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RELATIONSHIP BETWEEN OBESITY AND LEIOMYOMAS AMONG GHANAIAN WOMEN
(RUNNING TITLE: OBESITY AND FIBROID AMONG GHANAIAN WOMEN)

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ABSTRACT

BACKGROUND: Leiomyomas (uterine fibroids), the most common benign tumours affecting premenopausal women are often associated with considerable hospitalization and morbidity.

AIM: The purpose of this study was to determine the relationship between Obesity and fibroid among Ghanaian women.

METHOD: A prospective cross sectional study was carried out using 584 women, who presented for trans-abdomino pelvic ultrasound examination in a Diagnostic Centre in Accra, Ghana between June and December, 2012. The ultrasound images and their corresponding reports were produced by a Consultant Radiologist and further confirmed by an independent Consultant Radiologist. Demographic and anthropometric data (weight and height) were obtained from the women. Body Mass Index (BMI) was calculated and obesity was determined using World Health Organization classification.

RESULTS:

The mean age of the women was 35.42yrs ± 9.34 (range, 20-74 years). The ultrasound images revealed that 37.0% (216/584) of the women had fibroids. Out of this number, (216) 37.0% and 45.4% were overweight and obese respectively. The highest prevalence (43.1%) of fibroid cases was found among women aged 30-39. A significant relationship was found between BMI, Level of Education and development of fibroid ($R = -0.196$; χ^2 value= 29.618; $p = 0.001$) and ($R = 0.399$, χ^2 value= 92.923; $p = 0.001$) respectively. There was also a significant relationship between BMI and Level of Education ($R = -0.150$; χ^2 value= 33.556; $p = 0.001$).

CONCLUSION: The study showed that obesity is a major risk factor for leiomyomas among Ghanaian women. Health intervention programmes should focus on strategies on weight management in this population.

Keywords: *Obesity; leiomyomas; Ghanaian women.*

INTRODUCTION

The prevalence of overweight and obesity is increasing at an alarming rate in many parts of the world. [1] Studies carried out in developing countries report an approximate 20% prevalence of obesity. [2, 3, 4] The prevalence of obesity among urban civil servants in Ghana was found to be 36% [5] and more common among the married and educated. [6] In the developed world, the prevalence of obesity is similarly high in men and women, however in countries with relatively low gross national product (GNP), the prevalence is

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about 1.5 to 2 times higher among women than men. [7] Obesity is commonly associated with a combination of comorbidities, which collectively comprise a metabolic syndrome [1]. It is a very important risk factor for many diseases such as type 2 diabetes and a major public health problem affecting adults and children in both developed and developing countries. It is also reported to be among the risk factors of leiomyomas or uterine fibroid. [8, 9]. Fibroids are regarded as the most common benign gynaecologic tumours affecting premenopausal women [10, 11] and are often a frequent indication for hysterectomy and considerable hospitalization and morbidity.[12, 13, 14, 15] It is also considered as the most common mass in the female pelvis which is estimated to occur in 20 - 40% of women during their reproductive years. [16, 17] These tumours are believed to develop in the majority of American women and become symptomatic in one-third of these women.[10, 13] It also accounts for approximately one third of all procedures performed annually in the United States with black women having a greater fibroid burden than whites.[18, 19, 20] However in Ghana, exact data on prevalence rate of fibroids is unknown, current media discussions suggest a significantly high level of fibroids in the country. [21] Although the aetiology of fibroids remains unknown, the ovarian hormones oestrogen and progesterone are hypothesized to enhance fibroid growth [11, 22]. Higher levels of oestrogen have also been linked to women who are obese compared to women of normal weight. [23] . Fibroids can cause a wide range of clinical symptoms such as heavy menstrual periods, pressure symptoms to surrounding organs and infertility problems [24] and are also associated with spontaneous miscarriages. [25] Fibroid tumours are asymptomatic and could be associated with pelvic pain, urinary obstructive symptoms, infertility, and pregnancy loss. [26] The clinical symptoms and the need for treatment are directly linked to the type, position, and the size of the fibroid [26]. Reported risk factors for fibroids include nulliparity, genetic factors, hormonal influences [18, 27, 28, 29, 30] younger age at menarche [8] and obesity. [8, 9]. There is paucity of data on obesity and fibroid occurrence among Ghanaian women. It is against this backdrop that this study was undertaken to determine the relationship between Obesity and fibroid in Ghanaian women attending ultrasonography examination in a Diagnostic Centre in Accra, Ghana.

METHODS

A prospective cross sectional study was carried out using 584 women (aged: 20 years and above), who presented for trans-abdomino pelvic ultrasound examination in a Diagnostic Centre in Accra, Ghana between June and December, 2012. Patients who reported for other ultrasound investigations within the study period were excluded. The ultrasound images and their corresponding reports were produced by a Consultant Radiologist and further confirmed by an independent Consultant radiologist. The levels of agreement within and between the radiologists were determined using kappa. [31, 32] Demographic data was also obtained from the women using a questionnaire. Weight and height measurements were taken in a private area. Weight was measured to the nearest 0.1 kg in light clothing with subjects standing erect. Participants were asked to remove shoes, jackets and other heavy objects before standing on the scale. Height was measured with a portable stadiometer to the nearest 0.1 centimetre. Subjects stood upright on a base plate without shoes with their head and back straight, feet together and heels touching the back of the plate. The head plate was lowered to touch the top of the head and height noted. Body mass index was calculated as weight (kg) divided by the square of the

height (m^2). The BMI was categorised as follows [33]: underweight, < 18.5 kgm^{-2}, normal, 18.5-24.9 kgm^{-2}; overweight 25.0-29.9 kgm^{-2}, obese, ≥ 30.0 kgm^{-2}.
Permission was sought from the Head of the Diagnostic Centre before the study began. Subjects were informed of the purpose of the study and their verbal consent obtained before they were recruited into the study. They were assured that they would not be denied treatment or suffer any penalty if they refuse to participate. Descriptive and inferential analyses were carried out using the statistical package for social scientist version 17.

RESULTS

Intra and Inter Observer Variability

The level of agreement within the findings of each Radiologist and also between the two Radiologists had kappa values ranging from 95.5%-98.2% for intra-observer reliability and 90.4%-95.5% for inter-observer reliability, indicating very good agreement.

Demographic data and clinical findings of ultrasound images of the patients

The age range for all patients (N= 584) whose images were analysed was 20.0 –74.0 years, with mean and standard deviation values as 35.42 years and 9.34, respectively. However, the age range for patients whose images were confirmed with fibroid (n= 216) was 22.0–54.0 years, with mean and standard deviation values as 35.63 years and 7.46, respectively. Table 1 shows the age distribution of the patients. Prior to the study, 35.4% (207 of 584) of the sampled participants stated that they had been previously diagnosed with fibroids. However, during the study, only 71.3% (154 of 207) of those who reported that they had previously been diagnosed were confirmed of having fibroids. Additionally, out of the 377 patients who had not been previously diagnosed with fibroid, 62 representing 28.8% were confirmed to have fibroid. Overall, 37% (216 out of 584) of the participants were confirmed as having fibroids. Table 2 illustrates cross tabulation of participant's who were previously diagnosed with fibroids prior to the study and participants confirmed to have fibroids during the study. Figure 1 shows the prevalence rate of fibroid cases whiles Table 3 presents descriptive statistics of clinical findings from the ultrasound scans of the patients. The study further indicated that the highest prevalence (43.1%) of the fibroid cases was found among women aged 30-39 years and the lowest (7.9%) was recorded among women aged 49 years and above. Women aged between 20-29 years also recorded significant percentage of 31.0% of fibroids. The age grouping of the patients and those with fibroids is shown in Table 4.

Body mass index, Educational level and Fibroid

The study indicated that 30.1% (176 of 584) and 38.7% (226 of 584) of all the participants were overweight and obese respectively. In addition, out of the 216 patients confirmed with fibroid, 37.0 % (80) and 45.4% (98) were overweight and obese respectively (Table 5). Educational background of all participants (N= 584) as well as those confrmed with fibroids (n = 216) are shown in Table 6. Results showed that 75% of women with fibroids had higher education (ie. above secondary level).

Inferential analysis of BMI, Educational level, Age and development of fibroid

The study revealed (Table 7) a significant relationship between BMI, Level of Education and development of fibroids (R= -0.196; χ^2 value= 29.618; p = 0.001) and (R= 0.399, χ^2

value= 92.923; p = 0.001) respectively. There was also a significant relationship between BMI and Level of Education (R = -0.150; χ^2 value= 33.556; p = 0.001). However, Age Group was not significantly associated with BMI ((χ^2 value =2.279; p vale = 0.892) or development of Fibroids (χ^2 value = 4.337; p-value = 0.227).

DISCUSSION

The aim of this study was to determine the relationship between obesity and the development of fibroids in 584 women reporting for trans-abdominopelvic ultrasound scans at a Diagnostic Centre in Accra. Prior to the study, 35.4% (207 of 584) of the sampled participants stated that they had been previously diagnosed with fibroids. However, during the study, 71.3% (154 of 207) of the above were found to have fibroids. This indicates that 53 of the women may have been wrongly diagnosed. Additionally, out of the 377 patients who were not aware of having fibroids, 62 representing 28.8% were confirmed to have fibroids. In general, the prevalence of confirmed cases of women with fibroids was 37.0 % (216 out of 584). This finding is consistent with available data [(34)] which suggests that fibroids are the most common benign pelvic tumour in women, causing symptoms in approximately 25% of women in their reproductive age with the overall prevalence of fibroids increasing to over 70%. The highest prevalence (43.1%) of the fibroid cases was found among women aged 30-39 years and the lowest (7.9 %) recorded among women aged greater than 49 years. The current study also showed that 31.0 % of the women aged between 20-29 years also recorded significant cases of fibroid which is in agreement with previous works conducted elsewhere [34, 35] which suggest that uterine fibroid by sonography is very common among women in their late 30's and 40's, and usually shrink after menopause with a prevalence of two to five times more in black women than white women. The prevalence recorded from the current study was higher than that obtained by Lurie *et al,* (2005) [36] which estimated the prevalence of uterine fibroids as 4% in women aged 20-30 years, 11 to 18% in women between 30-40 years and 33% in women between 40-60 years. This difference could be attributed to racial and environmental factors.

Having fibroids at a much younger age may be related to a strong family history and the increased risk of uterine leiomyoma in people of African descent. In the premenopausal age group, this may result in infertility and menorrhagia depending on the location. Fibroids have social, economic and medical implications in the women populace. Premenopausal women (18-45yrs) in Ghana constitute about 40% of the Ghanaian population [37] and are strong component of the country's workforce and thus contribute immensely to the economy. Out of the 216 patients confirmed with fibroid, 37.0 % (80) and 45.4% (98) were overweight and obese respectively. Although the mechanism of obesity development is not fully understood, there is supporting evidence that unhealthy eating habits such as, excessive sugar and high fat intake, increased portion sizes coupled with physical inactivity have been playing major roles in the rising rates. [38, 39]. Social desirability for overweight and obesity in women is also cited as a cause for obesity among women in the West African region. It is well documented that some ethnic groups in Africa historically preferred overweight women and embraced cultural practices that encouraged female obesity. [40]. It was also observed that 75% of women with fibroid had higher education (ie. above secondary level) confirming previous findings [41] that female gender and tertiary education was associated with higher levels of obesity among

Ghanaian adults. Ovarian hormones, oestrogen and progesterone have been associated with the promotion of the growth of fibroid [11, 22] and also have a strong linkage with obesity. [23] These factors may contribute to the higher prevalence of overweight and obesity recorded among women with uterine fibroids in our study. Findings of our study showed a significant relationship between BMI, Level of Education and development of fibroids (R= -0.196; χ^2 value= 29.618; p = 0.001) and (R= 0.399, χ^2 value= 92.923; p = 0.001) respectively. There was also a significant relationship between BMI and Level of Education (R = -0.150; χ^2 value= 33.556; p = 0.001). However, Age Group was not significantly associated with BMI (χ^2 value =2.279; p vale = 0.892) or development of fibroids (χ^2 value = 4.337; p-value = 0.227). Similar findings [42, 43] consistent with findings of our study reported that BMI and weight gain in adulthood was associated with risk of uterine leiomyomata. Moreover it is suggested that physical activity plays a key role in the development of fibroids [44] as well as becoming obese [38, 39] which is consistent with the findings of this current study that there is association between BMI and fibroid development. Attainment of higher education also is known to be among the risk factors of development of fibroids [45, 46, 47] consistent with our study (Table 7) that there is association between the level of Education and development of fibroids.

CONCLUSION

The results of this study have demonstrated the link between obesity and fibroid. The high prevalence of obesity in this population indicates the need for appropriate interventions for its prevention and treatment in Ghanaian women. The findings of this study show the importance of creating awareness on obesity and its implication on health including risk of fibroid among the Ghanaian populace in order to reduce the burden of disease that consumes a lot of scarce resources and leads to premature deaths. Health education and healthy life styles also need to be encouraged among the Ghanaian women. Managing the health of the Ghanaian woman is essential for the socio-economic growth of the country.

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Table 1: Age distribution of the patients

Age Grouping	Frequency	Percentage	Cumulative Percentage
20-29 years	172	29.5	29.5
30-39 years	238	40.8	70.2
40-49 years	108	18.5	88.7
> 49 years	66	11.3	100.0
Total	584	100.0	100

Table 2: Cross tabulation of participant's who were previously diagnosed with fibroids prior to the study and participants confirmed to have fibroids during the study

		Confirmed Diagnosis of Fibroids In Participants		
		Yes	No	Total
Previous Diagnosis of Participants Having Fibroids	Yes	154	53	207
		71.3%	14.4%	35.4%
	No	62	315	377

	28.7%	85.6%	64.6%
Total	216 100.0%	368 100.0%	584 100.0%

Table 3: Frequency and percentage of findings of the conditions of the uterus

Uterus condition	Frequency	Percentage
Pregnancy only	187	32.0
Normal/Empty	181	31.0
Fibroid only	184	31.5
Pregnancy with Fibroid	32	5.5
Total	584	100.0

Table 4: Age grouping of patients with fibroids

Age Groupings	Fibroid confirmed N (%)
20-29 years	67 (31.0)
30-39 years	93 (43.1)
40-49 years	39 (18.1)
□49 years	17 (7.9)
Total	216 (100.0

Table 5: Distribution of BMI of overall patients as well as patients confirmed with fibroids

	Frequency (Percentage) of patients	
Body Mass Index (kg/m ^{2})	Overall population	Fibroid confirmed patients

Classification	Range	N (%)	n (%)
Normal	18.5- 24.9	182 (31.2)	38 (17.6)
Overweight	25-29.9	176 (30.1)	80 (37.0)
Obese	> 30	226 (38.7)	98 (45.4)
Total		584 (100.0)	216 (100.0)

Table 6: Educational background of the overall patients as well as patients confirmed with fibroids

		Level of Education	
Population	N	High Education (Secondary and Above)	Low Education (Below Secondary)
Overall Population	584	286 (49.0)	298 (51.0 %)
Fibroid confirmed patients	216	162 (75.0%)	54 (25.0 %)

Table 7: Relationship and correlations between BMI and Fibroid development, Age Grouping and Fibroid development and Age grouping and BMI among study population

	Pearson's Correlation		**Pearson Chi Square**		
Variables	R Value	P-Value	**X^2 value**	df	P-Value

BMI and Development of Fibroids	-0.196	0.001	29.618	2	0.001
Level of Education and Development of Fibroids	0.399	0.001	92.923	1	0.001
BMI and Level of Education	-0.150	0.001	33.556	2	0.001
Age Grouping and Fibroids Development	0.071	0.087	4.337	3	0.227
Age Grouping and BMI	0.015	0.772	2.279	6	0.892

Figure 1: Prevalence of fibroid confirmed cases among the study population