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Cardiovascular parameters and physical activity of pregnant women in 3 hospitals in the city of Douala (Cameroon)

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ABSTRACT

Physical inactivity and a sedentary lifestyle are linked to the occurrence of non-communicable diseases, which in some women can lead to maternal and fetal complications. This study aimed to determine the effect of physical activity on cardiovascular parameters in pregnant women. A cross-sectional study was conducted in three district hospitals (Deido, Logbaba, and City of palm trees) between October 2023 and February 2024. Physical activity levels were assessed using a questionnaire adapted for pregnant women. Cardiovascular parameters recorded included overweight and obesity, hyperglycemia, and hypertension. A total of 205 women were included in the study. The mean age was 28 ± 5 years. Sedentary lifestyles accounted for 40.4%, obesity for 35.1%, and overweight for 34.1%. Elevated blood pressure was more prevalent in the third trimester of pregnancy compared to the second trimester. Nearly 57.6% had a level of light (43.9%) or moderate (13.7%) physical activity. Only the prevalence of $SBP \geq 140$ mmHg, sedentary behaviour, and $DBP \geq 90$ mmHg varied ($p = 0.0001$) between physical activity levels. Physical activity has demonstrated its protective effect on certain cardiometabolic risk factors in pregnant women. Therefore, promoting physical activity and combating sedentary lifestyles is essential for pregnant women to prevent the onset of cardiometabolic diseases.

Keywords: Gestational hypertension; Gestational diabetes; Physical activity; Pregnant women; Cameroon

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INTRODUCTION

Non-communicable diseases (NCDs) cause more deaths than all other causes of mortality combined worldwide¹. Often wrongly considered a problem of high-income countries, they represent an equally, or even more, heavy burden for low- and middle-income countries. More than 80% of premature deaths (occurring before the age of 70) due to NCDs are recorded in these countries with serious socioeconomic consequences².

This high rate would be due to the increase in risk factors such as obesity, high blood pressure, hyperglycemia and dyslipidemias³. But age, sex, alcohol and tobacco consumption, poor diet, sedentary lifestyle and physical inactivity are also implicated in this rise⁴.

Today, physical inactivity and sedentary behaviour are considered the fourth leading risk factor for mortality worldwide⁵. These two conditions, combined with poor diet, are considered major determinants of obesity⁶, which, along with being overweight, constitute significant risk factors for cardiovascular disease and diabetes⁷. The prevalence of hypertension, diabetes and obesity is becoming very alarming⁸. It puts hypertension (35%) in the foreground, followed by obesity (15%) and diabetes (6%)^{9,10}. However, a small proportion of the world's population reaches the recommended level of physical activity (PA) due to lifestyle changes with a decrease in time spent engaging in physical activities and an increase in sedentary activities (television, telephone, computers, etc.); this would justify the growing prevalence of overweight and obesity¹¹. In the recommendations relating to standards for regular physical activity published by the WHO⁷, it is established that a minimum cumulative weekly volume of 150 minutes of physical activity contributes to the primary, secondary and even tertiary prevention of non-communicable diseases as well as to the improvement of quality of life including in pregnant women⁷.

Pregnancy is often seen as a time when a woman should rest and limit her activities. Physical activity was, until recently, perceived as a possible source of complications during pregnancy¹². During their pregnancies, women reduce their physical activity and adopt poor eating habits and sedentary behaviors¹³. This exposes them to various cardiovascular risks such as: obesity, hyperglycemia and high blood pressure.

In Cameroon, very little data is available on the preventive effects of physical activity on cardiovascular risk factors during pregnancy, which limits awareness among pregnant women. Thus, regular physical activity could be of vital importance in regulating blood sugar, blood pressure and body mass index during pregnancy. Given the importance of women in today's society, especially regarding the continuation of life, a study was conducted to determine the level of physical activity practice among pregnant women in consultation at certain hospitals in the city of Douala. In order to better appreciate the positive effects of

physical activity in the prevention of cardiovascular diseases and their risk factors, a survey evaluating the level of practice of these physical activities was conducted.

MATERIALS AND METHOD

Framework and type of study

The study was conducted in a hospital setting in the Littoral region of Cameroon, more specifically in 03 Districts (Douala I, Douala III and Douala V) covered by the Wouri department. Wouri is one of the four departments that make up the Littoral region, with Douala as its administrative capital. Still considered the economic capital of Cameroon, Douala is a cosmopolitan city comprising several private and public health institutions and is full of referral hospitals, first category hospitals and district hospitals. This study was conducted cross-sectionally in 03 district hospitals between October 2023 and February 2024. These included the district hospitals of Deido, Logbaba and Palm trees.

Participants and sampling

The study consisted of pregnant women who came for prenatal consultations in the various district hospitals of the city of Douala and who did not have any contraindications to engaging in physical activity. The participants who voluntarily took part in the study were interviewed individually and invited to participate in determining cardiovascular diseases and their risk factors. They had also completed the pregnancy physical activity questionnaire (PPAQ)¹⁴, which allows us to estimate the intensity of the subjects' PA and to classify them as low, moderate or intense level. Women who submitted incomplete or incorrectly completed questionnaires were excluded from the study. Initially, 210 participants from the various selected hospitals were contacted and among them, 05 (02.38%) questionnaires were excluded due to incomplete data. In total, two hundred and five (205) participants were selected for the study and constituted our final sample. The sampling was done randomly, thus allowing us to interview all the women. The minimum sample size of 163 was calculated using the Lorentz formula¹⁵.

Data collection

The data were collected using a structured questionnaire consisting of two sections. The first section contained information on sociodemographic and personal characteristics, and the hospital concerned. The second to assess the level of low-intensity (walking), moderate-intensity, intense physical activity, and time spent sitting reported by the participant in the week preceding the study.

Taking parameters and diagnostic criteria

The study included subject identification using an individual form and the collection of personal and family history, as well as toxicological eating habits. The height of the barefoot

subjects, in a standing position, was measured using a graduated stadiometer, the weight using the Terraillon brand impedance meter balance (BEG67317, BR, France). The body mass index (BMI) was calculated using the formula $BMI = \text{weight}(\text{kg}) / (\text{height}(\text{m}))^2$ and allowed us to define overweight for $BMI \geq 25$ and $< 30 \text{ kg/m}^2$, and obesity for $BMI > 30 \text{ kg/m}^2$ ¹⁶. Physiological parameters (blood pressure and heart rate) were measured at rest for at least 15 minutes, on the left arm of the seated subject using an OMRON M3 Plus (Health Care CO. Ltd, Kyoto, Japan) electronic cuff blood pressure monitor approved by the WHO. A blood pressure $\geq 140/90 \text{ mmHg}$ ¹⁷ was considered to be high blood pressure (BP), since a single measurement cannot be used to declare a subject hypertensive. Capillary blood glucose was measured from a drop of blood taken from the index finger using the ACCU-CHEK AVIVA electronic glucometer (Roche Group Laboratory Equipment 207 W, USA) and subjects with a blood glucose $\geq 1.26 \text{ g/L}$ ¹⁸ were assumed to be hyperglycemic. At the end of the parameter measurement, participants were asked to complete the PPAQ¹⁴ questionnaire to assess their level of physical activity practice by calculating the score obtained in METs (Metabolic equivalent Task) minutes/week. This questionnaire classifies subjects by activity level: low, moderate, and intense. Sedentary behaviour, on the other hand, was measured by the amount of time spent sitting per day.

Statistical analyses

Analyses were performed using StatView 5.0 software (SAS Institute, Inc., IL, USA). Qualitative variables were presented as percentages (%). Quantitative variables were presented as means \pm standard deviations (SD). The normality of quantitative variables was verified using the Kolmogorov-Smirnov test. The Student's t-test for unpaired samples was used to compare means, while the chi-square test was used to compare proportions. One-way ordered analysis of variance (ANOVA) and Fisher's post-hoc test were used to compare anthropometric and physiological parameters according to the participants' trimesters of pregnancy. The significance level was set at $p < 0.05$.

Ethics and professional conduct

Ethical approval and administrative authorisation were granted by the Institutional Ethics Committee for Human Health Research at the University of Douala (No. 3991 CEI-UDo/09/2023/M) and by Regional Delegation of Public Health of Littoral (No. 0449/AAR/MINSANTE/DRSPL/BCASS). Participants were provided with an informed consent form and a background questionnaire to accompany the physical activity questionnaire. Parameters and Blood samples were taken in strict confidence and on an anonymous basis.

RESULTS AND DISCUSSION

General characteristics

Of the 205 women included in the study, more than half (57.6%) were discharged from the Deido District Hospital, followed by the District Hospital of Palm trees (24.8%). The average age of the participants was 28 ± 5 years. The majority were under 35 years old, representing 89% of the population. It was observed that women in their third trimester of pregnancy (41.5%) were the most represented, followed by those in their second trimester (39%).

Physiological and weight parameters

Table I opposite shows the representation of blood pressures and heart rate of women.

Table I: Physiological parameters of the study population.

		Total (Aver\pmSD)	T1 (Aver\pmSD)	T2 (Aver\pmSD)	T3 (Aver\pmSD)
Parameters	SBP (mmHg)	115 \pm 13	116 \pm 10	114 \pm 14	115 \pm 14
	DBP (mmHg)	70 \pm 9	73 \pm 8	69 \pm 9	70 \pm 9
	CF (bpm)	93 \pm 12	91 \pm 11	94 \pm 13	94 \pm 12

T1 : trimester 1 ; T2 : trimester 2 ; T3 : trimester 3 ; aver : average ; DS : standard deviation ; PAS : Systolic Blood Pressure ; PAD : Diastolic Blood Pressure, CF : cardiac Frequency ; bpm= beats per minute.

Blood pressure decreased slightly from the first trimester (73 \pm 8 mmHg) to the third trimester (70 \pm 9 mmHg), while heart rate increased (Table I). Furthermore, 29.7% had a normal weight status, compared to 35.1% who were overweight and 34.1% who were obese.

Although no statistical difference was noted according to the quarters, overall, more than half of the participants were overweight (35.1%) and obese (33.7%) and were more represented in quarter 3 with 41.7% of women overweight and 44.9% of women obese.

Variations in blood glucose, hypertension, and heart rate

The figure 1 below highlights the relationship between fasting blood glucose and the trimesters of pregnancy.

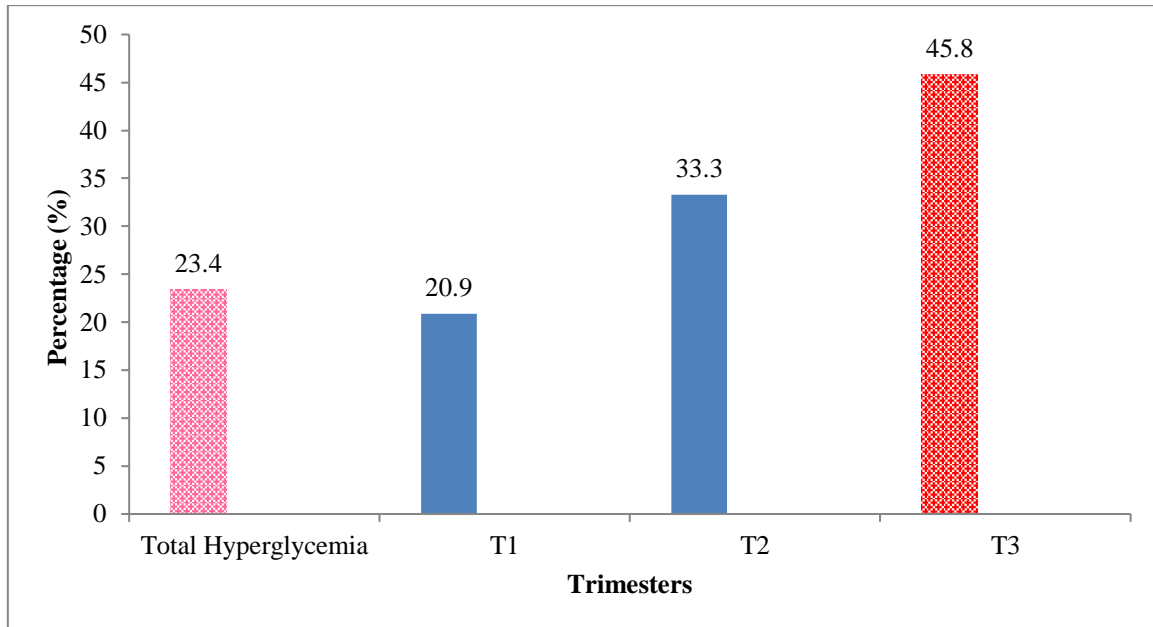


Figure 1: Hyperglycemia according to the trimester of pregnancy

T1=trimester 1, T2= trimester 2, T3=trimester 3

Hyperglycemia accounted for 23.4% of cases (Figure 1), with nearly half occurring in the third trimester (45.8%), twice the total rate. Gestational hypertension was present in 2.9% of cases, with equal proportions of elevated diastolic and systolic blood pressure observed more frequently in the third trimester (Figure 2). Similarly, total tachycardia was also present in 23.4% of cases, with higher rates in the second (37.5%) and third (47.9%) trimesters. Figure 2 opposite shows the distribution of gestational hypertension according to the trimester.

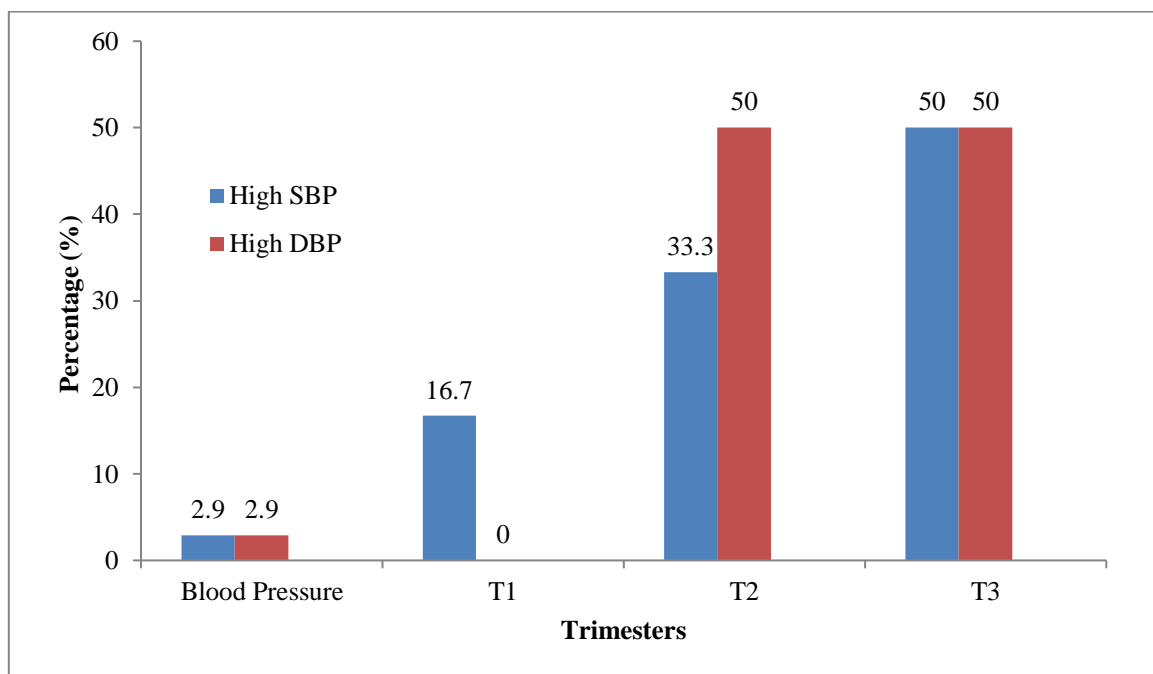


Figure 2: High blood pressure according to the trimester of pregnancy

T1: trimester 1 ; T2: trimester 2; T3: trimester 3; SBP : Systolic Blood Pressure; DBP: Diastolic Blood Pressure

Participants' level of physical activity

The level of physical activity practice of the participants is represented by figure 3 opposite.

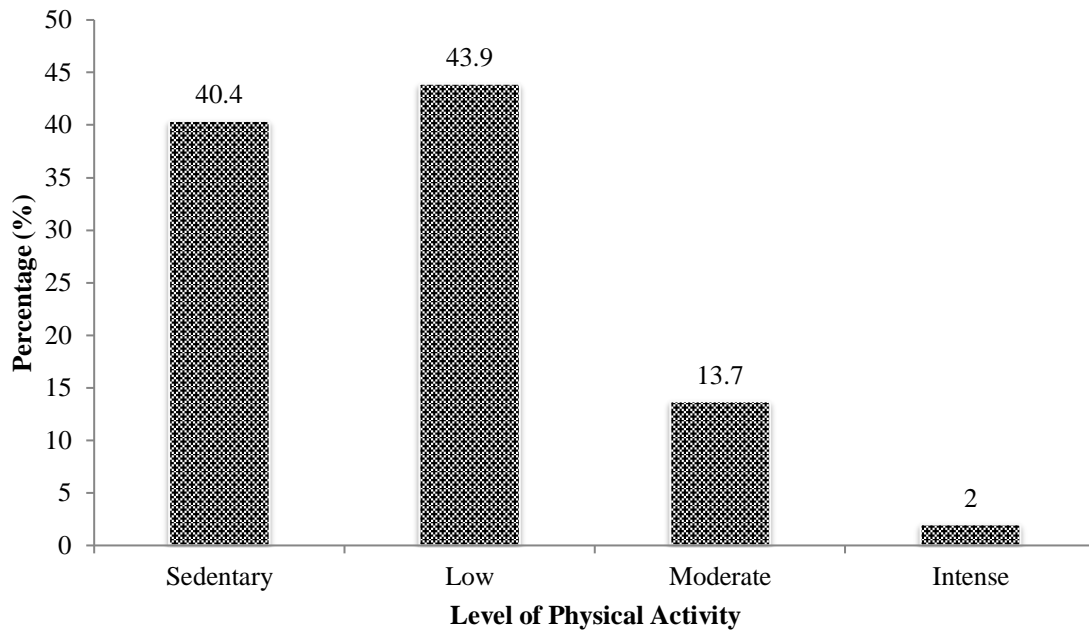


Figure 3: Physical activity level of pregnant women

The results show that 40.4% of women were sedentary and 43.3% engaged in light physical activity. Very few reported moderate (13.7%) or intense (2%) activity levels. By trimester of pregnancy, the first trimester showed only sedentary women (19.5%), while all were active in the third trimester, with 2% engaging in intense activity, 13.7% in moderate activity, and 25.9% in light activity.

Although no statistical difference was observed, it appears that more overweight women were sedentary (43.05%) while obese women engaged in light physical activity (47.82%).

Relationship between level of physical activity, hyperglycemia and hypertension.

Women with hyperglycemia (43.75%) engaged in light physical activity, and only 4.2% engaged in intense activity (Figure 4). In contrast, 66.67% of women with elevated systolic blood pressure (SBP) and 60% with elevated diastolic blood pressure (DBP) engaged in light to moderate physical activity.

The relationship between the level of physical activity and hyperglycemia is shown in Figure 4 below.

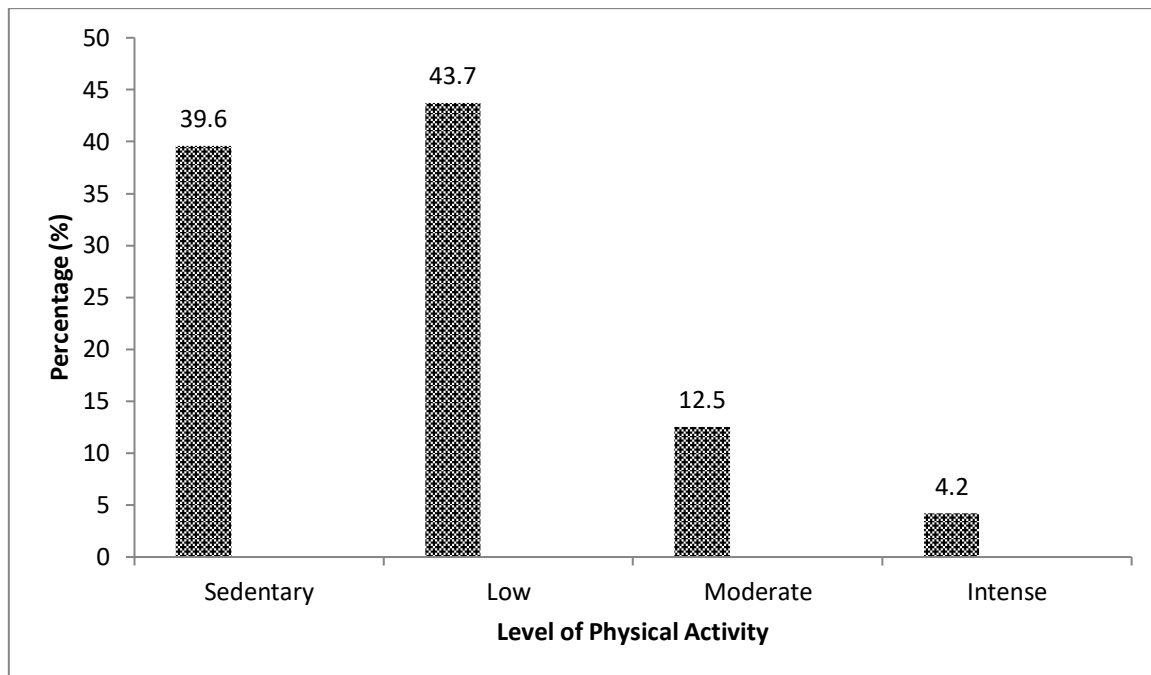


Figure 4: Relationship between level of physical activity and hyperglycemia.

DISCUSSION

The participants in our study had an average age of 28 ± 5 years, a very young population with a lower cardiovascular risk, unlike the study by Bagarou¹⁹, which had an average age of 35 years. This difference could be explained by the early sexual activity of our population, especially in urban areas like the city of Douala. There may also be social pressure encouraging early childbearing in our environment, since the chances of conception decrease significantly after age 38²⁰.

After age 40, pre-existing conditions are more frequent, with overweight and obesity rates of 35.1% and 34.1%, respectively. These results are similar to those obtained by Dovonou²¹ and Iwuala²², who respectively associated increased body fat with female sex in the third trimester, and lower than those of Ahoukeng²³, who found a high prevalence of 48.9%. Most body fat indicators (BMI, waist circumference, and body fat percentage) were significantly higher in women in the third trimester compared to women in the second trimester. Indeed, according to Amougou²⁴, with age, there is an increase in adiposity, the individual is less physically active, and there is a decrease in lean mass in favor of adipose tissue. Pregnant women tend to be less physically active²⁵.

Regarding blood pressure, our results showed a prevalence of gestational hypertension of 2.9%, which was lower than that of Bagarou¹⁹, who obtained 12.3%. This was despite the fact that 50% of these hypertensive participants were in the 30-39 age group. However, our systolic blood pressure (SBP) values decreased slightly from the first trimester (116 mmHg) to the third trimester (115 mmHg), which was consistent with the work of Green²⁶. Indeed, in

their study, they found that SBP increased from 112 mmHg to 120 mmHg between the 12th and 40th weeks. As for resting heart rate, the values increased as the trimester progressed from the first (91 ± 11 bpm) to the third (94 ± 12). This is consistent with some studies that have shown a maximum increase between the 25th and 28th weeks of pregnancy, with blood flow 30% to 50% higher than normal²⁷. Pregnancy is accompanied by major changes in the cardiovascular system; in particular the heart is more heavily used, because with the growth of the fetus, a greater quantity of blood would have to be brought to the uterus which would receive one-fifth of the pregnant woman's blood volume²⁸.

Regarding blood glucose, the prevalence of hyperglycemia was 23.4%. This percentage is significantly higher than that obtained by some authors who found a prevalence varying between 5% and 17% in Cameroon²⁹. This high rate could be explained by the fact that pregnancy is a stressful period that involves the secretion of certain hormones, such as cortisol, a hyperglycemic hormone that leads to an increase in blood sugar levels. The relatively young average age of the population could also encourage them to consume hyperglycemic products, especially during the last trimester. Furthermore, along the same lines, Saoucha³⁰ confirmed an increase in blood sugar levels as the pregnancy progresses. The progressively reduced sensitivity of maternal tissues to insulin is also thought to be the cause of this increase, since insulin no longer exerts its action properly on liver cells. According to Jovetti³¹, during gestation, women undergo a modification of their energy and nutritional metabolism to redirect some of the substrates towards the growing fetus; this insulin resistance is a metabolic adaptation triggered by several maternal hormones produced by the placenta and the pituitary gland, as well as by adipokines and cytokines.

The level of physical activity was 43.9% light and 13.7% moderate, with a sedentary rate of 40.4%. These results are lower than those of Seguin³², who found 57.4% moderate activity and 36.6% sedentary behaviour during pregnancy. Indeed, many women consider pregnancy as a period of rest, thus limiting any physical activity with a high metabolic equivalent such as: walking for the purpose of physical activity, cycling, jogging, heavy housework (washing and sweeping the floor), but advocating activities with a low metabolic equivalent, such as: shopping, taking care of children (washing, dressing, feeding) and the elderly, watching TV, working in front of a computer or being on their phone, preparing meals, work activities. However, an increase in physical activity levels was observed between the second and third trimesters. This is thought to be due to the numerous tips provided by healthcare professionals during prenatal visits. In contrast, Besnier³³ observed a significant decrease in physical and sporting activities during the first and second trimesters, based on the morphological changes in the breasts, feet, and abdomen that occur throughout pregnancy.

The increase in body mass would undoubtedly lead to musculoskeletal changes³⁴. Furthermore, the increase in the size of the breasts, uterus and fetus would also cause a forward shift in the center of gravity, which can lead to balance problems, particularly in the third trimester.^{35,36}

Although the population in our study was relatively young, they exhibited high rates of hyperglycemia, gestational hypertension, and especially obesity and sedentary lifestyles. The benefits of physical activity on these parameters will have a considerable effect, supported by adherence to healthy lifestyle and dietary measures during and after pregnancy.

CONCLUSION

Women with low levels of physical activity and sedentary lifestyles had a higher incidence of gestational hyperglycemia, while those with moderate to intense physical activity had a lower incidence. Furthermore, women with intense physical activity had lower blood pressure. Therefore, promoting physical activity and combating sedentary lifestyles is essential for pregnant women to prevent gestational diabetes and hypertension.

AUTHORS CONTRIBUTION

All authors contributed to the drafting of the manuscript

DISCLOSURE

No potential conflict of interest relevant to this article was reported.

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