VOLUME - 11, ISSUE - 04, APRIL - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Medicine

CORRELATION OF DIABETES MELLITUS AND DYSLIPIDEMIA WITH OBESITY IN INFERTILE FEMALES: A CROSS SECTIONAL STUDY

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ABSTRACT

Aims: To study the prevalence of infertility in obese or overweight females and its association with Dyslipidemia and Diabetes mellitus.

Materials And Methods: The study was performed on 160 infertile women between age 18-45 years who attended Obstetrics and Gynaecology OPD and Medicine OPD in Swaroop Rani Hospital, Prayagraj.The duration of study was from December 2019 to March 2021.Patients were divided into lean/normal weight females and obese/overweight females based on BMI.

Results: Out of total 200 patients 40 were excluded and remaining 160 were divided in two groups,

Group 1: lean or normal weight infertile women(N1 =63) and

Group 2: obese /overweight infertile women(N2= 97)

Mean age of controls and cases were found to be comparable(31.54±2.82 vs 31.22±2.97 years) with p =0.50. Mean BMI of control group was found to be 20.23±1.39 kg/m2 as compared to cases with mean BMI 27.77±2.86 kg/m2 which was significantly higher with p=<.001. Mean W:H ratio in cases and controls was found to be 0.83±0.05 and o.74±0.04 respectively with p-value= <0.001. Mean A1C levels in cases was significantly higher than in the control group (5.91±0.91% vs 4.61±0.58%) with p=<.001. Mean S, Triglycerides levels in cases was significantly higher than in the control group. (160.4±96.9 vs 110.2±15.8) with p=<.001. Mean S.Cholesterol levels in cases was significantly higher than in the control group. (165.1±41.06 vs 100±22.1) with p=<.001. Mean S.VLDL levels in cases was significantly higher than in the control group (43.9±18.94 vs 54.9±14.07) with p=<.001.Mean S.LDL levels in cases was significantly higher than in the control group (64.16±22.4 vs 54.33±16.17) with p=<.002. Mean S.HDL levels in control was higher than in the case group. (78.65±6.86 vs 40.77±12.83) with p=<.001.

Conclusion: The prevalence of obesity in infertile females at a tertiary care centre was 60.62 %. Positive association of obesity was found with dyslipidemia and diabetes mellitus(A1C -5.91±0.91% vs 4.61±0.58% with p=<.001)in obese females. Most of the females were in the range of impaired glucose tolerance phase which could be reversed by dietary modification and early intervention.

KEYWORDS : Obesity, Infertility, Dyslipidemia, Diabetes Mellitus.

INTRODUCTION

Obesity is a multifaceted disease with several causes. According to the report, more than 1.9 billion persons worldwide are overweight, with 650 million being obese. At the moment, India has around 135 million obese people. Obesity in Indian women has climbed from 13% in 2005-06 to 21% in 2010-11, according to the National Family Health Survey-4 (2015-16). 2

Infertility affects approximately 10-15 percent of couples. Infertility is linked to male factors in roughly one-third of instances, and female causes in the other one-third, with the remaining cases (1/3) being caused by both partners or being unexplained (10 percent). 3

Early-onset obesity appears to have a stronger link between excess body fat and reproductive problems. Obesity that develops early in life, especially throughout adolescence, favours the development of menstrual abnormalities, persistent oligo-anovulation, and infertility later in life. Obesity in women can also raise the chance of miscarriage and make assisted reproductive technologies less effective.

Insulin excess, which is associated with insulin resistance, is the key factor implicated in the link between obesity and reproductive issues.Through its effects on lowering sex hormone-binding globulin synthesis and circulating concentrations, as well as boosting ovarian androgen production rates, hyperinsulinemia may be directly responsible for the development of androgen excess.3

Obesity and dyslipidemia have long been linked. In a study of 13,770 Chinese children aged 2 to 17, Li Y. et al. discovered that the odds of having dyslipidemia were 1.76 times higher in overweight children than in those who were average weight.24

MATERIALS AND METHODS

Study was carried out in women between 18 - 45 yrs of age, attending outpatient department in Swaroop Rani Nehru Hospital and Kamla Nehru Memorial Hospital, department of obstetrics and gynecology and Medicine Department affiliated to M.L.N. Medical College, Prayagraj over a period of eighteen months in the year 2019 to 2021 after ethical approval.

Inclusion Criteria :

All sexually active women aged 18-45yrs with definite clinical confirmation of(primary or secondary) infertility attending OPD after informed consent.

Exclusion Criteria -

- women <18 yrs.
- women >45 yrs.
- pregnant women
- patient not giving consent
- Patients who are a known case of

1. Chronic Kidney Disease
2. Chronic Liver Disease

3. Anatomical abnormalities of genital tract
4. Genital tuberculosis

A detailed clinical history and clinical examination was carried out as per working proforma.Detailed past history regarding any medical condition like diabetes, hypertension, tuberculosis or any other endocrine or chronic past illness was taken along with any past surgical history.

Routine blood investigations were done complete blood count, A1C,S. Lipid Profile, VDRL, anti HCV, RBS, S. TSH, S. LH, S.FSH, S. Prolactin. Special investigations were S. FSH, S. ESTRADIOL, and S.Testosterone on day 2-3 of the menstrual cycle and a baseline abdominal ultrasonography was done to evaluate any genital tract abnormality or any underlying organ deformity. Total 200 patients were enrolled, out of them 40 were excluded because of the following reasons-

1. Blood sampling was not possible on day 2-4 of the cycle because of their personal reasons.
2. Ultrasonography could not be done on cycle day 2-4 because of the technical and personal reasons.
3. The patients were lost to follow up.

RESULTS:

Out of total 200 patients 40 were excluded(30 left the study,7were having Pelvic inflammatory disease and 3 had hypothyroidism) and remaining 160 were divided in two groups,

GROUP 1: lean or normal weight infertile women(N1 =63) and

GROUP 2: obese /overweight infertile women(N2= 97)

Mean age of controls and cases were found to be comparable(31.54±2.82 vs 31.22±2.97 years) with p =0.50.

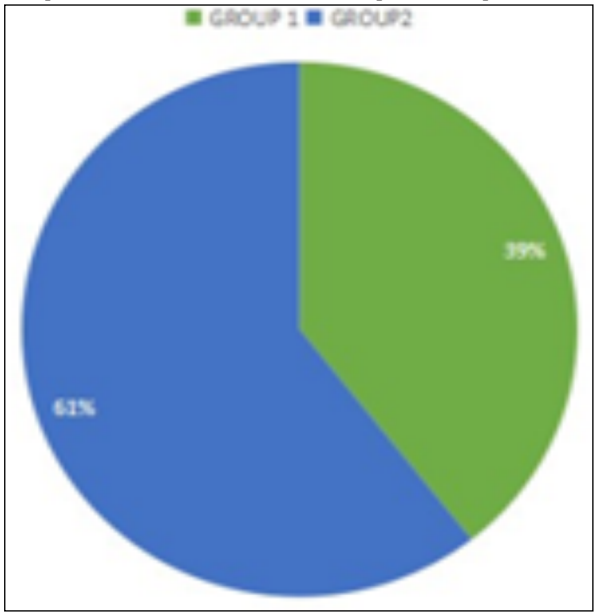

Fig 1: Group Wise Distribution Of Study Population

Mean BMI of control group was found to be 20.23±1.39 kg/m2 as compared to cases with mean BMI 27.77±2.86 kg/m2 which was significantly higher with p=<.001.

Table 3: BMI Distribution

S. No.	GROUPS	MEAN ± SD (kg/m^2)	SIGNIFICANCE OF DIFFERENCES	
1.	GROUP 1 (lean/normal wt)	20.23±1.39	T= -22.2	P- value =<.001
2.	GROUP 2 (obese)	27.77±2.86		

Mean W:H ratio in cases and controls was found to be 0.83±0.05 and o.74±0.04 respectively with p-value= <0.001.

Mean A1C levels in cases was significantly higher than in the control group (5.91±0.91% vs 4.61±0.58%) with p=<.001.

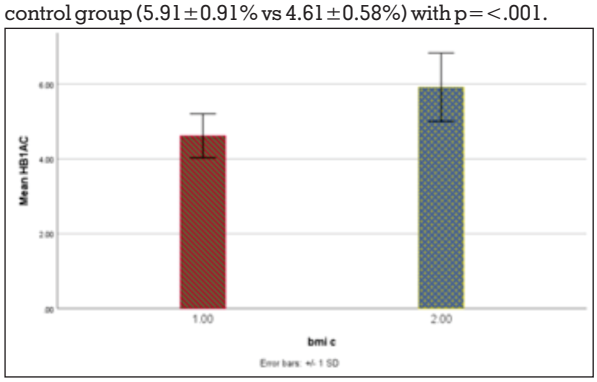

Fig 2 : Mean Hba1c Distribution

Mean S, Triglycerides levels in cases was significantly higher than in the control group. (160.4±96.9 vs 110.2±15.8) with p=<.001. Mean S.Cholesterol levels in cases was significantly higher than in the control group. (165.1±41.06 vs 100±22.1) with p=<.001. Mean S.VLDL levels in cases was significantly higher than in the control group (43.9±18.94 vs 54.9±14.07) with p=<.001.Mean S.LDL levels in cases was significantly higher than in the control group (64.16±22.4 vs 54.33±16.17) with p=<.002. Mean S.HDL levels in control was higher than in the case group. (78.65±6.86 vs 40.77±12.83) with p=<.001.

Table 2: Variation Of Metabolic Parameters With BMI

Correlations							
		HB1AC	S. TRIGL	S. HDL	S. LDL	S. VLDL	S. CHOLESTEROL
BMI	Pearson Correlation	0.678	0.267	0.132	0.254	-0.276	0.712
	p-value	<0.001	0.001	0.001	0.002	<.001	<.001
	N	160	160	160	160	160	160

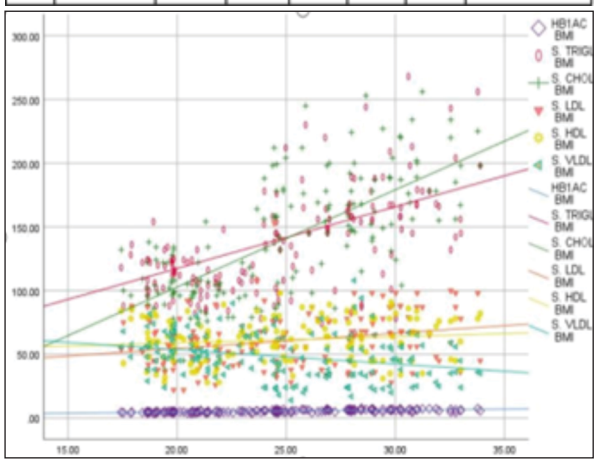

Fig 3: Scatter Plot With Lines To Show The Correlation Of Various Metabolic Parameters With Obesity.

DISCUSSION

According to our study, 60.62 percent of the 160 patients were

obese and infertile. The average age of controls and cases was found to be similar (31.542.82 vs 31.222.97 years) with a p value of 0.50.

Manal et al found that Obese women with a BMI 27 kg/m2 have a relative risk (RR) of anovulatory infertility of 3.1 (95% CI, 2.24.4) compared with their lean counterparts with a BMI 20.024.9 kg/m2. American cohort of more than 7000 women by Gesink Law et al.[47] showed reduced fecundity in eumenorrheic obese women, and van der Steeg et al.[48] presented data from a large Dutch cohort of more than 3000 women with normal cycles, in which the probability of spontaneous conception declined linearly with each BMI point 29 kg/m2 .

The mean BMI of the control group was 20.231.39 kg/m2, whereas the mean BMI of the patients was 27.772.86 kg/m2, which was substantially higher with p=.001.

According to our study, mean A1C levels in cases was significantly higher than in the control group (5.91±0.91% vs 4.61±0.58%) with p=<.001.

Krzysztof C et al[27] assessed prevalence of obesity, glucose intolerance, and dyslipidemia in 490 women with PCOS, aged 24.75 ± 8.05 years. Fifty-two percent of women had BMI < 26 kg/m2 and 90.3% had glucose<140mg/dl at 120of OGTT. Deirdre K. Tobias et al[39] found that history of infertility was reported by 27,774 (24.8 percent) women and was associated with a 20% higher risk of developing diabetes than those who had never reported infertility (HR 1.20 [95 percent CI 1.14, 1.28]).A meta-analysis has shown that the odds ratio (OR) of IGT, T2DM and metabolic syndrome (MetS) in PCOS is 2.48 [95% Confidence Interval (CI) 1.63, 3.77], 4.43 (95% CI 4.06, 4.82) and 2.88 (95%) CI 2.40, 3.45), respectively.

According to our study, mean S.Triglycerides levels in cases was significantly higher than in the control group. (160.4±96.9 vs 110.2±15.8) with p=<.001.The mean S.Cholesterol levels in cases was significantly higher than in the control group. (165.1±41.06 vs 100±22.1) with p=<.001.The mean S.VLDL levels in cases was significantly higher than in the control group. (165.1±41.06 vs 100±22.1) with p=<.001. The mean S.LDL levels in cases was significantly higher than in the control group. (64.16±22.4 vs 54.33±16.17) with p=<.002. While the mean S.HDL levels in controls was higher than in the case group. (78.65±6.86 vs 40.78±12.81) with p=<.001.

Krzysztof C. Lewandowski et al[27] (2019) conducted a study to study the Prevalence of Dyslipidaemia and Pre-Diabetes Among Women with Polycystic Ovary Syndrome (PCOS). Fifty-two percent of women had BMI < 26 kg/m2, 81.8 % had total cholesterol < 200 mg/dl, 82.8 % had LDL cholesterol < 130 mg/dl (48.3 % < 100 mg/dl), 81.4 % had triglycerides < 150 mg/dl. The most frequent abnormality was low HDL cholesterol, as only 33.9 % had LDL > 60 mg/dl.

Jin Ju Kim et al[40] (2013) concluded that triglycerides and low-density lipoprotein (LDL) cholesterol levels were 26 mg/dL and 12 mg/dL higher, and high-density lipoprotein cholesterol concentration was 6 mg/dL lower in women with PCOS than those of controls.Jinxia Zhang et al[29] (2012) in their study, found that the prevalence of dyslipidemia in patients with PCOS was 52.96%, about two times than that in the controls, 28.95%.A meta-analysis showed that, compared with age-matched controls, PCOS women had 26.39 (95% CI 17.24, 35.54) mg/dl higher Tg levels, 6.41 (95% CI 3.69, 9.14) mg/dl lower HDL-c and 18.82 (95% CI 15.53, 22.11) mg/dl higher non-HDL-c levels.LDL-c levels were also higher even in studies with BMI matching [8.32 mg/dl, 95% CI (5.82,10.81)]. The latter remained also higher in normal weight PCOS [9.20 mg/dl, 95%CI (4.68, 13.72)].

CONCLUSIONS:

The prevalence of obesity in infertile females at a tertiary care centre was 60.62 %. This includes a major proportion of infertile females and therefore all infertile patients should undergo screening for obesity to reduce future morbidity.

There is a positive association of obesity with dyslipidemia and diabetes mellitus(A1C -5.91±0.91% vs 4.61±0.58%) with p=<.001)in these females. Most of the females were in the range of impaired glucose tolerance phase which could be reversed by dietary modification and early intervention.

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