(RESEARCH ARTICLE)

Influence of parity and Body Mass Index (BMI) on endometry thickness variation in women of Lokossa, Benin

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Abstract

The thickness of the endometrium is also an important parameter in the clinical management of women. It is often influenced by several parameters which are important to determine. This is why the present study looked at the factors that influence the variation in the thickness of the endometrium of women in Lokossa in the Republic of Benin. This descriptive, prospective and cross-sectional study concerns 166 women aged 15 to 40 in Lokossa. Ultrasound examination measured the thickness of the endometrium on the longitudinal section through the suprapubic route. Anthropometric parameters were taken by other equipment from each woman. Analysis of one-way proc glm ANOVA variants and Student-Newman-Keuls (SNK) tests identified factors associated with variation in endometrial thickness in women. At the end of the study, the minimum, average and maximum values of the thickness of the endometrium obtained are respectively Vm = 3.50 mm, VMoy = 6.73 ± 1.38 mm, MV = 10.00 mm during the pre-ovulatory phase, Vm = 7.30 mm, MV avg = 10.75 ± 2.11 mm, MV = 16.00 mm during the post-ovulatory period. There is an association between the thickness of the endometrium and parameters such as age, weight, Body Mass Index, parity. BMI has been found to be associated with changes in endometrial thickness. And this variation in the thickness of the endometrium of the woman's uterus is related to the number of deliveries. Thus, the higher the number of childbirth, the greater the thickness of the endometrium deprived.

Keywords: Determining factors; Endometrial thickness; Women aged 15 to 40; Lokossa commune; Benin

1. Introduction

Over the course of a woman's life and depending on her hormonal impregnation, the endometrium undergoes significant changes [1]. Normal endometrial thickness is 4 to 8 mm in the first part of the cycle and 8 to 14 mm in the second phase of the cycle [2](. In postmenopausal women, it should not exceed 5 mm without any hormone replacement therapy. This limit increases to 10 mm under hormone replacement therapy [3]. Beyond that, we will talk about functional or organic endometrial hypertrophy. During the menstrual phase, the endometrium appears as a doubling of the emptiness line. During the proliferative phase, its echostructure is hypoechoic, it becomes hyperechoic in the luteal phase. The assessment of the thickness of the endometrium is used as a biological marker of good regulation of the secretion of reproductive hormones [4]. Some authors have noticed a low pregnancy rate in women with a thin

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endometrium. The thickness of the endometrium is also an important parameter that is taken into account in the process of artificial insemination [5]. The thickness of a woman's endometrium is sometimes dependent on several parameters which are important to study.

2. Framework, material and study methods

2.1. Study framework

The present study took place at the Departmental Hospital Center of Mono (CHD / Mono) in the Municipality of Lokossa. The municipality of Lokossa has a total of five districts which are Lokossa, Agamè, Koudo, Houin and Ouèdèmè-Adja. It is bounded to the north by the municipality of Dogbo in Couffo, to the south by the municipalities of Athiémé and Houéyogbé, to the east by that of Bopa and to the west by Togolese territory (figure 1).
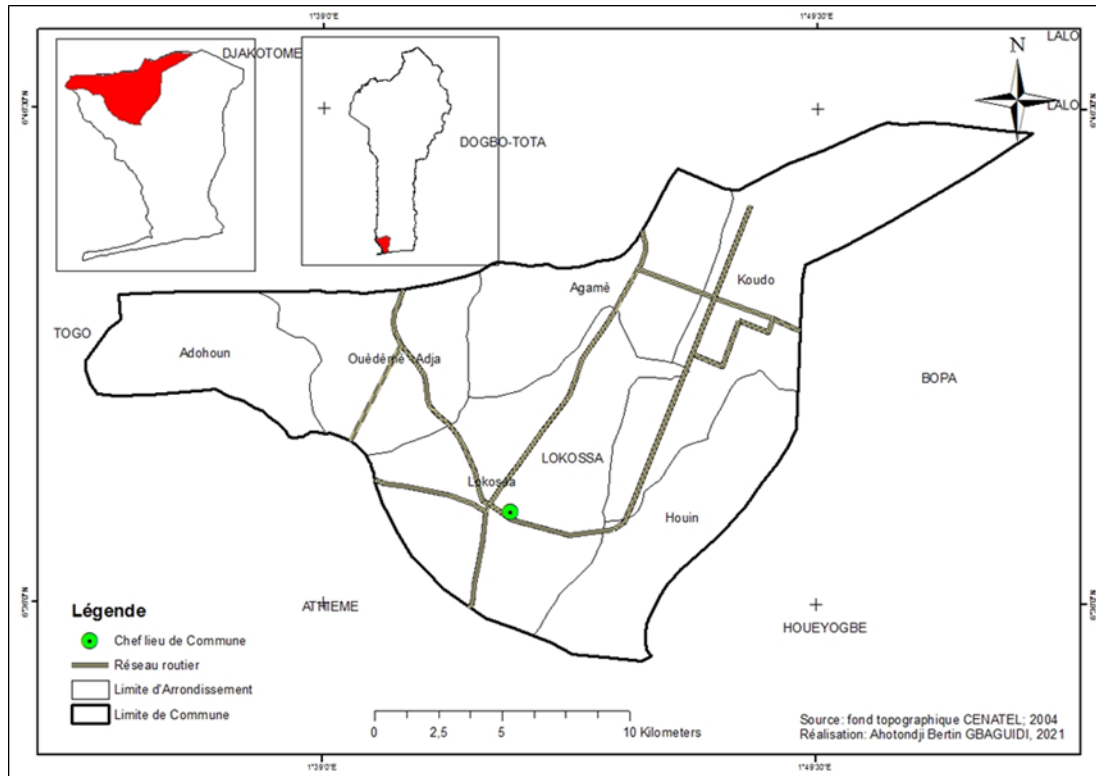
Figure 1 Geographical location of the Municipality of Lokossa

It covers an area of 260 km2 which represents 16% of the Mono area. According to the 2013 census, it has 104,961 inhabitants with 51.14% of women.

The Departmental Hospital Center of Mono (CHD-M) is a referral hospital. This is a public health facility with a social character. Its initial reception capacity is one hundred and twenty (120) beds and the number of staff is 218 agents.

2.2. Study materials and methods

2.2.1. Type and period of study

This is a cross-sectional, descriptive and prospective study that took place within the Departmental Hospital Center of Mono (CHD-M).

2.2.2. Study population

The study population includes women aged 15 to 40 regardless of the menstrual cycle and who attend the CHD-Mono maternity ward and those who come for a gynecological ultrasound examination in the medical imaging department of this hospital. A total of 166 women took part in this study.

2.2.3. Data collection equipment and tools

The data collection material consists of:

- a MINDRAY DC-6 brand ultrasound machine equipped with four probes: (3.5 MHz sector probe; 7.4 MHz linear probe, 6.1 MHz endovaginal probe; 2.2 MHz cardiac probe). In the present study, the 3.5 MHz sector probe was used for the examinations.
- a Sony reprographer to print the images.
- thermal paper.
- coupling gel;
- towels for patient hygiene;
- an investigation sheet.

Data collection technique

Anthropometric data was collected from care logs or directly by questionnaire (ages) and the other by taking measurements of weight and height. Morphological data were collected from measurements taken during gynecological ultrasound examinations. Finally, the body mass index (BMI) of the different women was calculated by the formula BMI = weight (kg) / height^2 (m)

The WHO BMI table was used as a reference to assess the excess weight of the women surveyed:

normal weight: if BMI between 18.5 and 24.9

- overweight: if BMI between 25 and 29.9
- Obesity class I: if BMI between 30 and 34.9
- Class II obesity (severe): if BMI between 35.0 and 39.9
- Class III obesity (massive): BMI greater than 40

Longitudinal pelvic ultrasound was the technique adopted.

Using an electronic marker, the following measurements were taken on the obtained gynecological ultrasound images:

- the length of the uterus, which is the distance between the midpoint of the outer wall of the fundus and the cervix;
- the anteroposterior thickness or widest diameter of the uterus which is the largest axis connecting the anterior outer wall and the posterior outer wall of the uterus. This axis is perpendicular to the previous one;
- The thickness of the endometrium is made on the sagittal section perpendicular to the cavity line between the two layers of the endometrium. When the cavity is distended by liquid, the thickness of each sheet measured separately is added (Richard J., n.d.);

To avoid inter-observer differences, all uterine measurements were performed on the same device by a single investigator.

Statistical data processing

The data collected were entered in Excel 2013 and then entered into the SPSS 21 software for descriptive analyzes and the production of graphs, then into the Statiscal Analyzes System version 9.2 (SAS 9.2) software for the analyzes of the variants. The mean values were then compared with each other using the Student Newman-Keuls test at the 5% threshold (level of probability).

3. Results

3.1. Presentation of the anthropometric factors of the women in the study

Anthropometric factors of women were collected in order to study their influence on variations in the thickness of their endometria. The results obtained during the present study are as follows.

Table 1 Anthropometric parameters of the women in the study

Anthropometric parameters	Min	Moy ±σ	Max
Age (years)	17.00	30.00±6.94	41.00
size (m)	01.40	01.65±0.08	01.78
Weight (Kg)	52.00	68.21±7.73	645.00
IMC	16.23	25.15±3.68	38.15

From the analysis of Table 2, it can be seen that the mean age of the women in the study is 30.00 ± 6.94 years. The youngest is 17 years old while the oldest is 41 years old. The average height of women is 1.65m and ranges from 1.40m to 1.78m. The average weight obtained is 68.21 kg, the minimum obtained being 52 kg. Regarding the BMI the calculated average value is 25.41 ± 3.68 kg / m2, the smallest and largest values are respectively 16.23 35.15 kg / m2

3.2. Distribution of women according to the Body Mass Index (BMI)

The Body Mass Index (BMI) is an indicator that can influence the change in the thickness of a woman's endometrium. Figure 2 shows the number of women according to the category of: normal weight, overweight, obesity I, obesity II and obesity III.
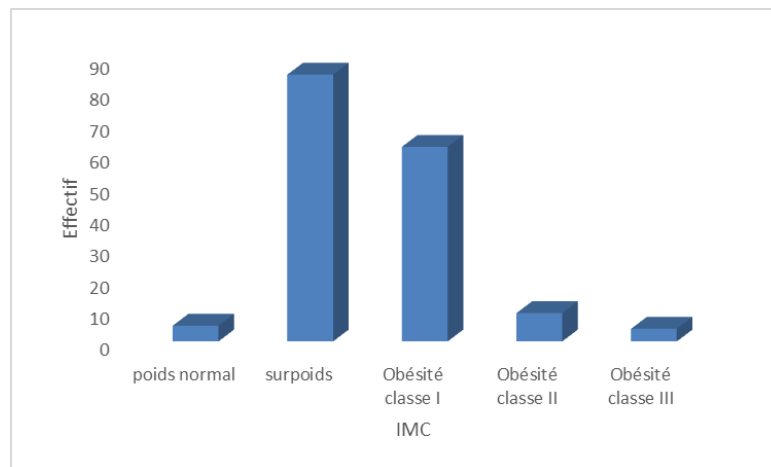
Figure 2 Presentation of women by weight category

As shown in figure 2, only 3% of the women in the study are normal weight, 51.5% are overweight, 37.6% are in a state of obesity class I, 5.5 are in the obesity class II and 2.4% are in obesity class III.

3.3. 3.3. Distribution of women by type of menstrual cycle (regular or irregular) and duration of periods

A woman's menstrual cycle is a very important indicator in the development of the thickness of the endometrium. Data on the regularity of the menstrual cycle of women were collected in order to study their influences on the variation of the thickness of the endometrium. The results obtained are shown in Table II.

Table 2 Distribution of women according to cycle regularity

CYCLE TYPE	EFF	FREQUENCES
Regular	133	79.51
1rregular	33	20.49
TOTAL	166	100.00

It emerges from the analysis of Table 2 that the majority of women. ie 79.51%. have a regulated menstrual cycle compared to 20.49% for the irregular cycle.

Regarding the duration of menstruation. the results of the work are illustrated in figure 3.
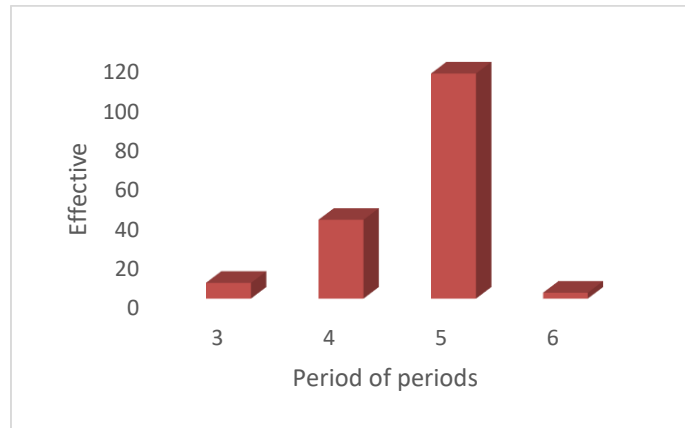
Figure 3 Distribution of women according to the length of their periods

It emerges from figure 3 that 69.28% of women have a period of menstruation of 5 days against 24.09%. who have a period of menstruation equal to 4 days. A minority of women have a period of 3 days or 6 days.

3.4. Endometrial thickness of women

The women's endometrial thickness was measured and classified according to the women's regular or irregular cycle. Thus. Table 3 presents the results of women having a regular cycle in relation to the different phases of the cycle.

Table 3 Variation in the thickness of the endometrium according to the different phases in women with a regular cycle

PHASES	Min	Moy ±σ	Max
Pre-ovulatory	3.1	06.76±1.80	10.10
Post-ovulatory	5.4	11.20±2.42	17.60

According to Table 3. the mean value of the endometrial thickness of women with a regular cycle is 6.76 mm during the preovulatory phase and 11.20 mm during the postovulatory phase. The minimum and maximum values of 3.1 mm and 10.10 mm (pre-ovulatory phase) and 5.4 mm at 17 (post-ovulatory phase).

With regard to women with an irregular cycle. Table 4 shows the variations obtained.

Table 4 Variation in the thickness of the endometrium according to the different phases in women with an irregular cycle

PHASES	Min	Moy ±σ	Max
Pre-ovulatory	3.5	06.73±1.18	10.00
Post-ovulatory	7.1	9.72±2.11	18.00

According to Table 4. the mean value of the endometrial thickness of women with an irregular cycle is 06.73 mm during the pre-ovulatory phase and 9.72 mm during the post-ovulatory phase. The minimum and maximum values of 3.5 mm and 10 mm (pre-ovulatory phase) and 7.1 mm to 18 mm (post-ovulatory phase).

3.5. Relations between anthropometric factors and the thickness of the endometrium of the women surveyed

The results obtained through the search for a link between anthropometric factors and the thicknesses of the endometrium of the uterus of women have been reported in Table 5.

Table 5 Relations between anthropometric factors the thickness of women's endometrium

Sources	DDL	Ficher Value			
		Age	Weight (kg)	Size (m)	IMC
Pre-ovulatory phase					
Endometrial thickness (mm)	51	1.19**	1.46**	0.21 ns	2.36**
post-ovulatory Phase					
Endometrial thickness (mm)	51	3.54***	1.77**	1.03 ns	6.77 ***

ns = non-significant relationship. * = significant relationship at the threshold 10 % .** = significant relationship at the threshold 5 % (admis). *** = significant relationship at the threshold (admis) of 1%.

The analysis of the variants shows that whatever the phase (pre or post-ovulatory). there is a highly significant effect ($p < 0.05$) of age. weight and BMI on the variation in thickness. of the endometrium. This seems to reflect that the thickness of the endometrium varies with age. weight and BMI. In contrast. size has no effect on the variation in the thickness of their endometrium.

Student-Newman-Keuls tests show that the oldest women aged between 25 and 40 years old and classified as obesity classes I. II and III have thickened endometres of mean values evaluated at 10.6 mm at the pre-ovulatory phase and 14.8 mm in the post-ovulatory phase. While the youngest women (17 to 24 years old) of normal weight or overweight. have an endometrium of 6.3 mm thick in the pre-ovulatory phase and 11.8 mm in the post-ovulatory phase.

3.6. Influence of parity and the menstrual cycle on the thickness of the endometrium

Parity. the type of menstrual cycle (regular or irregular) and the length of periods are factors that can also influence the change in the thickness of the endometrium.

The results of the one-way proc glm analyzes of variance (ANOVA) without repetition. provided the results. the data of which are shown in Table 6.

Table 6 Results of the analysis of variances on parity. regularity of the menstrual cycle. the duration of periods in women and the thickness of their endometres

Sources	DDL	Ficher Value		
		Type de cycle	Durée des menstrues	Parité
Pre-ovulatory phase				
Endometrial thickness (mm)	51	0.57ns	1.14ns	4.89***
Post-ovulatory phase				
Endometrial thickness (mm)	51	0.48ns	0.99ns	3.82***

ns = non-significant relationship. * = significant relationship at the threshold 10 % .** = significant relationship at the threshold 5 % (admis). *** = significant relationship at the threshold (admis) of 1%.

Analysis of Table 6 shows that parity has a highly significant effect on the change in endometrial thickness in the pre- and post-ovulatory phase. Thus. it can be said that the thickness of the endometrium varies depending on the number of actual deliveries. As for the regularity of the cycle and the duration of periods. they have no significant effect on the variation of the endometrium.

Student-Newman-Keuls tests show that women who have had fewer deliveries (between 1 and 2) have thicker endometres (8.9 mm in the pre-ovulatory phase and 14.6 mm in the post-ovulatory phase). The others who have had at

least three (03) deliveries have less thickened endometres (5.8 mm in the pre-ovulatory phase and 11.4 mm in the post-ovulatory phase).

4. Discussion

Of the 166 registered women. the most represented age group was [25. 30 years [. This shows that the women surveyed are young people of childbearing age. Our results are consistent with those of Sifer C. et al. (2009) who carried out a study in a population of young women on the influence of the endometrium and embryonic implantation site in "in vitro" fertilization.

In the present study. the majority of women were overweight or obese. These results are comparable to that of the WHO (2016) which found in a study of 182 women. a proportion of only 5% who have a weight close to normal. Likewise. in their research work. [6] Yessoufou et al. (2012) found similar results in female students of reproductive age at the National Medico-Social Institute (INMeS) in Benin. The results obtained in 2001 and 2008 by the Strategic Plan for the Development of Food and Nutrition in all departments of Benin. on a population of childbearing age show a BMI ≥ 33.9% and 37% respectively (overweight).

Compared to the research of the influence of anthropometric factors (age. height. weight and BMI) on the thickness of the endometrium during the pre and post-ovulatory phases. the analysis of the variants showed a highly significant effect of age. weight and BMI on the thickness of the endometrium. These results are consistent with those obtained by [7] Opolskiene G. et al. (2007) on a population of Tunisian women. A regression analysis conducted by [8] Maatela et al.. 1994 on endometrial thickening in asymptomatic postmenopausal women found an increased risk of pathologic findings in the presence of obesity (BMI> 26) and late menopause. [9] Linkov F. et al. (2008) conducted a study of endometrial thickness in women who received a dose of estrogen. This study found a link between BMI and endometrial thickness. In a 1993 study of endometrial thickness determined by ultrasound in 300 asymptomatic postmenopausal women. [10] Andolf et al. (1993) found that endometrial thickness was significantly correlated with 'BMI.

Regarding the association between menstrual cycle regularity. period length. parity and endometrial thickness. analysis of variants found no effect of cycle type and size. duration of periods on the thickness of the endometrium. However. a highly significant effect of parity on the change in endometrial thickness was determined. The studies carried out by Kehila M. et al (2010) on the influence of endometrial thickness on embryonic implantation in in vitro fertilization in Tunisia have shown that the variation in the thickness of the endometrium of the The woman's uterus is related to the number of childbirths.

5. Conclusion

Endometrial thickening seen on ultrasound in women is very important for medical management. The results showed that age. weight. BMI and parity are the factors that significantly influence the thickness of a woman's endometrium. The Student Newman Keuls (SNK) tests made it possible to identify among these studied parameters the most determining in the variation of the thickness of the endometrium. BMI has been found to be associated with changes in endometrial thickness. And this variation in the thickness of the endometrium of the woman's uterus is related to the number of deliveries. Thus. the higher the number of deliveries. the greater the thickness of the poor endometrium.

Compliance with ethical standards

Disclosure of conflict of interest

The writing of this manuscript is without conflict of interest. Each of the authors contributed to the success of this manuscript.

Statement of informed consent

All actors who contributed to this study gave their consent and agreed to participate in this research

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