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Sub-Fertility and Obesity among Urban Ghanaian Women in Cape Coast, West Africa

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Abstract

Background: The high and increasing prevalence of obesity among Ghanaian adults is predicted to be associated with detrimental health consequences, including subfertility among women who are in their reproductive ages. Based on existing data in the developed country, obesity affects fertility. However, there is paucity in literature on the synopsis of obesity and its association with infertility among women in urban African setting, particularly in Ghana. **Objectives:** The aim of this study was to estimate the prevalence of obesity among infertile couples and its possible contribution to infertility at the University of Cape Coast Hospital. **Method:** A hospital-based cross-sectional survey with retrospective data collection combined with a comparative component was carried out over a period of 24 consecutive months from January 2018 to December 2019. A data extraction tool was used to collect secondary data from patients' records. **Results:** The prevalence of sub-fertility was 15.3%, with primary sub-fertility accounting for 53.4% of cases. The prevalence of obesity was 43.3% among the infertile population compared to 18.3 % for the fertile population. Also, obesity was significantly associated with sub-fertility (OR = 3.59, [1.96; 6.57]). **Conclusion:** The prevalence of obesity and overweight was high among sub-fertile women compared to those who are fertile, and obesity was significantly associated with sub-fertility. Findings suggest the need for education on healthy lifestyle among Sub-fertile women to improve their fertility.

Keywords

Cape Coast, Body Mass Index, Obesity, Sub-Fertility

1. Introduction

In recent times, overweight and obesity, which correspond to excess body fat, have gained public attention [1]. Out of the 1.9 billion adults who were overweight in

2016, over 650 million were obese [2]. Future predictions, based on current trends, reveal that obesity is imminent in at least 20% of the world's adult population by 2030 [3].

This increasing prevalence is associated with a wide range of morbidities and complications, some of which adversely affect reproductive function.

Obesity in women is associated with ovulatory dysfunction, reduced ovarian responsiveness to agents that induce ovulation, altered oocyte as well as endometrial functions, and lower birth rates [4]. Recent evidence in the field of obstetrics and female reproductive health is pointing to the inevitable influence of obesity in contributing to subfertility [5].

Clinically, sub-fertility refers to "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse [6].

As a major issue of public health concern, sub-fertility is now classified as the fifth highest serious global disability among women below the age of 40 years [7] [8]. Sub-fertility affects 15% of couples of reproductive age globally [9]. Unfortunately, one modifiable factor which has consistently accounted for unsuccessful pregnancy and treatment outcomes among sub-fertile women is overweight and obesity [10].

Efforts targeted at preventing obesity among women as a way of improving fertility in our African setting is almost non-existent, likely due to lack of epidemiological insight; therefore we propose this study to estimate the prevalence of obesity among infertile women and its association with Sub-fertility in an African urban setting.

2. Materials and Methods

2.1. Study Design

A hospital-based cross-sectional survey with retrospective data collection combined with a comparative component was carried out over a period of 24 consecutive months from January 2018 to December 2019.

The cross-sectional component was used in determining the prevalence of obesity among the infertile women.

The comparative component matched the infertile respondents (cases) with fertile women (controls) according to their ages in order to establish a statistical association between obesity and Sub-fertility in our setting.

2.2. Population

- The target population comprises all women who sought fertility treatment at the University of Cape Coast Hospital during the study period.
- The comparative population of the survey comprises clients who attended the hospital's antenatal clinic for booking in the first trimester of pregnancy during the study period. The controls were matched to cases according to ages and were selected randomly from the hospital ANC registers.

2.2.1. Inclusion Criteria

- **The cases (Infertile women)**

All women who sought treatment for subfertility at the University of Cape Coast Hospital within the period of January, 2018 to December, 2019.

- **The Control (Fertile women)**

Clients who reported for antenatal booking during the first trimester in pregnancy at the University of Cape Coast Hospital within the period of January 2018 to December 2019 with documented pre-pregnancy weight or weight at booking. Those women are selected as control because being pregnant ruled out Sub-fertility and pregnancy weight during the first trimester can be a reflection of the pre pregnancy weight.

2.2.2. Exclusion Criteria

- **The cases (Infertile women)**

Patients with incomplete data in their folders were excluded.

- **The Control (Fertile women)**

All clients who reported for booking beyond the first trimester of pregnancy were excluded.

2.3. Sampling Technique

Census was carried out to include all cases of sub-fertility, who reported at the hospital during the study period and simple random sampling was used to select the controls.

2.4. Data Collection Instrument

- A structured pre designed data extraction tool was used in data collection. The data extraction tool comprised items to collect socio-demographic, medical and obstetric history and the body mass index information.

2.5. Data Analysis

Data was entered into Statistical Package for Social Sciences (SPSS) version 24 and analysed. Odds Ratio (OR) test, with a confidence interval at 95% was used to compare proportions.

2.6. Ethical Considerations

Ethical clearance was obtained from the University of Cape Coast Institutional Review Board with IRB ID: UCCIRB/CHAS/2019/142, The data was anonymized.

2.7. Limitation

This study has two main limitations that should be considered when interpreting the findings. First, it is a single centre retrospective study which limit the generalization of the findings to the city of Cape Coast and also the inability to confirm causal relationship.

Second, there is an absence of data on potential confounders like Polycystic

Ovarian Syndrome (PCOs).

3. Results

In all, data about 103 infertile women was analysed and we matched them according to age to 120 fertile respondents, which give us a total study population of 223 subjects.

3.1. Socio-Demographic Characteristics of the Infertile Group

The mean age of the sub-fertile group was 35.51 years with a standard deviation of 5.53 years and the ages ranged from 23 and 48 years.

It was found that more than four out of ten (43.6%) and two out of ten (23.3%) were within the age groups of 23 to 34 and above 40 years respectively.

Table 1 represents the age distribution for the sub-fertile group.

Table 1. Age distribution of the infertile group. (n = 103)

Age categories	Frequency	Percentage (%)
23 to 28	12	11.6
29 to 34	33	32.0
35 to 40	34	33.0
41 to 46	21	20.3
47 to 52	3	03.0
Total	**103**	**100.0**

The Results revealed that more than half of respondents (55.3%) were Traders/self employed, majority of them (83.5%) were married, and urban residence was the commonest (86.4%).

Table 2 presents the results of some socio-demographic characteristics of the sub-fertile group of women.

Table 2. Socio-demographic characteristics of the infertile group. (n = 103)

Variables	Frequency	Percentage (%)
Occupational status		
Traders/self employed	57	55.3
Public servants, private employee	38	36.8
Students	8	07.7
Marital Status		
In relationship	17	16.5
Married	86	83.5
Religion		
Christianity	91	88.3
Islamism	12	11.6
Type of residence		
Urban	89	86.4
Rural	14	13.6

3.2. Prevalence and Causes of Sub-Fertility

During the study period (January 2018-December 2019), 672 patients visited the Gynecology department of the UCC Hospital for various reasons. Out of this number, 103 was diagnosed with subfertility which gives a prevalence of 15.3% (103/672). Primary sub-fertility (53.4%) was more prevalent than secondary sub-fertility (46.6%). Ovarian factors were the highest (41.7%) cause of sub-fertility followed by uterine (18.5%) and male factors (8.5%). Tubal factors (11.6%). un-explained sub-fertility accounted for 9.7% of cases.

3.3. Prevalence of Obesity

3.3.1. Prevalence of Obesity Among the Infertile Group

The prevalence of obesity among the Sub-fertile patient was 44.6% (46/103) and both overweight and obesity accounted for 74.6%.

Table 3 presents the prevalence of the various BMI categorizations among the sub-fertile population.

Table 3. Prevalence of obesity among sub-fertile group. (n=103)

BMI Category	Frequency	Percentage (%)
Low BMI	4	3.8
Normal BMI	22	21.4
Overweight	31	30.0
Obese	46	44.6
Total	**103**	**100**

3.3.2. Prevalence of Obesity among Fertile Group

The total population of the fertile group was 120 respondents who were matched according to the age with the sub fertile group. It was found that more infertile women (44.6%) than sub-fertile ones (18.3%) were obese.

Table 4 compares the BMI categories between the sub-fertile and fertile groups.

Table 4. Comparison of BMI categories between sub-fertile and fertile group.

BMI Categories	Infertile F (%)	Fertile F (%)	Total
Normal + Low BMI	26 (25.2)	47(39.1)	**73**
Overweight	31 (30.0)	51 (42.5)	**82**
Obese	46 (44.6)	22 (18.3)	**68**
Total	**103**	**120**	**223**

3.4. Association between the BMI Categories and Fertility Statuses

A test of Odds Ratio with a confidence level of 95% was performed for the comparative component of the survey. The results revealed that obesity alone versus other BMI categories (overweight, normal weight and underweight) was significantly associated with sub-fertility status, obese women are 3 times likely to be infertile (Odds Ratio = 3.59) with a confidence interval of (1.96; 6.57). Similarly

when obesity and overweight are combined, there is significant association with sub-fertility status, overweight and obese women are almost 2 times likely to have sub-fertility (Odds Ratio = 1.90, with a confidence interval of [1.07; 3.39].

4. Discussion

4.1. The Socio-Demographical and Obstetric Characteristics of the Respondents

In this study, most women were in their reproductive age which ranged from 23 to 48years with a mean age of 35.5 years and standard deviation of 5.53 years. These findings were predictable, because sub-fertility affects women in their reproductive ages. These are similar to the study populations in other surveys related to sub-fertility conducted in Mangalore and in Pakistan where study participants were within the age ranges of 18 to 45years and 20 to 40 years respectively [11] [12].

4.2. Prevalence of Obesity among the Infertile Women

Our study has demonstrated that an increased Body Mass Index (overweight and obesity) yielded a higher percentage of sub-fertility. We found that more than four out of ten (44.6%) sub-fertile women were obese, three out of ten (30.0%) being overweight. Both overweight and obesity accounted for 74.6% among the sub-fertile subjects.

Similar observations were demonstrated by two studies conducted in India and Pakistan which also found that overweight and obesity collectively accounted for a higher percentage of women who were diagnosed with sub-fertility [11] [12].

Other studies have also shown the negative effect of obesity on reproduction, such as the studies in Iran [13] and Greece [14].

4.3. Association between Obesity and Fertility Statuses

It has been established in a number of studies that obesity and fertility statuses are closely related, with obesity having a negative impact on fertility. In our study, the test of association using Odds Ratio (OR) test, with a confidence interval at 95% conducted between obesity versus normal BMI and overweight and fertility statuses, there was a significant association, obese women are 3 times more likely to suffer from sub-fertility (OR = 3.59).

A similar result was obtained, when the same test was performed between obesity plus overweight versus normal BMI, and fertility statuses (OR = 1.9). This implied that there was an association between obesity status and the presence of sub-fertility. This is in line with the findings of a study in the Netherlands which revealed that obesity was associated with lower pregnancy rates in sub-fertile ovulatory women [15]. Similarly, a study in Australia also revealed that high body weight, which subsequently leads to obesity was strongly associated with various reproductive sequelae, most especially, sub-fertility [16]. In further support of previous findings which established an association between obesity and fertility

status, a review found that increase in body mass index (BMI) was strongly associated with ovulatory subfertility and anovulatory sub-fertility and also had an impact on fertility treatment outcome [17].

There are scientific evidence linking obesity to sub-fertility, particularly female sub-fertility through a disruption of the hormonal control of oocyte maturation and endometrial priming for implantation via an alteration of the normal hypothalamic-pituitary-ovarian axis [18] [19]. In addition, the adipose tissues produce signaling molecules which disrupt the normal menstrual cycle and its ovulation [19] [20].

5. Conclusion

The prevalence of obesity and overweight were high among infertile women compared to those who are fertile, and obesity was significantly associated with subfertility. Findings suggest the need for education on healthy diet and lifestyle among urban Ghanaian women who are contemplating conception, to improve their fertility.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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