



RESEARCH ARTICLE

ASSOCIATION OF BODY MASS INDEX WITH PRIMARY AND SECONDARY INFERTILITY AMONG INFERTILE WOMEN IN A SUB-SAHARAN AFRICAN CITY

Thomas Anthony Awolowo¹ and Dada Samuel Ayokunle²

¹Radiology Department, Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti-State, Nigeria

²Department of Medicine, Ekiti State University Teaching Hospital, Ado-Ekiti, Ekiti-State, Nigeria

ARTICLE INFO

Article History:

Received 19th November, 2023

Received in revised form

18th December, 2023

Accepted 15th January, 2024

Published online 27th February, 2024

Key words:

Body mass index; Primary Infertility;
Secondary Infertility; Female Infertility;
Private Health Care.

*Corresponding author:

Thomas Anthony Awolowo

ABSTRACT

Introduction: Studies have shown that abnormal body weight can lead to fertility problems in women. The effect of body mass index (BMI) on female infertility has not been studied in this environment. **Aims and Objectives:** To find out the association of BMI with primary and secondary infertility among infertile women in a sub-Saharan African city. **Methods:** A cross-sectional and descriptive study which included 112 infertile women (18-45 years) was carried out at a private diagnostic centre in Ado-Ekiti. Data on socio-demographics and other relevant information were collected. Primary and secondary infertility were classified based on the World Health Organization's definitions of infertility. The patient's weight and height were used to calculate the BMI and reported in kg/m². **Results:** More than two third of the participants (70.5%), had secondary infertility and 33 (29.5%) had primary infertility. The majority of the infertile women were overweight (41.1%) while 33.9% had normal BMI and 20.5% and 4.5% were obese and underweight respectively. Overall women with secondary infertility had significantly higher BMIs, than women with primary infertility. **Conclusion:** There is an increased risk of infertility among women with a BMI ≥ 25.00 and most of these women had secondary infertility. Evaluation of weight and treatment of obesity should be considered as part of treatment in obese and overweight women with infertility as this may improve the outcome. Precautionary measures including lifestyle modification may also go a long way in reducing the risk of infertility associated with abnormal body weight.

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Citation: Thomas Anthony Awolowo and Dada Samuel Ayokunle. 2024. "Association of Body Mass Index with Primary and Secondary Infertility among Infertile Women in a sub-Saharan African City..". *International Journal of Current Research*, 16, (02), 27181-27184.

INTRODUCTION

Reproductive dysfunctions have been related to both high and low body weight and may reveal biological and social influences.^{1, 2} Underweight or overweight contributes nearly to one-fifth of infertility.^{1, 3, 4} Studies have shown that being overweight (body mass index [BMI] ≥ 25 kg/m²) or underweight (BMI < 18.5 kg/m²) can contribute to fertility problems.^{1, 5-8} In a secondary analysis of National Survey of Family Growth (NSFG) data from 2011 to 2019 conducted in US involving more than 6000 infertile and non-pregnant fecund women aged 20–44 years showed that obese women had a 62% higher odds of infertility compared to non-obese counterparts.⁹ There are many biological and other causes of infertility, which can be treated by medical intervention and lifestyle modification. One of such causes that can easily be prevented is deflection from the normal BMI. One of the easiest ways to decide underweight or overweight is to determine BMI, which is an index of a person's relative skinniness or heaviness.¹⁰

Infertility is recognized as a worldwide health concern with profound implications for the reproductive well-being of couples. Its impact extends beyond individual lives, influencing social dynamics and placing demands on healthcare services.¹¹ In developing nations, there is limited research exploring the potential impact of excessive weight on infertility. Within these low-income countries, factors such as genital tract infections and sexually transmitted diseases among others are identified as critical contributors to infertility.^{12, 13} In Nigeria, the prevalence range of being overweight was reported to be 20.3%–35.1%, while the prevalence range of obesity was 8.1%–22.2%.¹⁴ Therefore, it is important to investigate the probable relation between BMI and female infertility in Southwestern Nigeria, especially knowing that up till now, only a few studies are available in this area. This study aims to evaluate the relationship between BMI and infertility among adult women referred for infertility test in a private medical facility in Ado Ekiti town in Nigeria.

MATERIALS AND METHODS

This was a cross-sectional descriptive study carried out at a private diagnostic centre, in Ado-Ekiti, south-Western Nigeria from June 2019 to May 2020. The patients were adult married women undergoing fertility tests and referred for hysterosalpingography from various clinics and hospitals in Ado-Ekiti and it's environ. Consent was obtained from all the participants while the ethics and research committee of Ekiti State University, Ado Ekiti approved the conduct of the study. The weights of subjects were measured to the nearest one kilogram (1Kg) with light clothes on and without footwear using a Seca weighing scale. The weighing scale was placed on a hard and flat surface and calibrated frequently using a known standard weight, while the pointer of the scale was adjusted to zero before each measurement.

The height of each subject was measured to the nearest 0.01metre (m) using a stadiometer in an erect position against the wall without foot-wears and head scarf or cap. The BMI in Kg/m² was calculated by dividing the weight in kilogram by the square of the height in meters. All measurements were taken by trained medical personnel. The participants were further grouped according to the WHO BMI classification¹⁵ as follows:

- under-weight < 18.5 kg/m²,
- normal 18.5–24.99 kg/m²,
- overweight 25–29.99 kg/m², and
- obese ≥ 30 kg/m².

Patient with other risk factors for infertility such as uterine fibroids, abdominal mass or ascites were excluded. The participants were categorized into primary or secondary infertility based on the WHO infertility definitions and terminologies.¹⁶

Statistical analysis: The statistical analyses were performed using SPSS version 23.0 (IBM, Chicago, IL, USA). Continuous variables such as Age, weight, height are expressed as the means ± standard deviations (SD). Categorical variables (type of infertility) are expressed as frequencies and percentages. For baseline characteristic analysis, we performed the chi-square test for categorical variables. Tables and chats are used to present the data.

RESULTS

One hundred and twelve (112) women were studied of which majority 79 (70.5%) had secondary infertility while 33 (29.5%) had primary infertility (figre1). More than two third (41.1%) of the subjects were overweight, about two third (33.9%) were of normal weight, less than two third (20.5%) were obese while very few (4.5%) were underweightd (figure 2). Sixty percent of the underweight subjects had secondary infertility while 40 % had primary infertility. Similarly, 55.3% of the normal weight subjects had secondary infertility while 44.7% had primary infertility. Also, majority of the overweight and obese subjects (78.3% and 82.6% respectively) had secondary infertility while few of them (21.7% and 17.4% respectively) had primary infertility, Table 1. Deviation of weight from normal BMI was more in infertility secondary (73.4%) than in primary infertility (48.5%) (Figure 3).

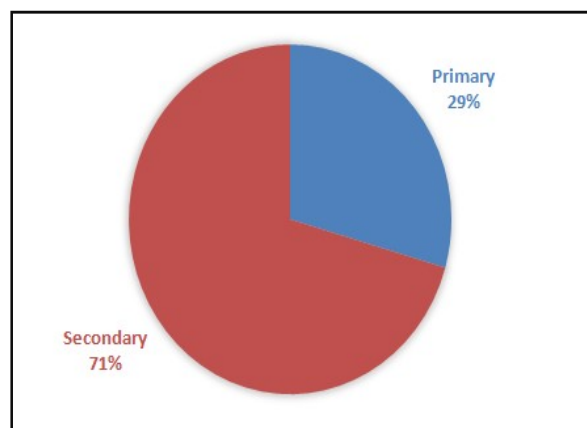


Figure 1. Prevalence of primary and secondary infertility in infertile women

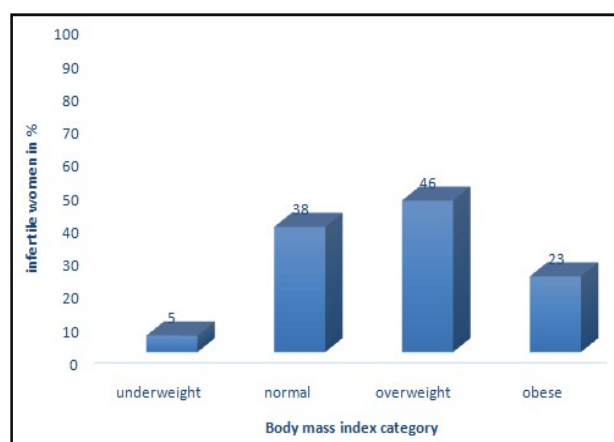


Figure 2. Association of body mass index with infertile women

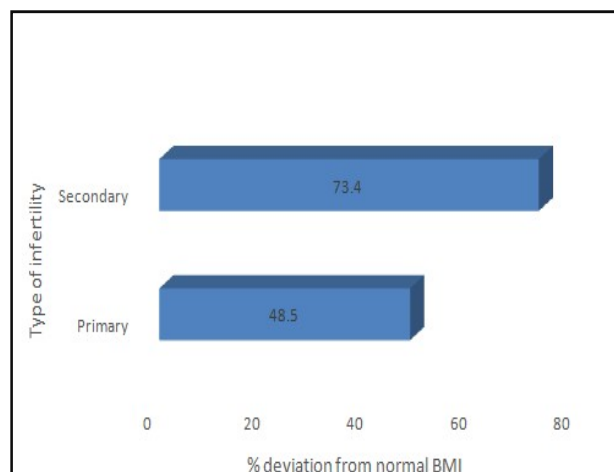


Figure 3. Deviation from normal body mass index in women with primary and secondary infertility

Table 1: Influence of body mass index class on women with primary and secondary infertility

Body mass index (kg/m ²)	Primary Infertility N (%)	Secondary Infertility N (%)
Underweight (<18.5)	2 (6.1)	3(3.8)
Normal (18.5-24.9)	17 (51.5)	21(26.6)
Overweight (25-29.9)	10 (30.3)	36(45.6)
Obese (30-34.9)	4 (12.1)	19 (24.1)
Total	33 (100)	79 (100)

DISCUSSION

Reports have shown that abnormal body weight reduces fertility for women with BMI less than 19 and higher than 25kg/m².^{17, 18} And research is showing that obesity is a health problem that can lead to disease-induced infertility.¹⁹ The result of this study showed a higher proportion of overweight and obese women in the infertile group when compared to women in the underweight category. This is in agreement with findings from other researchers,^{20, 21} which found significant associations between infertility and BMI. A significant number of women with BMI higher than 29.9 suffered from infertility and sexual dysfunction²². The physical appearance of women plays a role in shaping their sexual interactions, highlighting the link between overweight and obesity and the occurrence of sexual dysfunction.^{23, 24} Women with obesity face a higher susceptibility to menstrual disorders and imbalances in sex hormones, potentially influencing ovarian function and embryo development. Additionally, they are at an elevated risk of experiencing ovulation failure and polycystic ovary syndrome, a condition associated with infertility in women.^{25, 26}

Sex hormones such as oestrogen are fat soluble that are deposited in the body's fat layers. Women who have a low BMI yield a reduced amount of estrogen that can lead to an abnormal menstrual cycle.^{27, 28} In this study, majority of cases had secondary infertility. This is in line with findings from studies conducted in sub-Saharan Africa which show that primary infertility is relatively low.^{29, 30} This is however contrary to studies conducted in India, Turkey and Iran which show that primary infertility is more common.^{20, 31-33} This could be due to tribal and cultural differences as revealed by a tribal-based study in India which shows differences in the prevalence of primary infertility across tribes due to differences in socio-cultural and economic factors which inhibit tribal women from gaining adequate access to the health delivery system.³⁴ This study also shows that the proportion of women with normal BMI was more in secondary infertility when compared to primary infertility. This may possibly be because other causes such as semen abnormalities in their partner and congenital uterine anomalies could be the major causes of their infertility.^{20, 35, 36} It was also found that the deviation from normal BMI was also significantly higher in secondary infertility when compared to primary infertility. This might be due to the modifications in lifestyle factors such as intake of junk foods, lack of exercise, and increased stress. These results however differ from findings from a study in Mangalore, India by Dhandapani et al²⁰, which stated that the proportion of women with normal BMI was more in primary infertility and also that the deviation from normal BMI was higher in primary infertility, when compared to secondary infertility. This may be due to the fact that primary infertility is more prevalence in their study. Frisch³⁷ conducted comprehensive research on the correlation between low body weight and fertility, proposing that the initiation of menstruation and ovulatory cycles requires a specific threshold ratio of lean body mass to fat mass. He further stated that in cases of low body weight, women may undergo anovulatory cycles despite menstruating due to insufficient peripherally produced estrogen in adipose tissue and suggested that this can be reversed through weight gain.

Limitations

The limitations of this study include small sample size and the study is also conducted in a single private diagnostic centre, in

Ado-Ekiti. It is recommended that future studies should assess a larger sample size with varied characteristics. Also, this study only focused on women but since infertility can affect both male and female, future research should also study the effect of BMI among men with infertility. The small sample size of 112 infertile women from a specific diagnostic center in Ado-Ekiti may affect the generalizability of findings to a broader population. The diversity of the sub-Saharan African context might not be fully captured. Similarly, the cross-sectional nature of the study limits the establishment of causal relationships. Longitudinal studies would provide more insight into the dynamic associations between BMI and primary and secondary infertility. The study solely focuses on BMI as an indicator of body weight, excluding other relevant measures like body fat percentage and distribution. A comprehensive assessment of body composition could offer a more nuanced understanding of the relationship between body weight and infertility. It was also acknowledged that conducting the study in a single private diagnostic center may introduce selection bias, as women seeking fertility assessments at private facilities might have different characteristics compared to those attending public health facilities.

CONCLUSION

This study has shown that there is increased risk of infertility among women with BMI ≥ 25.00 and most of these women had secondary infertility. We also found that the deviation from normal BMI was also significantly higher in secondary infertility when compared to primary infertility. Abnormal BMI is a preventable risk factor for infertility and precautionary measures including lifestyle modification may go a long way in reducing the risk of infertility and other associated problems.

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