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Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women

Abstract

Background: Premature ovarian insufficiency (POI) represents about 1percent among women who are in less than 40 years age group. It has great negative impact on psycho-social, sexual and overall, on the quality of life of women.

Objective: This study was designed to investigate the comparison in lipid profiles, fasting blood sugar, systolic and diastolic blood pressure and waist circumference in between normal women and women with premature ovarian insufficiency (POI).

Methods and materials: This was a cross-sectional comparative study. Fifty women (POI) were taken with purposive sampling as study group who were diagnosed as premature ovarian insufficiency of idiopathic cause from 18 to 40 years. 50 healthy women were taken as comparison group at the same age group. The study was done in the Obstetrics and Gynecology department of Z. H. Sikder Women's Medical College, Dhaka from January 2020 to December 2021 over a period of two years. After taking written consent detailed information about the patients were collected in a predesigned data collection sheet for each patient. Metabolic syndrome (MS) was assessed for each one of POI. MS was diagnosed according the criteria of IDF (International diabetic federation).

Results: Serum total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and fasting blood sugar were significantly higher and high-density lipoprotein cholesterol (HDL-C) was reduced in women with POI($p<0.05$). There were no differences in triglycerides. Waist circumference was higher significantly in women with POI ($p<0.05$).

Conclusion: Early cessation of ovarian function is related with higher levels of TC, LDL-C, fasting blood sugar and waist circumference and lower HDL-C. Women with POI have higher risk of metabolic syndrome. Early detection and lifelong management should be provided to avoid complications.

Keywords: lipid profile, POI, TC, HDL-C, LDL-C, waist circumference and fasting serum glucose

Volume 13 Issue 4 - 2022

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Received: August 12, 2022 | **Published:** August 23, 2022

Introduction

About 1% of women are suffering from POI throughout the world below the age of 40. 1st case was reported by Fuller Albright in 1942, who described the condition as POI.[1] Among women with primary amenorrhea, it can be diagnosed by two levels of serum follicular stimulating hormone (FSH) ≥40mIU/ml at 6 weeks apart. Epidemiological studies have shown that, POI is more prevalent in Caucasian, African-American and Hispanic women.[2] Many reasons are responsible for POI, but more commonly it is idiopathic (60% to 80%). Premature ovarian failure (POF) is another term which is sometimes used interchangeably with POI, but POF is defined as the loss of ovarian function which is caused by end stage of multiple disorders.[3] However, in POI, intermittent and unpredictable resumption may occur in ovarian activity.[4] European society of human reproduction and endocrinology (ESHRE) has confirmed the term POI for research and clinical practice.

According to ESHRE the diagnostic criteria of POI include, cessation of menstruation or oligomenorrhoea for at least 4 months and increased FSH>25IU/l measured twice with a 4 week interval.[5] Insufficient ovarian reserve may result into high FSH, low AMH and AFC. It is a state of hypogonadism, amenorrhea, subfertility, hypoestrogenism and increased gonadotropins.[6] There is another term, transitional ovarian failure (TOF) which may take 3-10 years to ends up into POF. It presents with elevated FSH >10.2IU/l, AFC<5 follicles and AMH <0.5 to 1.1ng/ml with a regular cycle.[7] POI can be developed as a result of chromosomal (most commonly Turner's syndrome), autoimmune, genetic factors, secondary to infection (mumps virus), iatrogenic (surgery, radiation, chemotherapy), environmental, metabolic disorders, endometriosis and hyperprolactinemia.[7,8]

POI has negative impact on the psychological, social, sexual and quality of life of women. Women with POI have greater susceptibility for cardiovascular and neurological diseases and increased risk of mortality. If ovarian function losses early, it will lead to endogenous estrogen deficiency, which is a contributing factor for cardiovascular diseases. POI patients also present with many risk factors of cardiovascular disease, as–dysfunction of endothelium, abnormality in lipid profile and insulin dysfunction. As a result, risk of metabolic syndrome also increases.[9] The mortality risk due to ischemic heart disease in women with POI is higher.[10]

According to US National cholesterol education program (NCEP) ATP III (2005) and IDF(International diabetic federation), the criteria for metabolic syndrome are-HDL-C <50g/dl, TG >/=150mg/dl, fasting glucose >/=100mg/dl or 5.6mmol/l, SBP ≥130mmHg, DBP ≥85mmHg, waist circumference >35 inches or 88cm.[11]

However, the etiology, pathogenesis and diagnosis of POI is still under research. Early diagnosis and management could provide more preservation of ovarian function.[12]

Methods & materials

This was a cross-sectional comparative study. Fifty women with premature ovarian insufficiency (POI) were taken with purposive sampling as case and 50 healthy women were taken as control at the same age group. It was conducted in the Department of Obstetrics and Gynecology of Z.H. Sikder Women's Medical College & Hospital, Dhaka from January 2020 to December 2021 over a period of two years. After taking written consent detailed information about the patients was collected in a predesigned data collection sheet for each patient. Statistical level of significance was set at p <0.05. Statistical processing of data was done by SPSS, version 21.0.

Inclusion criteria:

a. Spontaneous onset of POI

b. Age 18-40 years

c. Secondary amenorrhea for 4 months or more

Exclusion criteria:

i. POI due to chemotherapy, autoimmune disease

ii. Patient is a diagnosed case of CLD, CKD

iii. Patient is getting any hormonal therapy

Ethical clearance

Written informed consent was taken from each patient. Ethical clearance was done from ethical committee of Z.H.Sikder women's medical college.

Results

Data is presented as mean±standard deviation. Student's t-test was done to do the analysis.

Table 1 shows the age group and BMI distribution in POI groups and in healthy comparison group. Age and BMI were matched in the both groups.

Table 2 presents the mean and standard deviation of lipid profile, fasting serum glucose, systolic blood pressure (SBP), diastolic blood pressure (DBP) and waist circumference in two groups.

Table 1 Epidemiological studies of POI patients

	POI patients (n=50)	Healthy comparison group (n=50)	P value
Age	30.7±5.9	28.3±3.5	<0.001
BMI	23.05±4.3	28.51±5.2	<0.001

Table 2 Comparison of metabolic parameters in women with POI and healthy controls

	POI patients (n=50)	Healthy comparison group (n=50)	P value
TC(mg/dl)	202.02±31.28	162.54±15.86	<0.001
HDL-C(mg/dl)	73.01±17.63	56.01±13.15	<0.001
LDL-C(mg/dl)	212.61±29.16	91.45±14.17	<0.001
TG(mg/dl)	76.15±32.43	75.12±15.29	0.32
Fasting serum glucose(mg/dl)	101.76±6.30	85.30±10.17	<0.05
SBP(mmHg)	115±21	116±6	0.3
DBP(mmHg)	78±7	74±6	0.41
Waist circumference(cm)	91±1.30	84±13.6	<0.05

Discussion

In this study, it is noticed that, POI is associated with abnormal lipid profile and impaired fasting glucose levels which may lead to increased cardiovascular risk.

This study was conducted to understand the risks and effects of POI and also to compare the criteria of metabolic syndrome with age matched premenopausal healthy controls. Significantly higher levels of TC, LDL-C and lower levels of HDL-C were reported in the study (p<0.05).

Table 3 shows that in 2020, Gunning MN also found in his study elevated cardiovascular risk in women with POI than healthy controls.[13]

Table 3 Comparison of total cholesterol (mg/dl) among this study and other study

Study	Result	P value
The cardiovascular risk of middle age women who was previously diagnosed as premature ovarian insufficiency Gunning MN, March 2020	182.21±26.90	P<0.01
Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women Mahjabeen N	202.02±31.28	P<0.001

In 2017, similar conclusions were drawn by Mozaffarian D and Benjamin EJ in their studies.[14,15]

Failures of ovarian function in POI is itself a risk factor for cardiovascular diseases, similarly which increases the risk in menopausal women. Vaidya D, Appiah D, Gulhan I and Muka T found similar in their studies.[16–19]

In Table 4 it is shown that, Podfigurna A in 2018 also found significantly higher LDL-C and lower HDL-C. But levels of TG were not significant as our study.[20]

Table 4 Comparison of HDL-C, LDL-C,TG among this study and other study

Study	Result	P value
Metabolic profile of patients with premature ovarian insufficiency Podfigurna A, October 2018	HDL-C (mg/dL) - 74.03 ± 18.73	P<0.0001
	LDL-C (mg/dL)- 114.70 ± 31.17	P<0.001
	TG (mg/dL)- 77.26 ± 48.47	0.33
Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women Mahjabeen N	HDL-C(mg/dl)- 73.01±17.63	P<0.001
	LDL-C(mg/dl)-212.61±29.16	
	TG(mg/dl)- 76.15±32.43	P<0.001
		0.32

Insulin resistance also increases the cardiovascular risk. Table 5 shows, in this study, fasting glucose level was significantly higher in women with POI (p<0.05).

Citation: Mahjabeen N, Nasreen SZ, Tarafdar MA. Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women. *Obstet Gynecol Int J.* 2022;13(4):262–265. DOI: 10.15406/ogij.2022.13.00659

Table 5 Comparison of fasting serum glucose of this study with other study

Study	Result	P value
Risk factors for diabetes mellitus in women with premature ovarian insufficiency Kolaksizoglu M, 2013	114±6.90	P<0.01
Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women Mahjabeen N	101.76±6.30	P<0.05

But in a study of Kalantaridou and Ates S, there was no significant difference in POI and healthy controls in respect to fasting blood glucose level.[21,22]

Kulaksizoglu M studied 43 patients of POI and compared with 33 healthy controls. He found higher fasting glucose level in women with POI.[23] Corrigan also reported higher fasting glucose levels same as this study.[24]

Table 6 shows that, systolic and diastolic blood pressure were not significantly higher in this study. Van Beresteyn EC also did not find any significant relation as this study.[25]

Table 6 Comparison of SBP, DBP and waist circumference of this study with other study

Study	Result	P value
The cardiovascular risk of middle age women who was previously diagnosed as premature ovarian insufficiency Gunning MN, March 2020	SBP(mm of Hg)-124±16.90	P<0.04
	DBP(mm of Hg)-85±5.1	P<0.01
	Waist circumference(cm)-90	P<0.01
Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women Mahjabeen N	SBP(mmHg)- 115±21	0.3
	DBP(mmHg)-78±7	0.41
	Waist circumference(cm)- 91±1.30	P<0.05

But Gunning MN in 2020, found significantly higher SBP, DBP and waist circumference in their study.[13]

Elevated waist circumference was reported in this study significantly in women with POI, which is an important component of metabolic syndrome. Waist circumference has a high predictive value as a risk factor for developing type 2 diabetes mellitus and cardiovascular diseases.[13,26,27]

POI is a medical problem affecting women's life. Its etiopathology is still under conflict. These factors may pay a role for prevention.[28,29]

Conclusion

This study shows that high levels of TC, LDL-C, fasting glucose level, increased waist circumference and low HDL-C are significantly raised in POI women. We have found no difference in TG and blood pressure. These parameters will help identifying risk factors, early diagnosis, management and overall prevention of metabolic syndrome for PIO women and thereby we can reduce the morbidities.

Acknowledgments

None.

Funding

None.

Conflicts of interest

Author declares there is no conflict of interest exists.

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Citation: Mahjabeen N, Nasreen SZ, Tarafdar MA. Comparison of metabolic profile in between women with premature ovarian insufficiency and normal women. *Obstet Gynecol Int J.* 2022;13(4):262–265. DOI: 10.15406/ogij.2022.13.00659