD) in tables and figures and analyzed using t-test and Chi-square tests. As well as the results were compared between groups with different variables, with a statistical significance level of ≤ 0.05 .

RESULTS

The demographic and clinical features of the participants were presented in the table (1). The

mean age of the enrolled female was 27.11 (± 6.66). the maximum proportion (51.2%) of females were in age group (23-31), where (26.3%) in case group and (24.9%) in control group. In regarding to the marital status (70.3%) were married, with those (32.7%) in normal group and (37.6%) in PCOS group. It was noticeably higher than single females in both PCOS group (11.7%) and control group (16.1%). In terms of residential area, many of participants were urban residents in both case (26.3%) and control (33.7%) group. While sub urban and rural residents represented (34.2%) and (5.8%) respectively. Most of the PCOS group have irregular menstrual cycle (38.1%), among them 20.5%) had amenorrhea, (12.2%) had oligomenorrhea and (5.4%) had both amenorrhea and oligomenorrhea. While the highest percentage (40.0%) of participants had regular menstruation in control group. With only (9.4%) had irregular menstruation. Furthermore, among PCOS cases (38.5%) had hirsutism, (31.7%) had acne and it was only (8.8%) had acanthosis nigricans. Whereas in normal group the proportion of hirsutism (9.8%), acne (10.7%) and acanthosis nigricans (3.4%). There was a highly significant difference between clinical feature in both case and control detected with ($P < 0.05$).

In regard to body size of the females in this study, the majority of females were normal or healthy weight (36.1%) followed by overweight (35.1%), with (28.7%) obese. In accord with BMI more than and less than 25, number of participant (63.9%) were in the $BMI \geq 25$ as displayed in figure (1).

However, the distribution of participants based on BMI between case and control groups were vary. The proportion of both overweight and obese in PCOS group were (18.0%), whereas in control group the percentage of overweight (17.1%) and obese (10.7). in addition, about (22.0%) in control group had a healthy weight and only (14.1%) in PCOS group were healthy. There were a significant differences

seen in both case and control groups with P-Value = 0.01, and 0.02 respectively as illustrated in figure (2).

When the risk factors for polycystic ovarian syndrome were assessed table (2), it was seen that frequency of primary complaint among PCOS patients which revealed the topmost for attending the gynecological clinic was infertility from 79 (38.6%) married women 38 (18.5%) of them had infertility. While in control group from 69 (33.7%) married women only 5 (2.4%) had infertility, and the difference between the two groups was highly significant P-Value = 0.000. Followed infertility obesity is another risk factors among PCOS group, the proportion of obese in case group (17.1%), whereas in control group only (9.8%) were obese. Moreover, similar rates of normal weight (18.0% v. 22.4%, respectively), and overweight (15.1% v. 17.6%, respectively) were detected regarding both case and control group samples. There were no significant differences between study groups with P-Value = 0.066. While other risk factors such as metabolic syndrome, liver disease, and pregnancy complication were less common. There were no significant differences in the prevalence of liver disease between the case and control groups. No differences were observed between groups in metabolic syndrome profile (dyslipidemia, high blood pressure, diabetes). Comparison of prevalence rate of pregnancy complications between normal control group and PCOS group. There were also no statistical differences found in the prevalence of PIH (2.0%) and miscarriage (10.2%) between groups.

Table 3, describes the mood disorder associated with the occurrence of PCOS. It was observed that females with PCOS were more likely to had suffered from some of the mood disorders as compared to controls. The proportion of depression (2.9%) in PCOS and (1.5%) in control group with P-Value = 0.498, anxiety found among (16.1%) cases Vs (8.3%) controls with P-Value = 0.000. and poor self-esteem (8.8%) in cases Vs (5.9%) in control,

psychosexual dysfunction (6.8%) cases Vs (5.4%) control, as well as among PCOS group (25.4%) had negative body image with only (9.8%) in control group with P-Value = 0.000.

If not treated properly, PCOS can lead to various serious complications and result in possible aggravation of the syndrome. In the present study, the most common risk factors associated with the occurrence of PCOS was obesity, infertility and mood disorders compared to normal groups. The details of all risk factors observed in the study population of both groups are provided in figure 3.

DISCUSSION

Polycystic ovarian syndrome is the most common endocrinological disorder in reproductive-aged women due to hormonal imbalance ⁽⁷⁾. The incidence of PCOS is rapidly increasing these days that might be due to changes in lifestyle, and dietary pattern. As well as nowadays technology users continue to grow up among teenagers especially who spend a significant amount of time at internet online which leads to lack of muscle contraction, physical activity and exercise as a result increased obesity. Obesity is the major challenge of PCOS patients and it has a strong impact on physiological and psychological well-being. Obesity is also known longstanding risk factor for CVD including diabetes hypertension and dyslipidemia. The present data revealed that more than quarter of the PCOS patients were either overweight or obese. Although no significant difference was observed between two groups ($P > 0.005$). This might be due to the high prevalence of overweight in our community in general. Our culture that most of the women are housewife and in a low educational level, as well as lifestyle, diet and physical inactivity are factors affect the high prevalence of overweight in our community. In 2020 a study by Aldossary et al in Saudi Arabia showed similar results of prevalence of obesity among PCOS women. And another study agreement

with the results that there is no significant difference between PCOS and non PCOS in according to obesity⁽⁸⁾.

In the present study, the major concern for visiting clinic was infertility that was present in (36.9%) of the females including 77 women out 103 PCOS. However, the overall prevalence of infertility could be higher since (23.3%) of the enrolled women were unmarried; moreover, the married PCOS women are usually under the gynecologist care because of their initial concern of infertility. There was a highly significant difference detected between PCOS and normal control group in the risk of infertility in this study. Same results were found in other trails as^(9, 10). The current result also mentioned next prevalent but chief complaint was irregular menses present in (75.7%). As to this, a study by Zhai et al 2017 in Tibian females documented similar data with menstrual irregularity and infertility as two foremost complaints.

Regarding to metabolic syndrome which refers to the co-occurrence of several known cardiovascular risk factor, including insulin resistance, obesity, atherogenic dyslipidemia and hypertension⁽¹¹⁾. in this study there were no significance difference in accordance to dyslipidemia, high blood pressure and diabetes between females diagnosed with PCOS and normal control group with low level of prevalence 1.9% (2/103), 2.9% (3/103), 2.9% (3/103) respectively. Similar findings observed in some previous study^(12, 13). while another study showed higher prevalence of MS with statistical difference between two groups⁽¹⁴⁾. It is possible due to that the metabolic refers tests after diagnosed PCOS have done only for the patients who suspected of having high level of fat which affected our results.

It is important to acknowledge that all potential long-term health consequences of PCOS, including increased risk of CVD and gynecological risks of endometrial, breast and ovarian neoplasia were undetected in this study. This is in agreement with the

systematic review⁽¹⁵⁾. While in a recent meta-analysis⁽¹⁶⁾, revealed that women with PCOS are at increased risk for endometrial cancer whereas their risks for breast and ovarian cancer are similar to those of women in general population. Similar our result according to CVD risk factor a population-based cohort study found no significant difference in subclinical atherosclerosis, CAC or aortic plaque in women with PCOS compared to regularly cycling control group⁽¹⁷⁾. However, the risk of cardiovascular disease in PCOS patient is debated. In a large Canadian cohort study by Kazemi et al 2019 found that women with PCOS exhibited a high prevalence of MS and adverse cardio metabolic risk factors when compared with age-matched control. One explanation for this variances, most of the females of both groups are young age group (23-31). It is rare to have cardiovascular disorder and gynecological cancer in this age group. And it is primarily a phenomenon of pri or post-menopausal age, therefore women with PCOS may not demonstrate this risk factors until these years.

Many studies have been performed comparing pregnancy outcome in women with PCOS versus controls. A systematic review and meta-analysis concluded that women with PCOS demonstrated significantly elevated risk of gestational diabetes, pregnancy induced hypertension, pre-eclampsia compare with controls^(18, 19). In recent study, the prevalence of pregnancy-induced hypertension 3.9%, miscarriage 20.3%, and multiple pregnancy 2.9% with no significant difference between two groups. It might be due to the limit sample size of pregnant women.

PCOS patients also suffer from mood disorders like anxiety, depression, poor self-esteem, psychosexual dysfunction and negative body image⁽²⁰⁾. Present study indicates that females with PCOS have significantly higher rate of clinical elevation on anxiety and negative body image as compared to those of women in the general population. as reported by a systematic review and meta-analysis

(21). And a recent study by Altuntaş et al 2022 observed a significantly higher negative body image and depression in women with PCOS than in healthy controls. Accordingly, females with PCOS had relatively greater psychopathology than healthy controls in depression, poor self-esteem and psychosexual dysfunction. Although there's no significant difference seen between two groups in this study. This conflict could be due to our sample of 103 not being sufficiently large, and in our culture that had a strong social relationship with their relatives and friends as well as our islamic religion have a significant powerful to decrease the level of occurrence of psychological sequelae, all of the factors affected our results.

CONCLUSION

Polycystic ovarian syndrome is associated with several reproductive and psychological abnormalities. It is a complex heterogeneous disorders presenting with spectrum of phenotypes such as menstruation irregularities, hirsutism and acne. The result of this study suggest that PCOS is significantly associated with high risk of infertility, obesity, anxiety and negative body image compared with those women in general population. all these above stated issues have impact on health of women thus quality of life. Screening for detecting PCOS in women, and applying rigorous cohort or multi centered studies are required to these result and to properly determine the role of PCOS in the development of long-term and medical health consequences and to evaluate the significance of risk factor modification interventions.

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TABLES & FIGURES

Table (1): Distribution of Socio-Demographic and Characteristics of Groups.

Variables	Case		Control		Total		P-Value
Age	N (103)		N (102)		N (205)		0.113
Mean (±SD)	26.05(±6.454)		28.18(±6.727)		27.11(±6.661)		
Age Groups	N	%	N	%	N	%	
14 – 22	31	15.1	20	9.8	51	24.9	
23 – 31	54	26.3	51	24.9	105	51.2	
32 – 40	15	7.3	26	12.7	41	20.0	
41+	3	1.5	5	2.4	8	3.9	0.347
Total	103	50.2	102	49.8	205	100	
Marital Status	N	%	N	%	N	%	
Single	24	11.7	33	16.1	57	27.8	
Married	77	37.6	67	32.7	144	70.3	
Divorced	2	1.0	2	1.0	4	2.0	
Total	103	50.3	102	49.8	205	100.1	
Residential Area	N	%	N	%	N	%	

Urban	54	26.3	69	33.7	123	60.0	0.034
Suburban	44	21.5	26	12.7	70	34.2	
Rural	5	2.4	7	3.4	12	5.8	
Total	103	50.3	102	49.8	205	100	
Menstrual Cycle	N	%	N	%	N	%	0.000
Normal/regular	24	11.7	82	40.0	106	51.7	
Amenorrhea	42	20.5	2	1.0	44	21.5	
Oligomenorrhea	25	12.2	12	5.9	37	18.1	
OM/AM	11	5.4	1	0.5	12	5.9	
Total	103	49.8	102	49.4	205	99.2	
Hirsutism	N	%	N	%	N	%	0.000
Yes	79	38.5	20	9.8	123	60.0	
No	24	11.7	82	40.0	70	34.2	
Total	103	50.2	102	49.8	205	94.2	
Acne	N	%	N	%	N	%	0.000
Yes	65	31.7	22	10.7	87	42.4	
No	38	18.5	80	39.0	118	57.5	
Total	103	50.2	102	49.7	205	99.9	
Acanthosis Nigricans	N	%	N	%	N	%	0.031
Absent	85	41.5	95	46.3	84	41.0	
Present	18	8.8	7	3.4	92	44.9	
Total	103	50.3	102	49.7	205	85.9	

Figure (1): Distribution of body mass index (BMI)

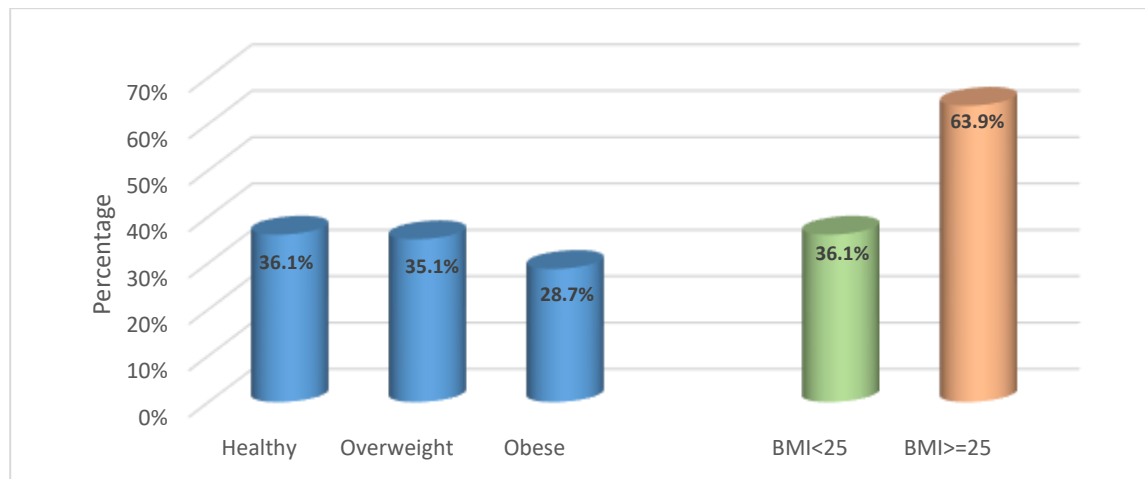


Figure (2): Distribution of body mass index (BMI) in both study groups

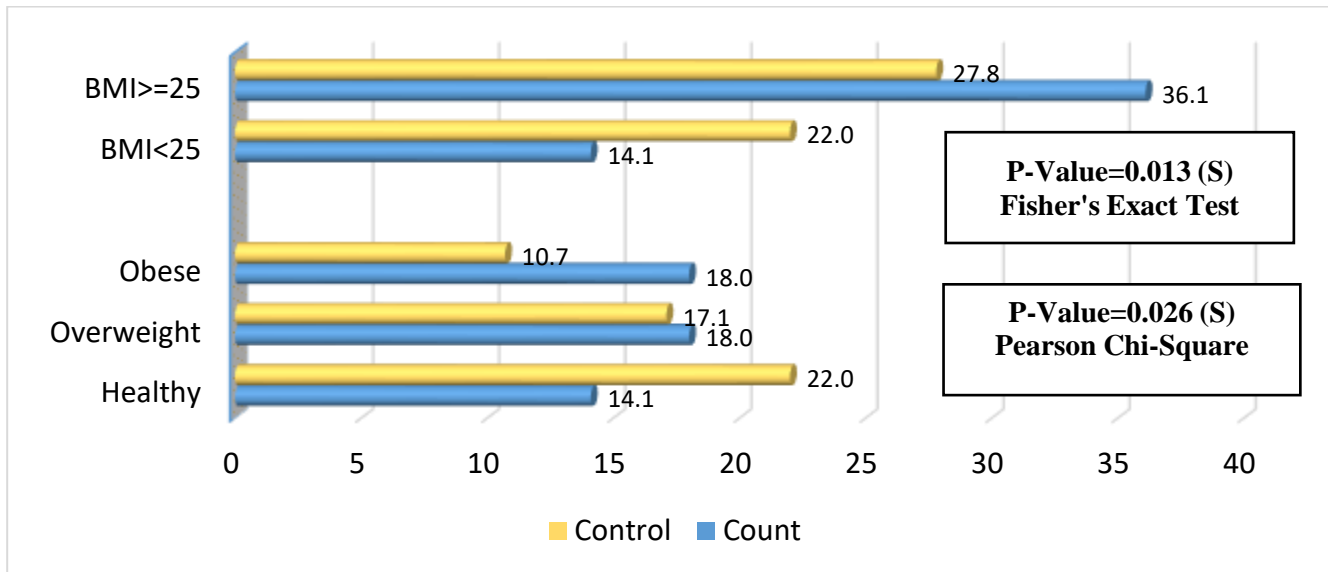


Table (2): Distribution of Risk Factors Associated with the occurrence of PCOS.

Variables	Case		Control		Total		P-Value
Infertility	N	%	N	%	N	%	0.000
Yes	38	18.5	5	2.4	43	20.9	
No	65	31.7	97	47.3	162	79.0	
Total	103	50.2	102	49.7	205	100	
Dyslipidemia	N	%	N	%	N	%	0.683
Yes	2	1.0	3	1.5	5	2.5	
No	101	49.3	99	48.3	200	97.6	
Total	103	50.3	102	49.8	205	100	
High blood pressure	N	%	N	%	N	%	0.505
Yes	3	1.5	2	1.0	5	2.5	
No	100	48.8	100	48.8	200	97.6	
Total	103	50.3	102	49.8	205	100	
Diabetes	N	%	N	%	N	%	0.246
Yes	3	1.5	0	0.0	3	1.5	
No	100	48.8	41	49.8	92	98.6	
Total	103	50.3	102	49.8	205	100	
Liver disease	N	%	N	%	N	%	0.505
Yes	3	1.5	2	1.0	5	2.5	
No	100	48.8	100	48.8	200	97.6	
Total	103	50.3	102	49.8	205	100	
Obesity	N	%	N	%	N	%	0.066
Normal	37	18.0	46	22.4	83	40.4	
Overweight	31	15.1	36	17.6	67	32.7	
Obese	35	17.1	20	9.8	55	26.9	
Total	103	50.2	102	49.8	205	100	
PIH	N	%	N	%	N	%	

Yes	4	2.0	4	2.0	8	4.0	0.634
No	99	48.3	98	47.8	197	96.1	
Total	103	50.3	102	49.8	205	100	
Miscarriage	N	%	N	%	N	%	0.555
yes	21	10.2	21	10.2	42	20.4	
No	82	40.0	81	39.5	163	79.5	
Total	103	50.2	102	49.7	205	100	

Table (3): Distribution of Mood Disorder associated with PCOS.

Variables	Case		Control		Total		P-Value
Depression	N	%	N	%	N	%	
Yes	6	2.9	3	1.5	9	4.4	0.498
No	97	47.3	99	48.3	196	95.6	
Total	103	50.2	102	49.8	205	100	
Anxiety	N	%	N	%	N	%	0.008
Yes	33	16.1	17	8.3	50	24.4	
No	70	34.1	85	41.5	155	75.6	
Total	103	50.2	102	49.8	205	100	
Poor Self-Esteem	N	%	N	%	N	%	0.323
Yes	18	8.8	12	5.9	30	14.7	
No	85	41.5	90	43.9	175	85.4	
Total	103	50.3	102	49.8	205	100	
Psychosexual Dysfunction	N	%	N	%	N	%	0.345
Yes	14	6.8	11	5.4	25	12.2	
No	89	43.4	91	44.4	180	87.8	
Total	103	50.2	102	49.8	205	100	
Negative Body Image	N	%	N	%	N	%	0.000
Yes	52	25.4	20	9.8	72	35.2	
No	51	24.9	82	40.0	133	64.9	
Total	103	50.3	102	49.8	205	100	

Figure (3): Bar graph displaying the percentage of risk factors among patients with PCOS

