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Research Article

HYPOPRESSIVE ABDOMINAL GYMNASTICS AND THE MANAGEMENT OF POST-PARTUM LOW BACK PAIN: CASE OF 64 PRIMIPARES UNDER 20 YEARS OF PORTO-NOVO

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Abstract

One of the consequences of pregnancy and childbirth is postpartum low back pain. Its prevalence remains very high both in postpartum women (2/3) and in the general population. This musculoskeletal pain can persist for up to three (3) years, that is, until the arrival of a new pregnancy. It is therefore necessary to manage this pain. All the works in the literature are unanimous on the fact that there can be no treatment for low back pain without strengthening the abdominal and spinal muscles. However, because of the co-contraction of the abdominal and pelvic muscles, the abdominal muscles can only be strengthened by hypopressive techniques on the perineum. This experimental comparative study brought together 64 continuous primary low back pain women who gave birth by the vaginal route. Our objective is to assess the effectiveness of hypopressive abdominal gymnastics in the management of postpartum lumbar pain in women under the age of twenty from the city of Porto-Novo. The results showed that hypopressive abdominal gymnastics promotes the toning of the abdominal strap and the significant reduction in pain and functional disability linked to low back pain. There is no doubt that hypopressive gymnastics is a very effective method of managing low back pain in the postpartum period.

Keywords: Hypopressive gymnastics, Low back pain, Postpartum, Primiparous, Benin.

INTRODUCTION

The abdominal muscles form restraining arches of the closed abdomen (anteriorly by the abdominal fascia and posteriorly by the thoracolumbar fascia) which stabilize the spine (McGill *et al.,* 2003). The ability of the abdominal muscles to stabilize the spine decreases during pregnancy and remains diminished beyond eight (8) weeks after delivery (Gilleard and Brown, 1996). Indeed, pregnancy causes great weakness of the abdominal muscles, a shortening of the spinal muscles and a reduction in the fluid of the intervertebral discs (Darwich and Diwan, 2009). This weakness of the abdominal muscles is the cause of low back pain during and after pregnancy (Fast *et al.,* 1990). After delivery, the abdominal right diastasis increases this weakness, thereby increasing the stress on the spine which becomes hyperlordosis (Contamin *et al.,* 1970). In young women, these lower back pains can persist for more than three years postpartum (Bakker *et al.,* 2013) and are often accompanied by functional limitation (Rebollo *et al.,* 2016). Low back pain, which is often overlooked because it is believed to be a normal consequence of pregnancy, can however be a serious problem in one third (1/3) of these women (Terzi *et al.,* 2015). Indeed, it can compromise the ability to work, sexual activity, but also affect the quality of daily life (Fatton *et al.,* 2007). In addition, the risk of these pains lasting until a new pregnancy is extremely high (Terzi *et al.,* 2015). It is therefore necessary to resort to low back pain rehabilitation which cannot be done without strengthening the abdominal and spinal muscles (Dufour *et al.,* 2010). According to Ostgaard (Ostgaard and Zetherström, 1997), the management of this pain should be carried out the first six months after childbirth. Classic abdominal exercises are a dangerous perineal risk factor for postpartum women because these physical practices cause a significant increase in intra-abdominal pressure (Valancogne, 2001). In fact, the danger is the risk of the appearance, in the medium and long term, of complications in the spine (herniated disc, low back pain, etc.) as well as in the urogynecological sphere (incontinence) (De Gasquet, 2004). The shortening of the straight lines, which brings the shoulders and hips closer together, is harmful to the back. It accelerates the descent of organs, which can also induce incontinence. All these deleterious effects of conventional abdominal exercises have led health professionals to look for other methods of abdominal strengthening. It is a question of toning the trunk by emphasizing the strengthening of the muscles of the abdomen by reverse breathing (performing exercises during the expiratory phase and not during the inspiration phase) (Tchoumak, 2012). Abdominal gymnastics which does not generate pressure, respects and preserves all the abdominal, perineal, diaphragmatic connective structures, and corrects spinal statics (Tchoumak, 2012). Its practice causes a drop in intra-abdominal pressure, the role of which is crucial for the reflex activation of the pelvic floor and the abdominal strap (De Gasquet, 2008). To our knowledge, no study has been done on the effectiveness of this gymnastics in the management of postpartum low back pain and the functional disability caused by it in primiparas under 20 years old. In this study, our objective is to study the effect of hypopressive abdominal techniques in the management of postpartum lumbar pain and functional disability in young primiparous continent women under 20 from the city of Porto-Novo. It will be a question of evaluating and analyzing the evolution of the values of the intensity of lumbar pain in the group of hypopressive abdominal

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gymnastics and those of the control group. And the comparison of the values obtained in the two groups, will allow us to check if the ten sessions of hypopressive abdominal gymnastics influenced the intensity of the lumbar pain and the functional incapacity in our subjects.

MATERIALS AND METHODS

We took into account in the subject his lumbar pain, his functional capacities, his physical state, his socio-professional situation but also his psychological state (ANAES, 2003). To better adapt these hypopressive techniques, we must at first glance distinguish pain of pure pelvic origin from that of spinal origin. Muscle and ligament structures that suffered during childbirth were minimized. This requires structuring the exercises according to their resentment on the perineo-sphincter region and on the abdominal strap (Recommandation de l'ANAES, 2003). In this rehabilitation special attention was paid to balancing the pelvis and normalizing the joints of the pelvic bones (Leclerc, 2006). Particular vigilance for the protection of the spine has been established because it was requested during pregnancy and is still postpartum.

Experimental setting and type of research

This is an experimental study which took place in the city of Porto-Novo (Republic of Benin). The Biomechanics and Performance Laboratory of the National Institute of Youth, Physical Education and Sport (INJEPS), the Sport-Health-Service Center, CHUDO-PN, Attakè health center, health center Arcarde de Tokpota and the Louis Pasteur clinic served as support for the experiment.

Study population

A woman was considered to have low back pain after pregnancy in the present study if she gave a positive answer to the specific question on the location of the pain, which included the marking of the affected area on a drawing included in the questionnaire (Mogren and Pohjanen, 2005).

Table I. characteristics of the subjects of the study

	Experimental group	Control group
Age (average in year)	17,27 ± 1,00	17,38 ± 1,26
Weight (average in Kg)	57,08 ± 8,97	55,2 ± 7,34
Size (average in centimeter)	1,58 ± 0,22	1,49 ± 0,63
Body mass index (BMI) (kg/m^2)	22,86	24,86
Feeling of low back pain during pregnancy	100 %	100 %
Type of issue	100 % low way	100 % low way
Professional activity	Student : 14 Seamstress : 8 Any : 9	Student : 9 Trade : 11 Computer training: 5 Any : 8
Postpartum duration (Recruitmentperiod)	3 mois à 3,5 mois : 19 3,5 mois à 4 mois : 12	3mois à 3,5 mois : 15 3,5 mois à 4 mois : 18

And if it succeeds in identifying the pelvic pain of the lumbar pain by giving a positive answer to the question of knowing if the subject feels real pain in the lower back or pelvic pain (Mogren and Pohjanen, 2005). The study involved a group of 64 continuous primiparous women under the age of 20 with low back pain, the causes of which are pregnancy and childbirth. They were recruited three (3) months after delivery. They were divided into two groups: a group of 31 primiparas who received a program to strengthen the abdominal strap using hypopressive abdominal techniques and a second group of 33 primiparas who received no treatment. Table I presents the characteristics of the two study groups. The average age of the subjects in our sample is 17.33 ± 1.12 years. The average weight is 56.14 Kg ± 1.32 and the average size is 1.53 m ± 0.06. The average body mass index (BMI) is estimated at 23.98 kg / m2.

Sampling methods and techniques

We used a non-probabilistic method. Indeed, the reasoned choice technique was used for the constitution of the sample. The choice of this technique is based on the following reasons:

- Eliminate as much as possible the confounding variables;
- To exclude women who contracted low back pain before pregnancy;
- To remove those whose origin of low back pain is not related to pregnancy and childbirth (distal hernia, strenuous socio-professional activities, obesity and all conditions that can cause low back pain);
- To be able to separate women suffering from pelvic pain from those suffering from lower back pain and from those who have contracted posterior back pain;
- And retain only those who have received the approval of their gynecologists or midwives.

Criteria

a- Inclusion criteria

- Be a primiparous continent less than 20 years old and reside in Porto-Novo;
- Suffer from low back pain caused by pregnancy and / or childbirth;
- Be at the third month (at least) and the fourth month (at most) after delivery;
- Be authorized by a health specialist (gynecologist or midwife) to do physical activities;
- Give written consent.

b- Criteria for non-inclusion

- Women who gave birth by cesarean section;
- Suffer from obesity;
- Those whose causes of their low back pain do not arise from pregnancy and childbirth;
- Suffer from herniated disc, vertebral static disorder, infection, osteoarthritis, arthritis, osteoporosis, fractures, kidney stones, or even pancreatitis.

c- Exclusion criteria

- Being under medication and analgesic treatment;
- Successively miss three (3) hypopressive abdominal gymnastics sessions;
- Have high blood pressure diagnosed;
- Refusal to continue the experiment.

Data collection equipment and techniques

For taking data in the field, we used the following equipment:

- A questionnaire adapted to collect anthropometric data on subjects, socio-professional activities and on the history of pain contracted before pregnancy;
- A SANITAS SBM 09 brand blood pressure monitor allowed us to take the subjects' blood pressure during the first session;
- A record of the history of pain (given by VAS) at the start of the 10 sessions of the program;
- The Oswestry Low Back Pain Disability (ODI) questionnaire was used to assess the functional disability caused by postpartum lumbar pain;
- A Hana brand bathroom scale with a maximum capacity of 150 kg and 0.1% accuracy. was used to assess the subjects' body mass;
- A measuring rod graduated from 0 to 200 cm made it possible to measure the size of the subjects to the nearest millimeter.
- A stopwatch for taking the duration of the work sequences;
- The intensity of pain was measured with a visual analog scale and the Saint-Antoine questionnaire (QDSA). The EVA being a strip with a cursor placed between "no pain" and "maximum pain"; graduated from zero to one hundred millimeters.

Data collection strategies

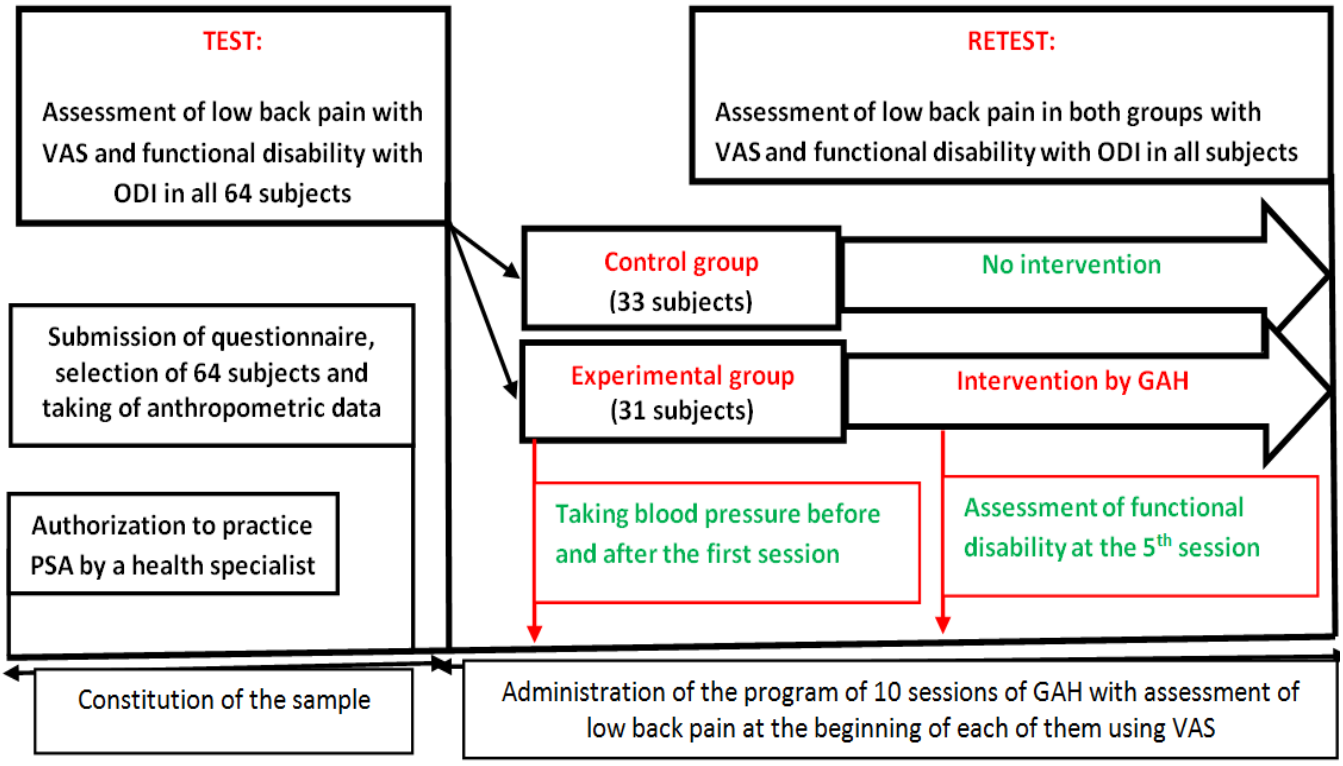
This study brought together 64 women under the age of 20. These women using midwives were recruited during the routine check-up at one (1) month postpartum in the health centers (CHUDO-PN, Attakè health center, Arcarde health center in Tokpota and the Louis Pasteur clinic).

Women who met the inclusion criteria and gave their written consent were educated on the subject of the study.

- Weight gain: when the figure 0.0 appears, the subject in light clothing shows on the scale to be weighed (while standing in the middle of the scale, feet slightly apart and without moving). Three measurements are taken and the average of the three gives the weight of the subject. All weight gains are made by the same experimenter.
- Size measurement: the subject stands on the base of the height chart, feet slightly apart. The back of his head, shoulder blades, buttocks, calves and heels should all touch the vertical board. The subject's head is held so that the horizontal line from the ear canal to the bottom edge of the eye socket is parallel to the base of the height rod.
- Pain assessment: It was assessed at the beginning and at the end of the experiment in the two groups. In addition, she was assessed at the start of each session at the experimental group level to monitor the progress of the pain. For the measurement, the subjects move the

Experimental protocol

Experimental plan



cursor on a ruler graduated from 0 to 10 depending on the intensity of the pain. The subject moves the cursor on the slider to rate his pain. Pain intensity is measured by the distance between the cursor position and the "no pain" end. In addition, the subject fills in the Saint-Antoine questionnaire (QDSA) which allows to appreciate the description of the pain.

- Assessment of the subject's functional incapacity: this was assessed at the start and at the end of the experiment for all subjects in the two groups. In addition, it was evaluated at the 5th session of hypopressive abdominal gymnastics in subjects in the experimental group. The assessment involves completing the Oswestry Low Back Pain Disability Index (ODI) questionnaire. A total score is established as a percentage of disability (sum of the scores for each section / number of sections answered) x 20 =% of disability) (Calmels *et al.,* 2005). An interpretation based on disability scores is made: minimum disability from 0 to 20%, moderate disability from 20 to 40%, severe disability from 40 to 60%, disabling disability from 60 to 80%. Above 80%, these are either bedridden subjects or an excessively perceived incapacity (Calmels *et al.,* 2005).
- Intervention: hypopressive abdominal gymnastics (GAH) aims at toning the abdominal strap and resuming the function of the abdominal muscles (maintaining the sagittal balance of the spine and the well-being of the woman by reducing the pain, improvement in lumbopelvic flexibility, strengthening of the para-vertebral muscles, dorsolumbar muscles and abdominals).
- Frequency: Each subject in the experimental group underwent a program of 10 hypopressive abdominal gymnastics sessions for one (1) and a half months; 2 sessions per week.
- Exercise intensity: The physical activity sessions were low intensity (<47% of max Fc (theoretical max Fc = 220 - age). The heart rate monitor placed on the subject made it possible to follow the evolution of the heart rate.
- Duration of the exercises: each session lasted 30 minutes and was divided into three parts which are, getting started and getting started; main part and finally the return to calm.
- Content of the exercises: at this level, we used the combination of the Caufriez (2007) and Rebollo (2016) program.

Variables studied

a) Independent variables

- Body mass index (BMI) = MC / T 2 (in kg / m2);
- Age (years);
- Hypopressive abdominal gymnastics program.

b) Dependent variables

- Intensity of low back pain;
- The functional disability caused by low back pain.

Ethical considerations

At the start of this study, we required and obtained permission from the gynecologist or midwife in charge of the subject. After subjects were made aware of the objectives and interests of the study, written informed consent was obtained from each subject to express their agreement to participate.

Statistical analysis

The collected data was compiled and then analyzed using IBM SPSS version 21 software. It allowed us to do descriptive analysis of the variables studied. We carried out nonparametric tests because the tests of normality and homogeneity of variances were not conclusive. The Wilcoxon rank test was adopted for comparing variables within a group at the start and end of the study. The significance threshold was set at $p < 0.05$. The Mann-Whitney test made it possible to compare the variables between the groups.

RESULTS

Comparison of the evolution of the mean values of lumbar pain between the two groups during the experiment

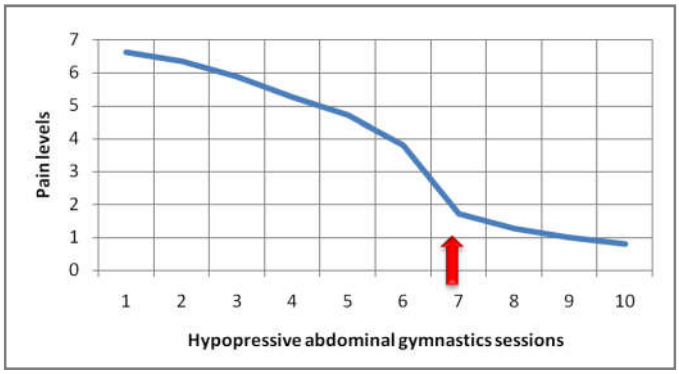


Figure 2. Evolution of mean lumbar pain values in the experimental group

Evolution of average pain values in the GAH group: The curve shows a gradual decrease in the average value of low back pain from the first session to the sixth session of GAH. There is a sharp drop in the curve from the sixth session to the seventh session of GAH. It gradually decreases from the seventh to the tenth session of the experiment.

Comparison of the intensity of pain during the sessions: The analysis of variance by order of order 2 of Friedman with associated sample, gave a p less than 0.05 ($p = 0.002$). This shows that there is a significant difference between the level of pain taken per session at the experimental group level. The comparison of the intensity of pain taken at the beginning of the experiment at each of the other sessions with the Wilcoxon rank test reveals that the difference is very significant from the sixth session because $p < 0.01$ ($p = 0.003$).

Comparison of the average values of lumbar pain during the study in the experimental group and the control group

At the start of the study (Table IIa and IIb), there was no significant difference between the average intensity of low back pain between the two study groups ($p = 0.47$).

Table IIa: Evolution of the mean pain values during the study in the GAH group and the control group

	Nº EVA	1	2	3	4	5	6	7	8	9	10
Experimental Group	Means	6,63	6,36	5,90	5,27	4,72	3,81	1,72	1,27	1,00	0,81
	standard deviation	1,36	1,12	0,94	1,10	1,27	0,87	0,78	0,90	0,77	0,75
Control Group	Means	6,69	-	-	-	-	-	-	-	-	4,84
	standard deviation	1,25	-	-	-	-	-	-	-	-	1,51

Table IIb. Inter and intra group comparison of the mean values of our study sample

	Statistical tests	R value
Comparison of the intensity of pain at the start of the study between the two groups	Mann-Whitney U test	0,47
Comparison of the intensity of pain at the start and end of the study in the control group	Wilcoxon test	0,03*
Comparison of the intensity of pain at the start and end of the study in the experimental group	Wilcoxon test	0,00**
Comparison of pain intensity at the end of the study between the two groups	Mann-Whitney U test	0,00**

* significant difference ** very significant difference

Table IV. Inter and intra group comparison of the mean values of our study sample

	Statistical tests	R value
Comparison of functional disability at the start and end of the study in the control group	Wilcoxon test	0,02*
Comparison of functional disability at the start and end of the study in the GAH group	Wilcoxon test	0,003**
Comparison of functional disability assessed at the start of the study between the control group and the GAH group	Mann-Whitney U test	0,18
Comparison of functional disability assessed at the end of the study between the control group and the GAH group	Mann-Whitney U test	0,01**

* significant difference ** very significant difference

Table V. Correlation between GAH, pain intensity and the functional capacity of the subjects in our sample

Correlation between	Statistical correlation tests	R value
GAH and the intensity of pain at the end of the study	Spearman's Rho r	0,78
GAH and the functional capacity of the subjects	Spearman's Rho r	0,92
Pain intensity and functional capacity of subjects	r of Pearson	0,33

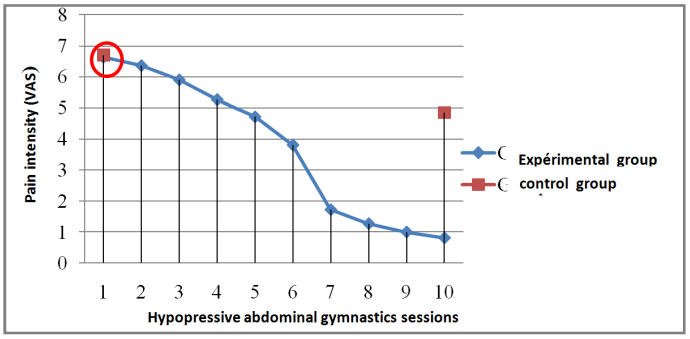


Figure 3. Evolution of pain intensity in the two (2) groups

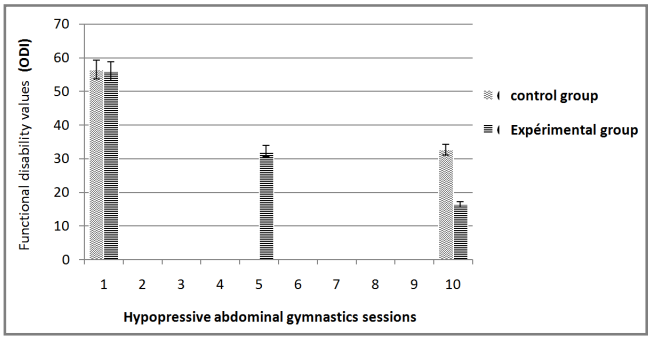


Figure 4. Evolution of functional disability in the two 2 groups

There was a difference in pain intensity in the two study groups. That of the GAH group is more significant than that of the control group (0.05 < 0.03 < 0.00).

Comparison of the functional incapacity of the subjects in the study sample

Evolution of the average value of functional disability in the two groups during the study: The mean values of functional impairment decreased during the study in the two study groups. In the GAH group, the average goes to the fifth session from 56 ± 8.28 to 32.27 ± 10.33 and to 16.36 ± 5.95 in the tenth session. While in the control group, the mean values of functional disability went from 56.46 ± 10.03 to 32.69 ± 11.65.

Comparison of functional disability between the GAH group and the control group: The comparison between the groups reveals that there is no significant difference between the mean values of functional disability between the two groups at the start of the experiment (0.18 > 0.05).

However, the comparison of the mean values at the end of the study shows a significant difference (p = 0.01)

Correlation between the evolution of pain, functional disability and GAH

Table V shows that there was a strong correlation between GAH and pain intensity at the end of the study (0.78). In addition, there is a very strong correlation between GAH and the functional capacity of the subjects in our sample (0.92).

DISCUSSION

The value of the intensity of low back pain caused by pregnancy remains high in the subjects studied even after three months postpartum. In fact, the mean pain intensity values of the experimental group were 6.63 ± 1.36 and that of the control group was 6.69 ± 1.25 at the start of the study. This finding of persistent pain after childbirth has also been reported by (Charlier *et al.,* 2012) According to the author, more than 2/3 of women complain of having low back pain immediately after

giving birth, while only 37% report such complaints 12 and 18 months after childbirth (Charlier *et al.,* 2012). Young age (17.27 ± 1 years for the experimental group and 17.38 ± 1.26 years for the control group) and height (1.58 ± 0.22 m for the experimental group and 1.49 ± 0, 63 m for the control group) of our subjects could be the cause of these high values of the intensity of postpartum pain because at this period of life the structures are in full growth. In the literature, factors such as the short stature and young age of the mother are responsible for the onset of low back pain in the postpartum period (Breen *et al.,* 1994). And Endresen's study (Endresen, 1995) specifies that it is especially in younger women that we observe the development of low back pain in the postpartum period.

There was a significant decrease in the intensity of pain and functional impairment in subjects in the experimental group during the ten sessions. At the end of the program, the comparison p of the means of pain intensity (0.000) and that of functional limitation (0.01) show that there was a significant decrease in these two variables in terms of experimental group. Our results are in accordance with those of the works of the literature (Miyamoto *et al.,* 2013; Gladwell *et al.,* 2006; Rydeard *et al.,* 2006) which showed that the hypopressive techniques favor the amelioration of the pain measured with the VAS and that of the functional incapacity measured with the Oswestry Low Back Pain Disability Questionnaire (OSD). They help correct neuromuscular patterns and increase stabilization of the lumbopelvic region by incorporating deep stability in the background of a global movement (Rydeard *et al.,* 2006). Hypopressive abdominal gymnastics, through this study, has proved to be an effective method in the management of low back pain and functional disability in primiparasunder 20 years of age. It has significantly reduced the pain and functional disability it produces. Studies, notably those of Caufriez (2006), reveal that GAH allows the global care of the woman in postpartum. In terms of biomechanics, it improves posture, which manifests itself by repositioning the projection axis of the center of gravity and a significant reduction in the arrows in lumbar lordosis and kyphosis. In addition, the subjects' feeling of comfort also increased with less pain. Physical activity is well known to be beneficial for physical and psychological well-being before, during, and after pregnancy (Borg-Stein *et al.,* 2005). It is one of the most effective techniques for treating this pain in the postpartum period (Sabino and Grauer, 2008). Strengthening the abdominal, back and pelvic muscles using physical exercises improves back support and helps restore functional capacity of the trunk. These low intensity exercises allow the effective treatment of pain (Dufour *et al.,* 2010). Strengthening the abdominal muscles and good physical health are therefore essential in the rehabilitation of low back pain (Dufour *et al.,* 2010).

Conclusion

The postpartum period is a defining period in dealing with the consequences of pregnancy and childbirth. These two events cause changes (biomechanical and hormonal) with the appearance of low back pain. The observation in our country is that this period is not at all rest and the young mother quickly finds normal activities including prolonged standing and carrying weight. This worsens this pain and gives little respite to a weakened perineum which must heal in good conditions to avoid irreversible sequelae and which may worsen with future pregnancies. It is to preserve this structure (perineum) that we have chosen to manage lumbar pain and functional postpartum incapacity using hypopressive abdominal gymnastics. For this study, we chose using a reasoned choice method 64 continuous primiparous women under twenty (20) years of age who gave birth by the vaginal route. All of these women suffer from postpartum low back pain. These subjects were divided into two groups (control group and experimental group). The results show that hypopressive abdominal gymnastics promotes a significant reduction in lower back pain. In addition, it considerably reduces the functional limitation caused by this lumbar pain.

Acknowledgments

We extend our sincere thanks to the heads of the Sport-Health-Service Center, CHUDO-PN, and the health centers that enabled the study to be carried out. Moreover, we thank all the subjects who accepted to participate in this study

Disclosure of conflict of interest

The authors declare no conflicts of interest.

Abreviations list

- **BMI:** Body Mass Index
- **CHUDO-PN:** Departmental University Hospital of Ouémé-Porto/Novo
- **GAH :** Hypopressive Abdominal Gymnastics
- **INJEPS:** National Institute of Youth, Physical Education and Sport
- **LaBioP:** Laboratory of Biomechanics and Performance
- **ODI :**Oswestry Low Back Pain Disability
- **QDSA:** Saint-Antoine Questionnaire
- **VAS:** Analog Visual Scale

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