Original Article

Increased Body Mass Index & Waist Circumference are Associated with Female Infertility: A Cross-Sectional Study

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Abstract
Background: The prevalence of obesity and overweight are increasing and has become an epidemic worldwide. Obesity has detrimental influences on all systems, including reproductive health. Obesity can lead to menstrual disturbance, anovulation, miscarriage, pregnancy complications and subfecundity and infertility. This study aimed to investigate the effects of body mass index (BMI) and waist circumference (WC) on infertility in women of childbearing age. Methodology: This was a hospital based cross-sectional observational study comprising hundred (100) infertile women aging 18-35 years in Outpatient Department of Obstetrics & Gynaecology and Endocrinology in Chittagong Medical College Hospital and Department of Biochemistry, Chittagong Medical College, Chattogram. Samples were taken by non-probability consecutive sampling. Important variables in this study were age, BMI, waist circumference and Blood Pressure. Results: Most of the infertile women were 21-30 years. In the study, among the infertile women increased BMI was found in 50% cases and increased waist circumference was found in 76% cases. Conclusion: Overweight and obese patients should be informed about the importance of pre-pregnancy weight reduction and should be encouraged to lose weight before the treatment to reduce the poor obstetrical outcomes due to obesity.

Introduction

Infertility is one of the medical, social, and psychological burdens in this part of world. Infertility has been recognized as a public health issue worldwide by the World Health Organization (WHO)[1]. Infertility is defined as the inability to conceive after one year of regular intercourse without contraception[2]. It can be divided into two broad categories – primary and secondary infertility. Primary infertility refers to the inability to ever have a child and secondary infertility refers to those cases where people have had children but fail to conceive after that[3].

There are multiple aspects that can lead to the infertility which are subdivided into four broad categories: female infertility (35%), male infertility (30%), a combination of both (20%) and unexplained or 'idiopathic' infertility (15%)[4,5]. The infertility problem is more common phenomenon among the women now a days and has increased over past 30 years. The prevalence of infertility is estimated to be between 12 and 14%[6].

Infertility stems from occupational factors e.g., shift work, stress, physical (radiation) and toxic (chemicals) sources or various lifestyle factors (age, nutrition, exercise, obesity, psychological stress, smoking or alcohol consumption) in addition to environmental pollution factors[7,8]. The prevalence of overweight and obesity is high and increasing, which has become a major public health concern globally[9]. Obesity (BMI ≥ 30 kg/m^2) amongst women of reproductive age also has increased significantly in the last decades[10].

Several studies have shown that obesity increases the risk of prenatal complications such as gestational hypertension and gestational diabetes[11,12]. It is also responsible for prolonging labor, increasing the risk of obstructed labor and cesarean delivery[13] and has notable effects on the fetus[12,14]. Data in a large population-based cohort study showed that higher BMI positively correlates with fertility problems[15]. However, studies show that low BMI is also associated with infertility[16].

Materials & Methods

This study was a hospital based cross sectional observational study. The duration of the study was 1 year from July 2018 to June 2019. This study was

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carried out on 100 infertile females selected from outpatient department of Obstetrics & Gynaecology and endocrinology, Chittagong Medical College, Chattogram and has been referred to the biochemistry department, Chittagong Medical College, Chattogram for thyroid profile evaluation. Permission for the study was taken from the Ethical Review Committee of CMC. Informed consent from each subject was taken before the collection of samples. Sampling technique was nonprobability consecutive sampling and inclusion criteria were infertile woman aged between 18 and 35 years.

Exclusion criteria were male infertility, any congenital anomaly of the genital tract or any obvious organic lesion and any history of taking contraceptives. Height and weight were measured and then BMI was calculated. Waist circumference was measured by measuring tape in standing position. All the data was processed and analyzed using Microsoft Excel and IBM-SPSS v22.0 for Windows. Statistical inference was based on 95% confidence interval and p-value ≤0.05 was considered statistically significant. Variables were expressed as mean ± standard error of means (SEM). The distributions were expressed in percentages. The summarized data were presented in the form of tables.

Results

Table-I shows that, most of the subjects of the study were in the age group of 21-30 years and were mostly housewife.

Table-I: Distribution of baseline socio-demographic characteristics among the study subjects (n = 100)

Socio-demographic Variables		Percentage (%)
Age in Groups	≤ 20 Years	11
	21-30 Years	68
	> 30 Years	21
Married For	< 5 Years	57
	5-9 Years	34
	≥ 10 Years	09
Occupation	Housewife	88
	Service holder	12

Table-II shows that mean BMI was 26.78 ± 0.34 kg/m² and mean waist circumference was 85.84 ± 0.63 cm in the study cases. On the other hand, all the study population was found normotensive.

Table-III shows that, in the study population increased BMI was found in 50% cases and increased waist circumference was found in 76% cases.

Table-II: Mean value of BMI, waist circumference and blood pressure among the study subjects (n = 100)

Variables	Mean ± SEM	Median	Range
BMI (Kg/m²)	26.78 ± 0.34	25.25	19.92-35.38
Waist Circumference (cm)	85.84 ± 0.63	87.50	70-98
Systolic BP (mmHg)	105.10 ± 1.00	100.00	90-130
Diastolic BP (mmHg)	68.45 ± 0.78	70.00	60-90

Table-III: Distribution of obesity status among the study subjects (n = 100)

Variables		Frequency	%
BMI	Normal	50	50
	Obese	50	50
Waist Circumference	Normal	24	24
	Obese	76	76

Discussion

Overweight and obesity have become a global problem of public health. Several countries worldwide have witnessed a double or triple escalation in the prevalence of obesity in the last three decades, probably due to urbanization, sedentary lifestyle and increase consumption of high calorie processed food[17]. The body mass index (BMI) is commonly used for diagnosis of overweight (25.0–29.9 kg/m²), obesity (> 30.0 kg/m²), as well as underweight < 18.5 kg/m²). Waist circumference (WC) is also used for measuring central obesity. When WC ≥ 94 cm for men and ≥ 80 cm for women or waist-to-hip ratio (WHR) ≥ 0.90 in men and ≥ 0.85 in women is termed as central obese[18].

Obesity and overweight are common conditions that have consequences not only for general health but also to a great extent on reproductive health. In our study majority of the infertile women were 21-30 years old where increased BMI was found in 50% infertile cases and increased waist circumference was found in 76% infertile cases. In the United States, around 34% women of reproductive age are overweight and 26% are obese[19]. In a study in China, the prevalence of overweight and obese are 16.5% among women aged 20 to 49 years according to WHO criteria[20]. Another study showed that, the obese women had a higher risk of miscarriage relative to the normal-BMI women[21]. A study in

India also showed that overweight and obesity increases the chance of female infertility compared to those of mothers of normative weight[22].

It has been shown that the probability of pregnancy is reduced by 5% per unit of BMI exceeding 29 kg/m^2 [23]. The association between obesity and lower fertility rate has been shown in several studies, and it has been shown that obesity in early adulthood alters the reproductive functions. The risk of menstrual problems and infertility increased in these women[24]. Obesity causes infertility through various pathways, including impaired ovarian follicular development, qualitative and quantitative development of the oocyte, fertilization, embryo development and implantation[25]. The interaction between obesity and fecundity is not fully understood. It seems that the exact cause of infertility is long standing anovulation due to hyperandrogenism.

Conclusion

Overweight and obesity are common conditions that have consequences not only on general health but also to a great extent on reproductive health. So, it should be informed to that people about the importance of pre-pregnancy weight reduction and should be encouraged to lose weight before the treatment to reduce the poor obstetrical outcomes due to obesity.

Limitations of the Study

This study has certain limitations like small sample size, cross sectional type of study and conducted in single center.

Conflict of interest

The authors declared that they have no conflict of interest.

Acknowledgement

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