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Pregnancy and pelvic girdle pain: Analysis of pelvic belt on pain

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Aims and objectives: To analyse pain and functional capacity in women with pelvic girdle pain and to evaluate the effect of pelvic belt on these parameters. Two types of belts were to compare.

Background: Pelvic girdle pain is very common during pregnancy. To prevent and relieve pelvic pain, women can use a set of techniques and tools such as a pelvic belt. While scientific evidence is lacking, commercial industries suggest the effectiveness of pelvic belts.

Design: Randomised control trial.

Methods: Forty-six pregnant women with pelvic girdle pain were evaluated. Pain analysis included a quantitative and a qualitative assessment. A daily activities questionnaire was used for functional capacity evaluation. Women were tested at two times during the pregnancy for a longitudinal evaluation, and they used one of the two belt models during their pregnancy.

Results: Pelvic pain started between the 14th–21st week of pregnancy. Pain intensity was 60 ± 20 mm. Daily activities could increase pain. The use of belts reduced pain. The intensity of pain decreased by 20 mm on a visual analogue scale. The daily activities were also easier. However, all these conclusions are valid only if pregnant women used belts regularly on short periods.

Conclusions: The belts appear to be interesting tools to reduce pelvic pain and improve comfort of pregnant women. This effect might be explained by an analgesic effect with proprioceptive and biomechanical effect. The different types of belts could have differential effects on global, sacroiliac joint and back pain during pregnancy, but this hypothesis requires confirmation.

Relevance to clinical practice: Relevant for patient: to use an easy and validated tool. Relevant for clinical practice: to suggest a tool scientifically validated for patient. Relevant to economic issues: belts decrease pelvic pain and increase comfort of pregnant women. Sick leave could decrease.

KEYWORDS
pelvic belt, pelvic girdle pain, pregnancy

1 | INTRODUCTION

This work is first of all a contribution to the setting up of a database on pelvic girdle pain during pregnancy. At present, there is insufficient evidence to conclude that wearing a pelvic belt reduces such pain. It is clinically important to know the effect of such belts to scientifically validate their use in pelvic girdle pain (PGP) prevention or treatment during pregnancy.

What does this paper contribute to the wider global clinical community?

- Pelvic girdle pains are common during pregnancy.
- Pelvic belts decrease pelvic girdle pain and improve functional capacity. Pelvic belt is a tool easy to use and well accepted by women.
- This study encourages clinical practice to suggest using pelvic belt during pregnancy.

2 | BACKGROUND

About 50% of pregnant women suffer from PGP (Robinson, Mengshoel, Veierød, & Vøllestad, 2010). PGP is reported as the most common cause of sick leave during pregnancy which can reach up to 37% (Larsen et al., 1999). For Vleeming, Albert, Ostgaard, Sturesson, and Stuge (2008), PGP is localised in the posterior region of the pelvis, defined as "a pain between the posterior iliac crest and the gluteal fold, particularly in the vicinity of the sacroiliac joint (SIJ). The pain may radiate in the posterior thigh and can also occur in conjunction with/or separately of pain in the symphysis." Endurance capacity while in bipedal position and when walking is impaired (Vleeming et al., 2008).

The "self-locking" mechanism is a model where shear in the SIJ is prevented by increased friction due to a combination of two factors: the first is a specific anatomic arrangement that increases the friction coefficient (form closure), and the second is the tension of muscles and ligaments crossing the SIJ that leads to higher friction and hence stiffness (force closure) (Snijders, Vleeming, & Stoeckart, 1993; Van Wingerden, Vleeming, Buyruk, & Raissadat, 2004). A combination of both is needed to maintain the stability of joints (Pool-Goudzwaard, Vleeming, Stoeckart, Snijders, & Mens, 1998). During pregnancy, hormonal and mechanical factors such asymmetric laxity of the SIJ (Damen et al., 2002), changes in collagen metabolism of ligaments (Kristiansson, Svärdsudd, & von Schoultz, 1999) and altered motor control (Aldabe, Milosavljevic, & Bussey, 2012) among the factors lead to pelvic instability by a decrease in "force closure" leading to PGP (Mens, Pool-Goudzwaard, & Stam, 2009; Mens, Vleeming, Stoeckart, Stam, & Snijders, 1996).

A method to restore pelvic stability is the use of a pelvic belt. According to Soisson et al. (2015), pelvic morphometry was unaltered by pelvic belt. For other studies, the pelvic belt may press the joint surfaces of the SIJ together and may provide SIJ and pelvic girdle stability by an increase in "force closure" (Mens, Damen, Snijders, & Stam, 2006; Pool-Goudzwaard et al., 1998), although this remains controversial (Soisson et al., 2015). According to the biomechanical model (Pel, Spoor, Goossens, & Pool-Goudzwaard, 2008), application of a 50N medial compression force at the anterior superior iliac spine improves SIJ stability. A small force applied to a belt seemed sufficient to recreate the "self-locking." Two belt positions are reported in the literature: a high position at the level of the anterior superior iliac spine and a low position, close to the greater trochanter and the pubic joint (Pel et al., 2008). Pelvic belt position could have an impact on musculoskeletal structures. The use of a flexible belt performed better on pain, and it seemed to be better tolerated compared to rigid belt. However, the two types of belt could improve function and decrease pain (Flack, Hay-Smith, Stringer, Gray, & Woodley, 2015). In pregnant women, the use of a pelvic belt decreases pain and improves daily activities (family, house and yard activities) (Carr, 2003). But other studies have not observed a decrease in pain by wearing a pelvic belt (Depledge, McNair, Keal-Smith, & Williams, 2005; Soisson et al., 2015). Actually, there is insufficient evidence to conclude that wearing a pelvic belt reduces PGP (Ho et al., 2009). There is no good-quality evidence to support the use of pelvic belt because of various study methods, belts and tools. Nevertheless, it is clinically important to know the effect of the belts to scientifically validate their recommendation for PGP prevention and management during pregnancy.

The first objective of this study was to analyse pain and functional capacity during pregnancy in pregnant women with PGP. The second objective was to evaluate the effect of pelvic belts on pain and on functional capacity. The last objective was to compare two types of belts (narrow and flexible or wide and rigid).

3 | METHODS

3.1 | Study sample

Pregnant women with PGP aged 25–35 years were recruited. Inclusion of pregnant women from the 18th week of pregnancy, with pain in the SIJs and/or pubic region, was verified by a positive result for at least half of the following set of tests (posterior pelvic pain provocation test, Patrick Faber's test, Trendelenburg modified test, pain provocation tests and active straight leg raise test) during clinical examination (Albert, Godskesen, & Westergaard, 2000). The exclusion criteria were the presence of lumbar-pelvic pain before pregnancy. Twin pregnancies and pregnancies with complications were also exclusion criteria. These women were randomised into two groups (A and B): group A corresponded to women who had a belt during pregnancy, and group B corresponded to those who did not wear a belt. Group A was randomised into subgroups (A1/A2) to assess the types of belt: A1 wore belt 1 and A2 belt 2. All subjects gave written informed consent prior to participation in the study approved by the Ethics Committee of University and Hospital Erasme (Be) (number P2011/017). The recruitment of subjects took place between January 2009–December 2011.

3.2 | Materials

Two pelvic belts for pregnant women were used:

- Belt 1 (Ortel-P Thuasne) (Figure 1a). This belt is narrow and flexible. The belt can be placed in two positions: high position (at the anterior superior iliac spine) or low position (at the pubis). Women had first the belt adjusted on their body, and modified belt pressure through the elastic Velcro systems on each side.
- Belt 2 (LombaMum Thuasne) (Figure 1b). This belt is wide and rigid with metal reinforcements in the lumbar area. This belt allows only one position but a complete Velcro system adjusts the tension at several levels.

3.3 | Protocol

For pain evaluation, the visual analogue scale (VAS) (Bodian, Freedman, Hossain, Eisenkraft, & Beilin, 2001) was used for quantitative assessment. For qualitative assessment, a topographic representation (Albert et al., 2000) was analysed. For the functional capacity, a daily activities questionnaire with the Quebec Back Pain Disability Scale (QBPDS) was completed (Kopec et al., 1996). A diary was completed by women during the study to track the use of belts, and a questionnaire was used to obtain the judgement of women on the belts. Women were evaluated twice in a longitudinal design: when they started the study (T1) and between the 34–week of pregnancy (T2).

3.4 | Statistical analysis

All statistical procedures were conducted using STATISTICA version 5.0 software for Windows. To investigate normal distribution of data, we used the Kolmogorov-Smirnov test. All scores were found to be normally distributed. For nominal data, the chi-square test was used to compare the relationship between several variables. For continuous data, an analysis of variance for repeated measures (ANOVA) was performed for comparison of all variables between different time points (within-group factor) and groups (between-group factor) evaluated. When a significant effect was found, the LSD post hoc test was applied. The statistical level of significance was set at .05.

4 | RESULTS

A total of 46 pregnant women with PGP were included. The characteristics of the study samples are presented in Table 1.

Table 2 shows the characteristics of pain in women with PGP. No significant difference between groups A and B was found. For 22% of women, pain started early in pregnancy. For others, symptoms appeared in the 4th month of pregnancy ±2 months. In the evening, pain was significant (91%). In contrast, only 56% of the sample showed pain in the morning. Pain was experienced as deep (63%), diffuse (56%) and irradiating (34%). PGP concerned the SIJ (54%), the gluteal region (43%), the iliac crest (43%), the groin (19%) and the pubic area (17%). Furthermore, 59% of our subjects also suffered from back pain. The activities that caused or increased pain were prolonged standing (58%) or sitting (52%), walking (56%) and all activities (50%). Pain was described as intense for SIJ (VAS: 60 ± 30 mm) and as average for the spine (VAS: 20 ± 30 mm) and the pubic joint (VAS: 10 ± 30 mm). Global VAS (any pain) was 60 ± 20 mm. The QBPDS had a mean score of 42/100: women had significant disabilities in their daily activities, but only 15% of women used an analgesic treatment.

Table 3 shows the characteristics of pelvic belt use. No difference was found between belt 1 and belt 2. In most cases, belts were used regularly: 68% of women used the belt several times a week.

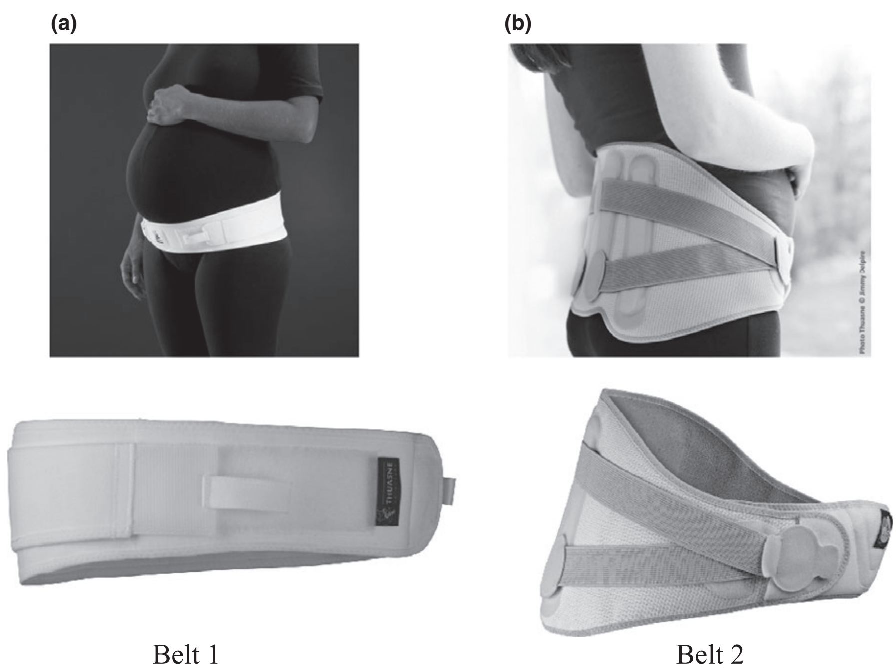

FIGURE 1 Belts used. www.thuasne.com

TABLE 1 Characteristics of pregnant women with PGP (mean [*SD*])

Groups	Number	Age (years)	Height (cm)	Week of pregnancy T1	Week of pregnancy T2	Mass before pregnancy (kg)	Mass T1 (kg)	Mass T2 (kg)	Mass gain (kg)
A									
A1	17	29 (5)	161 (4)	28 (4)	36 (1)	66 (11)	72 (11)	77 (12)	13 (5)
A2	21	30 (5)	162 (5)	26 (5)	35 (1)	66 (11)	73 (11)	78 (12)	12 (4)
A1 + A2	38	30 (5)	162 (5)	27 (5)	36 (2)	66 (11)	73 (11)	78 (12)	12 (5)
B	8	29 (5)	163 (6)	27 (6)	36 (2)	58 (10)	65 (9)	70 (9)	12 (2)
A + B	46	30 (5)	162 (5)	27 (5)	36 (2)	64 (12)	71 (11)	76 (12)	12 (4)

A, women with belt during pregnancy; B, women without belt during pregnancy; A1, women wore belt 1; A2, women wore belt 2.

On average, belts were used 4 days a week and ±2 hr 30/day. 47% of women wore the belt in the morning, 68% in the afternoon and 31% in the evening. Women used the belt for daily activities (55%), going out (42%) and gait (37%). With the belt, 48% of women saw their pain decrease and 63% felt supported. The level of support was evaluated at 8/10. 57% of women were satisfied with their belt, 18% found it excellent, and 13% were not satisfied. The global assessment was very good with a score of 8/10.

Table 2 shows the effect of the belts on pain characteristics. No difference was found between groups A/B and between T1/T2 for group B. For the group A, diffuse pain decreased by 42% ($p < .001$). It was the same for deep pain, which decreased by 18% ($p = .025$). A decrease by 37% ($p = .005$) was observed for the number of women with pain on the SIJ. Pain provocation during standing decreased by 42% ($p < .001$). A similar trend was observed for sitting: pain decreased by 39% ($p < .001$) and by 37% for walking ($p = .005$) between test moments. The VAS at the SIJ decreased from 60 ± 30 mm–40 ± 40 mm ($p = .025$). A similar result was observed for global VAS from 60 ± 20 mm–40 ± 30 mm ($p = .004$).

There was no difference in pain between belt 1 and belt 2 (Table 4). However, VAS scores displayed differential evolution. In group A1, a significant decrease in global pain intensity ($p < .001$) and pain intensity at the SIJ ($p = .003$) was observed, whereas in group A2, spine pain intensity decreased significantly ($p = .01$).

5 | DISCUSSION

Pelvic girdle pain can start at the beginning of pregnancy, but in most cases of the present study sample (78%), it started between the 14th–21st week of pregnancy. These results are in agreement with the literature (Mens et al., 1996; Östgaard, Zetherström, & Roos-Hansson, 1994; Wu et al., 2004). PGP was located at the SIJ, the gluteal region, the iliac crest, the inguinal angle and the pubic area, consistent with studies of Mens et al. (1996) and Sturesson, Uden, and Uden (1997) and meta-analyses of Vleeming et al. (2008) and Wu et al. (2004). In the present study, 59% of women also suffered from back pain. Wu et al. (2004), in a meta-analysis, reported a lower prevalence of combined PGP and LBP (45%). The lack of uniformity of terms in the literature makes it difficult to compare results (Mogren & Pohjanen, 2005). Pelvic girdle pain was experienced as deep, diffuse and irradiating. In the literature, it is perceived as a stab (Östgaard, Roos-Hansson, & Zetherström, 1996) deep, diffuse and bright pain that can radiate to the spine or lower limbs (Hansen et al., 1999). Such radiation could perhaps explain why some women report combined pain, making it difficult to differentiate between PGP and back pain. Pelvic girdle pain was a significant pain with a VAS at 60 ± 30 mm for the SIJ and 10 ± 30 mm for the pubic joint. These results corroborate those of Kristiansson, Svärdsudd, and von Schoultz (1996): pelvic pain was at 40 mm at 12 weeks, 60 mm and 70 mm at 24 weeks and 36 weeks. The average intensity of PGP was between 50–60 mm (Wu et al., 2004). For back pain, VAS at the spine was 20 ± 30 mm. Low back pain is very common, but pain intensity is lower than PGP. Pelvic girdle pain is more intense and disabling than low back pain (Östgaard et al., 1996; Van de Pol, Van Brummen, & Bruinsz, 2006). Kristiansson et al. (1996) obtained a good correlation between VAS and disability scales. Despite an absence of pain, women may have some difficulties in performing tasks, but the difficulties increase with the increase in VAS (Mens, Huis in 't Veld, & Pool-Goudzwaard, 2012; Wu et al., 2004). In our study, global VAS was 60 ± 20 mm, corresponding to a significant pain, and the average QBPDS score was 42/100. Our results showed that women with PGP have important difficulties or disabilities during daily activities. Pain manifested mainly in the evening, indicating that pain started or increased after activities. Standing or sitting, walking or daily activities (cleaning, shopping, child care) increased PGP. These results are in line with the literature (Hansen et al., 1999; Noren, Ostgaard, Johansson, & Ostgaard, 2002; Wu et al., 2008). Pain was continuous, chronic and latent where 15% of women had pain without performing any activity. It should be noted that both groups were equivalent in terms of pain.

Women in the study used their pelvic belt regularly: 4 days/week and 2 hr 30/day. As pain increased with activities such as standing or sitting, walking or daily activities and was significant in the evening, women used the belts in the afternoon or in the morning during activities. For all women, belts have been used for daily tasks, going out as well as for walking. With the belt, pain decreased in 48% of women and 63% felt more support. Pelvic belts appear an easy tool to use, very well accepted by patients and without adverse

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TABLE 2 Characteristics of pain according to groups and times

		A		*p* Value	B		*p* Value	*p* Value
	A + B (T1)	T1	T2	T1 vs. T2	T1	T2	T1 vs. T2	A vs. B
Start of pain								
At the beginning (%)	22	21	/	/	25	/	/	/
Month (mean [*SD*])	4 (2)	4 (2)	/	/	3 (2)	/	/	.50
Time of pain (%)								
Morning	56	52	32	.25	75	38	.95	.90
Afternoon	67	63	42	.25	88	38	.99	.90
Evening	91	89	46	.75	100	50	.99	.90
Type of pain (%)								
Irradiating	34	39	13	.99	12	0	.90	.90
Localised	28	29	26	.99	25	38	.90	.90
Diffuse	56	63	21	<.001	25	25	.90	.90
Deep	63	68	50	.025	37	12	.90	.95
Superficial	4	5	2	.90	0	0	.75	.75
Localisation (%)								
SIJ	54	55	18	.005	50	37	.90	.99
Lower limb post	26	21	13	.95	50	37	.90	.95
Groin	19	18	18	.95	25	50	.90	.99
Pubis	17	18	8	.95	12	25	.90	.95
Lumbar spine	59	60	34	.10	50	50	.90	.90
Thoracic spine	15	18	13	.95	0	12	.90	.90
Iliac crest	43	45	18	.05	37	37	.90	.95
Gluteal	43	37	23	.75	75	37	.95	.90
Pain provocation (%)								
Standing	58	63	21	<.001	37	12	.90	.90
Sitting	52	55	16	<.001	37	12	.90	.90
Activities	50	52	39	.75	37	25	.90	.90
Position change	41	39	18	.25	50	38	.90	.95
Inactivity	15	16	10	.90	12	0	.90	.90
Gait	56	58	21	.005	37	38	.90	.95
VAS (mm)								
SIJ	60 (30)	60 (30)	40 (40)	.02	50 (30)	50 (30)	.87	.83
Symphysis	10 (30)	20 (30)	10 (30)	.27	0 (10)	20 (30)	.19	.70
Spine	20 (30)	20 (30)	10 (20)	.10	20 (40)	10 (20)	.23	.94
VAS global (mm [*SD*])	60 (20)	60 (20)	40 (30)	.004	50 (30)	50 (30)	.80	.77
QBPDS (/100 [*SD*])	42 (17)	41 (16)	41 (24)	.80	44 (25)	26 (22)	.29	1
Women with antalgic treatment (%)	/	16	/	/	12	/	/	/
Pain relieve (%)								
Rest	54	58	28	.05	37	38	.90	.90
Cushion	26	31	8	.99	0	12	.90	.90
Massage	10	13	5	.95	0	12	.90	.90
Movements	6	8	5	.90	0	12	.75	.75
Heat	8	10	2	.95	0	0	.75	.75
Position change	4	3	2	.90	12	0	.90	.75
Belt	/		34			0		.99

A, women with belt during pregnancy; B, women without belt during pregnancy; A1, women wore belt 1; A2, women wore belt 2; T1, fist evaluation; T2, second evaluation.

TABLE 3 Used pelvic belts during pregnancy according on subgroups

	A1	A2	A	*p*-Value groups
Regular use (%)	59	90	68	>.05
When? (%)				
Morning	35	57	47	>.05
Afternoon	70	66	68	>.05
Evening	29	81	31	>.05
Activities with belt (%)				
Go out	41	43	42	>.05
Daily tasks	35	71	55	>.05
Sitting	6	24	16	>.05
Relaxation	6	9	8	>.05
Gait	35	38	37	>.05
Days/week with belt (mean [*SD*])	3,5 (1,4)	4,5 (1,6)	4,2 (1,6)	.16
Hours/day with belt (mean [*SD*])	2 hr	3 hr	2 hr 30	.15
Sensation (%)				
Support	59	66	63	>.05
Rest	23	6	13	>.05
Decreased pain	47	43	48	>.05
Oppression	12	0	5	>.05
Flexibility	5	6	5	>.05
Opinion (%)				
Excellent	23	6	18	>.05
Satisfactory	41	71	57	>.05
Not very satistactory	23	6	13	>.05
Unsatisfactory	0	0	0	>.05
Ease of installation of belts (/10 [*SD*])	8 (2)	7 (2)	8 (2)	.05
Global assessment (/10 [*SD*])	8 (2)	8 (1)	8 (2)	.91
Support of belt (/10 [*SD*])	8 (1)	8 (2)	8 (2)	.24
Abdominal pressure (/10 [*SD*])	3 (4)	3 (3)	3 (3)	.56

A, women with belt during pregnancy; A1, women wore belt 1; A2, women wore belt 2; T1, fist evaluation; T2, second evaluation.

effects. Women rated the ease of using the belts at 8/10. Furthermore, 47% of women were satisfied by the belt, 18% found them even excellent, and only 13% were dissatisfied.

The women who used a belt experienced a decrease in pain between the two moments of evaluation. Pain was less diffuse and less deep. The global and SIJ VAS decreased by 20 mm on average. Also, pain at the iliac crests decreased. Kalus, Kornman, and Quinlivan (2008) showed with compression belt a decrease in pain by about 20 mm. Carr (2003) and Flack et al. (2015) observed a decrease in the intensity and duration of pain with the use of belt on the short term. In our study, as a consequence of a longer use of pelvic belts (approximately 9 weeks), at the second evaluation, although women were more advanced in their pregnancy, fewer women reported pain associated with daily activities (standing, sitting and walking).

Pelvic belts appear thus effective in reducing the pain and improving the activities of daily living during pregnancy. We suggest the hypothesis that they have an analgesic effect based on two principles. Firstly, they could have a proprioceptive effect at two levels: (i) Depending on the direction of the deformation, related receptors may be stimulated (Shaffer & Harrison, 2007). The proprioceptive receptors are located at the surface and in deep layers of the skin but also in the SIJ, such as free nerve endings, Pacinian corpuscles, Merkel cells, Ruffini endings and Pacinian receptors (Varga, Dudas, & Tile, 2008; Vilensky et al., 2002). The compression force of ligaments at the SIJ, combined with pelvic extrinsic compression, could stimulate those receptors (Vilensky et al., 2002). The proprioceptive receptors help keeping optimal postural control and achieve accurate motion through mastered motor control over the environment (McCloskey, 1994; Shaffer & Harrison, 2007). Thus, the sum of the activations of these sensory receptors provides somatosensory stimuli that influence SIJ proprioception and may influence the neuromotor control of pelvic and/or lumbar muscles (Arumugam, Milosavljevic, Woodley, & Sole, 2012; Soisson et al., 2015). Therefore, the pelvic belt may be considered as providing proprioceptive feedback that may help controlling activities in regard to the vulnerable state of their pelvis. (ii) Furthermore, by stimulating the

TABLE 4 Characteristics of pain according to belt and times

	A1		*p* Value	A2		*p* Value	*p* Value
	T1	T2	T1 vs. T2	T1	T2	T1 vs. T2	A1 vs. A2
Start of pain							
At the beginning (%)	23			19			/
Month (mean [*SD*])	4 (2)			4 (2)			.89
Time of pain (%)							
Morning	59	29	.99	47	33	.75	.90
Afternoon	70	35	.99	57	47	.90	.75
Evening	88	35	.99	90	47	.99	.75
Type of pain (%)							
Irradiating	41	6	.99	38	19	.95	.95
Located	41	12	.99	19	38	.95	.99
Diffuse	53	17	.99	71	24	.99	.90
Deep	65	17	.99	71	52	.50	.99
Superficial	6	0	.90	5	5	.90	.90
Localisation (%)							
SIJ	59	12	.99	52	10	.99	.90
Lower limb post	21	12	.90	24	14	.90	.90
Inguinal angle	23	17	.90	14	19	.90	.90
Pubic	21	6	.90	19	10	.90	.90
Lumbar spine	41	12	.99	76	52	.99	.99
Thoracic spine	12	17	.90	24	10	.95	.90
Iliac crest	35	17	.95	52	19	.99	.90
Gluteal	35	17	.95	38	28	.90	.90
Pain provocation (%)							
Stay up	60	17	.99	66	24	.99	.90
Stay seated	60	6	.99	52	24	.99	.95
Activities	41	35	.95	62	43	.50	.90
Change position	47	17	.99	33	19	.95	.90
Inactivity	17	12	.90	14	9	.90	.90
Gait	60	17	.99	57	24	.99	.90
VAS (mm)							
SIJ	60 (30)	30 (40)	.003	60 (20)	50 (30)	.83	.12
Symphysis	10 (30)	0 (20)	.26	20 (30)	20 (30)	.69	.19
Spine	10 (30)	10 (20)	.68	30 (30)	10 (30)	.01	.25
VAS global (mm [DS])	60 (20)	30 (40)	<.001	60 (20)	50 (30)	.24	.06
QBPDS (/100 [DS])	42 (12)	38 (28)	.48	41 (19)	44 (20)	.34	.51
Women with antalgic treatment (%)	12			19			
Pain decreased (%)							
Break	60	23	.99	57	33	.50	.90
Cushion	23	0	.99	38	14	.75	.95
Massage	12	12	.90	14	0	.95	.95
Movements	12	12	.99	5	0	.90	.95
Heat	0	0	.90	19	5	.95	.90
Changes in position	6	0		0	5	.90	.90
Belt		23			43		.95

A, women with belt during pregnancy; B, women without belt during pregnancy; A1, women wore belt 1; A2, women wore belt 2; T1, fist evaluation; T2, second evaluation.

proprioceptive receptors, pelvic belts may act on the gate control mechanisms proposed by Melzack and Wall (1965). This system activates the A α and β fibres which block the pain influx conveyed by the A δ fibres at the dorsal spinal horn. The gate control is a modulation system for pain at spinal level (Kumar, Abbas, & Rizvi, 2012; Treede, 2016). Secondly, the belts could have a biomechanical effect of improving the self-locking of the pelvis by increasing the "force closure" (Snijders et al., 1993) and by reducing SIJ laxity (Arumugam et al., 2012), although this reduction may not change pelvic morphology, for example, as measured by MRI (Soisson et al., 2015). Pelvic belts induce a change in muscle activity (Jung, Jeon, Oh, & Kwon, 2013; Park, Kim, & Oh, 2010; Snijders, Ribbers, de Bakker, Stoeckart, & Stam, 1998), although such changes are not confirmed in all studies (Soisson et al., 2015), and release the SI ligaments, especially the sacrospinous, sacrotuberous and the interosseous sacroiliac ligaments (Sichting et al., 2014). As a consequence, the pelvic belt could be efficient for altering the activation pattern (Oh, 2014). Therefore, pelvic belts may relieve and stabilise the SIJ and may reduce pain in pregnant women.

In the present study, no difference was found between the two types of belts used in our study. The literature tends to favour flexible belts that seem to have a greater impact on pain (Flack et al., 2015; Snijders et al., 1993). However, although no significant difference between groups was seen, the narrow flexible belt allowed a significant decrease in SIJ and global pain, which tends to support previous findings. After the use of the broader and more rigid belt, a decrease in back pain was found, suggesting the possibility of a differential benefit of both types of belts. Further research is needed to confirm the hypothesis that the narrow flexible belt would be more efficient for SIJ pain and a broad and rigid belt for back pain.

6 | LIMITATIONS

The number of subjects was not similar in the two groups, group B being smaller. Moreover, due to recruitment organisation, pregnant women were not included before the 18th week of gestation. These two aspects may limit our conclusions.

7 | CONCLUSIONS

The present study showed that the use of pelvic belts over an average duration of 9 weeks reduced PGP, particularly in the SIJ. Pain intensity decreased by 20 mm (VAS). Furthermore, daily activities such as standing, walking and sitting were easier. Pelvic belts appear thus to have an analgesic effect that might be related to proprioceptive and biomechanical effects. These conclusions were drawn after testing the regular usage of belts for short periods (4 day/week and ± 2 hr 30/day). Furthermore, the results suggest that different types of belts (narrow and flexible or wide and rigid) could have different effects on the global, SIJ and the back pain during pregnancy, but this hypothesis still requires confirmation.

8 | RELEVANCE TO CLINICAL PRACTICE

- Relevant for patient: to use an easy and validated tool.
- Relevant for clinical practice: to suggest a tool scientifically validated for patient.
- Relevant on economic issues: belts decrease pelvic pain and increase comfort of pregnant women. Sick leave could decrease.

CONTRIBUTIONS

Study design: JB, VF, MR; data collection and analysis: JB, ECVL, VF; manuscript preparation: JB, VF.

CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

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