**Online Supplemental File: Tables**

**Table 1: Risk of bias assessment of included systematic reviews with the SIGN checklist34**

|  |  |
| --- | --- |
| **First Author and Year Published** | **Itemsa on SIGN Checklist** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Total** | **Qualityb** |
| Belogolovsky, 201546 | **1** | **1** | **1** | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **1** | **1** | **6** | **A** |
| Boissonnault, 201248 | **1** | **1** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **0** | **0** | **1** | **6** | **A** |
| Close, 201449  | **1** | **1** | **0** | **0** | **1** | **0** | **1** | **1** | **1** | **1** | **1** | **1** | **9** | **A** |
| Gutke, 201531 | **1** | **1** | **0** | **0** | **1** | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **8** | **A** |
| Hall, 201639 | **1** | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **11** | **H** |
| Ho, 200953 | **1** | **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **1** | **1** | **5** | **L** |
| Khorsan, 200941 | **1** | **1** | **1** | **0** | **1** | **0** | **1** | **1** | **1** | **1** | **1** | **1** | **10** | **H** |
| Liddle, 201540 | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **12** | **H** |
| Lillios, 201247 | **1** | **1** | **0** | **0** | **1** | **0** | **1** | **1** | **1** | **0** | **0** | **1** | **7** | **A** |
| Nascimento, 201242 | **1** | **1** | **1** | **0** | **0** | **0** | **1** | **0** | **0** | **1** | **1** | **1** | **7** | **A** |
| Richards, 201245 | **1** | **1** | **0** | **0** | **1** | **0** | **1** | **1** | **1** | **0** | **1** | **1** | **8** | **A** |
| Ruffini, 201638 | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **11** | **H** |
| Stuber, 200821 | **1** | **1** | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **0** | **1** | **0** | **9** | **A** |
| Stuge, 200344 | **1** | **1** | **1** | **0** | **1** | **0** | **1** | **1** | **1** | **1** | **1** | **0** | **9** | **A** |
| van Benten, 201488 | **1** | **1** | **1** | **0** | **0** | **0** | **1** | **1** | **1** | **1** | **0** | **1** | **8** | **A** |
| VanKampen, 201552 | **1** | **1** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **0** | **0** | **1** | **5** | **L** |
| Verstraete, 201351 | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **L** |
| Waller, 200943 | **1** | **1** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **1** | **0** | **0** | **6** | **A** |

Scottish Intercollegiate Guideline Network (SIGN)

a,bSee Figure 2 for Quality assessment SIGN checklist itemsa and scoringb for systematic reviews

**Table 2: Systematic reviews of Effectiveness by Condition and Treatment with Quality (Risk of Bias) Rating**

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **Treatment** | **Quality\*** | **First Author, Year Published** |
| **Pregnancy LBP** | Chiropractic Care | A | Stuber, 200821 |
| SMT | H | \*\*Liddle, 201640 |
| L | Van Kampen52 |
| Exercise  | H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| A | Nascimento, 201242 |
| L | Van Kampen, 201552 |
| Water exercise | A | Waller, 200943 |
| OMT | H | Ruffini, 201638 |
| H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| Electrotherapy | H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| Support devices | H | \*\*Liddle, 201640 |
| **Pregnancy PGP** | Exercise  | H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| L | \*\*Verstraete, 201351 |
| L | \*\*Van Kampen, 201552 |
| Patient education | H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| Information | L | \*\*Verstraete, 201351 |
| L | \*\*Van Kampen, 201552 |
| Support device | H | \*\*Liddle, 201640 |
| A | \*\*Gutke, 201531 |
| L | \*\*Verstraete, 201351  |
| L | \*\*Van Kampen, 201552 |
| **Pregnancy LBP and/or PGP** | SMT | H | Khorsan, 200941 |
| A | \*\*van Benten, 201488 |
| Multimodal care | H | \*\*Liddle, 201540 |
| A | \*\*Richards, 201245 |
| A | \*\*van Benten, 201488 |
| Exercise | H | \*\*Liddle, 201540 |
| A | \*\*Gutke, 201531 |
| A | \*\*Stuge, 200344\*\*  |
| A | van Benten, 201488 |
| A | \*\*Richards, 201245 |
| A | Belogolovsky, 201546 |
| A | Lillios, 201247 |
| A | Boissonnault, 201248 |
| L | \*\*Van Kampen, 201552 |
| OMT | H | \*\*Liddle, 201540 |
| A | \*\*van Benten, 201488 |
| CAM | H | Hall, 201639 |
| A | Close, 201449 |
| Support devices | A | \*\*Gutke, 201531 |
| A | \*\*van Benten, 201488 |
| A | \*\*Richards, 201245 |
| L | Ho, 200953 |
| Patient education | A | \*\*Gutke, 201531 |
| Physiotherapy | A | Stuge, 200344 |

\*Scottish Intercollegiate Guideline Network (SIGN) Quality rating: >9=high quality, low risk of bias (H); 6-9=acceptable quality, moderate risk of bias (A); <6=low quality, high risk of bias (L); \*\*SR that examines a number of treatment options

OMT = Osteopathic manipulative therapy; SMT = Spinal manipulative therapy

**Table 3a: Summary of systematic reviews by treatment type with participant information, quality rating,**

**and overall study conclusion for women experiencing pregnancy-related LBP (n=7).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatment / Intervention** | **Quality\*** | **First Author, Year Published** | **Number of studies, participants and type of studies** | **Grading used and Quality of studies** | **Conclusion** |
| **Chiropractic care** | A | Stuber, 200821 | 6 studies (297): 1 quasi-experimental single-group pretest-posttest design4 case series1 cross-sectional case series study | Down and Black (adapted):1 Moderate, 3 low  | Although chiropractic care is associated with improved outcomes in pregnancy-related LBP, the studies they examined were rated moderate to poor in methodological quality.  |
| **SMT** | H  | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT | GRADE:1 Low | There was no difference in pain and functional disability between women who received SMT, exercise or neuro emotional technique. |
| L | Van Kampen, 201552 | 17 studies (n=3,964): 1 RCT | PEDro Scale: 1 High  | At least 50% of the women in each treatment group (SMT, exercise or mind-body treatment) experienced clinically meaningful improvements in pain symptoms. |
| **Exercise** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 8 RCTs | GRADE:8 Low  | Exercise, land or water, may reduce pregnancy-related LBP and improves functional disability, compared to UOBC.However, low-quality evidence also suggested no significant differences in the number of women reporting low-back pain between group exercise**,** added to information about managing pain, versus usual prenatal care |
| A | Gutke, 201531 | 56 studies (n, not provided): 4 RCTs and 2 CCTs | PEDro scale:6 Moderate1 Low  | Almost all exercises performed at home or in a group reported positive effects on pain and disability compared to controls. However, the results did not indicate which type of exercises should be recommended as exercise protocol varied between studies. |
| A | Nascimento, 201242 | 19 studies, but those pertaining to pain and disability:2 studies (n=905):1 RCT 1 two-arm, two-center RCT  | No analysis performed | Although the 2 RCTs show differing results with respect to pain intensity and functional ability, the authors suggest that overall, exercise during pregnancy provides benefits for maternal health such as decreasing musculoskeletal discomfort and improving quality of life. Furthermore, they suggest that active women are better able to handle their condition. |
| L | Van Kampen, 201552 | 17 studies (n=3,964): 4 RCTs  | PEDro Scale: 2 High, 2 Fair | Confirmed the utility of exercise, either home- or group-based, to lessen pain and improve functional disability. |
| **Water exercise** | A | Waller, 200943 | 2 studies (n=648):2 RCTs | PEDro scale:1 High, 1 LowSIGN:1 High,1 Moderate | They concluded that therapeutic aquatic exercise appears to be a safe and effective treatment modality for women experiencing pregnancy-related LBP. |
| **OMT** | H | Ruffini, 201638 | 24 studies (n=1840) 4 RCTs, 2 case controls 1 observational study 1 case series | GRADE:1 High,1 Moderate, 1 Low,1 Unclear  | Although they were unable to pool the data, the data from these studies suggested a positive effect of OMT compared to controls for improving disability scores, pain during pregnancy and autonomic function. |
| H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 3 RCTs | GRADE:1 Moderate2 Low | OMT, added to UOBC, relieved pain and functional disability better than UOBC alone. However, OMT did not improve the same outcomes when adding placebo ultrasound to UOBC. |
| A | Gutke, 201531 | 58 studies (n, not provided): 1 RCT | PEDro scale:1 High | Although the evidence is limited, OMT significantly decreased pain intensity and disability compared to a general treatment with out without sham-ultrasound. |
| **Electrotherapy** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT  | GRADE:1 Low | TENS improves pain and functional disability significantly more when applied in late pregnancy. |
| A | Gutke, 201531 | 56 studies (n, not provided): 1 RCT  | PEDro scale:1 Moderate  | Although limited evidence, TENS use demonstrated a significantly greater decrease in pain and increase in function when compared to exercise and acetaminophen groups. |
| **Support devices** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 2 RCTs(1 abstract only) | GRADE:2 Low | No significant difference between the belts to relieve pain or decrease functional disability. However, 1 small study using KT might significantly provide more pain relief that exercise. |

\*Scottish Intercollegiate Guideline Network (SIGN) Quality rating: >9=high quality, low risk of bias (H); 6-9=acceptable quality, moderate risk of bias (A); <6=low quality, high risk of bias (L)

GRADE = Grading of recommendations, assessment, development, evaluation; CCT = Controlled clinical trial; KT = Kinesiotape; OMT = Osteopathic manipulative therapy; PEDro = Physiotherapy evidence database scale; RCT = Randomized control trials; SMT = Spinal manipulation therapy; TENS = Transcutaneous electical nerve stimulation; UOBC = Usual obstetric care

**Table 3b: Summary of systematic reviews by treatment type with participant information, quality rating,**

**and overall study conclusion for women experiencing pregnancy-related PGP (n=4).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatment / Intervention** | **Quality\*** | **First Author, Year Published** | **Number of studies, participants and type of studies** | **Grading used and Quality of studies** | **Conclusion** |
| **Exercise** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121):3 RCTs  | GRADE:1 Moderate,2 Low  | There is very little evidence that group exercise, in addition to information, may help manage pain compared to UOBC. |
| A | Gutke, 201531 | 58 studies (n, not provided): 5 RCTs  | PEDro scale:4 High,1 Moderate | Almost all exercises performed at home or in a group reported positive effects on pain and disability compared to controls. However, the results did not indicate which type of exercises should be recommended as exercise protocol varied between studies. |
| L | Verstraete, 201351 | 68 articles included:6 RCTs1 guideline1 review 1 narrative | Analysis unclear | Although no treatment option can guarantee full recovery, stabilizing training, muscle strengthening exercise and group exercise, as well as advice and information may reduce anxiety, reduce pain and enhance functional and coping abilities. Care should include a multidisciplinary management approach. |
| L | Van Kampen, 201552 | 17 studies (n=3,964): 3 RCTs  | PEDro Scale: 2 High, 1 Fair | Although the studies in this review confirmed the utility of exercise to decrease pain and increase functional disability. When examining the effect of exercise on PGP, most of the RCTs included improved over time but not necessarily between groups.  |
| **Patient education** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT | GRADE:1 Low | Information in a birth preparation plan on exercise and how to manage PGP was no more effective in managing pain intensity compared to UOBC. |
| A | Gutke, 201531 | 58 studies (n, not provided): 1 RCT3 CCTs (not included in the level of evidence) | PEDro scale:1 Moderate | The 1 RCT included found no difference between the treatment and control groups. The CCTs included here dealt with a multimodal approach that included education. It was reported that women in these groups experienced less discomfort and decreased pain intensity compared to controls. |
| **Information** | L | Van Kampen, 201552 | 17 studies (n=3,964): 1 RCT | PEDro Scale: 1High,  | PGP improved with time without any significant effects between the groups. |
| L | Verstraete, 201351 | 68 articles included:6 RCTs1 guideline 2 reviews 1 narrative 1 survey 1 quality analysis | Analysis unclear | To help reduce pain, information about the disorder itself, practical and anatomical information and possible contributing factors should be provided to the patient. This can include bed rest, avoiding activities that aggravate pain and strategies to minimize pain an prevent maladaptive behaviors. |
| **Support devices** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT | GRADE: | A non-rigid lumbopelvic belt and information significantly reduced pain and functional disability more than exercise and information for up to 6 weeks postpartum. However, the addition of a non-rigid belt to exercise plus information did not enhance the pain-relieving effects of exercise plus information only. |
| A | Gutke, 201531 | 58 studies (n, not provided): 2 RCTs  | PEDro scale:2 High  | Supported by strong evidence, authors suggested using a non-rigid belt significantly decreased pain intensity and disability over the short term. A pelvic belt may be a first treatment choice to stabilize the pelvis before exercise treatment has taken effect. |
| L | Verstraete, 201351 | 68 articles included:1 RCT1 guideline3 reviews 1 narrative | Analysis unclear | No RCT has investigated the use of pelvic belts as a single treatment option. It was suggested that the pelvic belt be used for symptomatic relief and applied for short periods of time. |
| L | Van Kampen, 201552 | 17 studies (n=3,964): 4 RCTs  | PEDro Scale: 2 High, 2 Fair | The literature is not conclusive concerning the use of a lumbopelvic belt. Most studies indicated no significant effect on pain. |

\*Scottish Intercollegiate Guideline Network (SIGN) Quality rating: >9=high quality, low risk of bias (H); 6-9=acceptable quality, moderate risk of bias (A); <6=low quality, high risk of bias (L).

GRADE = Grading of recommendations, assessment, development, evaluation; CCT = Controlled clinical trial; OMT = Osteopathic manipulative therapy; PEDro = Physiotherapy evidence database scale; RCTs = Randomized control trials; SMT = Spinal manipulation therapy; UOBC = Usual obstetric care

**Table 3c: Summary of systematic reviews by treatment type with participant information, quality rating,**

**and overall study conclusion for women experiencing pregnancy-related LBP and/or PGP (n=15).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatment / Intervention** | **Quality\*** | **First Author, Year Published** | **Number of studies, participants and type of studies** | **Grading used and Quality of studies** | **Conclusion** |
| **SMT** | H | Khorsan, 200941 | 13 studies (n>2,100):1 RCT6 case series, 2 case control studies1 cohort study1 other study design 2 SR | SIGN: 2 Strong (+), 6 Neither strong or weak, 5 weak (-) | The review described this limited evidence as emergent. However, the authors suggest that clinicians consider SMT as a treatment option for healthy pregnant women, without contraindications, who prefer this approach. |
| A | van Benten, 201488 | 22 studies (n=3,826): 1 RCT  | CBRG Internal ValidityCheck:1 GoodOverall: Moderate quality  | There is no evidence that manual therapy should be recommended for treatment of pregnancy-related lumbopelvic pain; 1 RCT reported positive effects on disability and pain however, no significant differences between groups were found.  |
| **Multimodal care** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT | GRADE:1 Low | Both groups, MOM intervention (manual therapy, exercise and education) and UOBC, reported a significant improvement in functional disability, but only those who participated in the MOM group reported improvements in pain. |
| A | van Benten, 201488 | 22 studies (n=3,826): 6 RCTs and 1 CCT  | CBRG Internal ValidityCheck:3 Good4 PoorOverall: Moderate quality. | Almost all the RCTs that examined a combination of interventions, reported positive results with respect to pain, disability and/or sick leave. |
| A | Richards, 201245 | 4 studies (n=566)1 RCT  | CASP:Moderate to high risk of bias | A multimodal intervention did not result in greater improvements in functional outcomes when measures with the DRI for pregnant women less that 32 wks gestation compared to acupuncture. |
| **Exercise** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 4 4 RCTs  | GRADE:4 Moderate,  | Exercise in general and an 8- to 12-wk exercise program, in particular, improved functional disability and reduced the number of women who reported LBP and/or PGP. Whereas group exercise plus information was not better at preventing either of these pains compared to UOBC. |
| A | Gutke, 201531 | 56 studies (n, not provided): 7 RCTs 2 CCTs | Pedro Scale:2 High6 Moderate1 Low | Almost all exercises performed at home or in a group reported positive effects on pain and disability compared to controls. However, the results did not indicate which type of exercises should be recommended as exercise protocol varied between studies. |
| A | Stuge, 200344 | 9 trials (n=1,350);2 RCTs 2 CCTs | Quality assessment form: 2 High 2 Moderate to Low | There was no strong evidence that exercise will help prevent or treat pregnancy-related back pain. However, water gymnastics demonstrated less pain intensity compared to no intervention. |
| A | Richards, 201245 | 4 studies (n=566)2 RCTs  | CASP:2 Low to moderate risk of bias | Exercise in either an individual home exercise program or group setting has been shown to demonstrated improved functional outcomes. The types of exercise the authors suggested would be of benefit include core and pelvic floor muscle training as well as stretching should be included in the regime |
| A | van Benten, 201488 | 22 studies (n=3,826): 9 RCTs | CBRG Internal ValidityCheck:Overall: Moderate quality.6 Good3 Poor | Exercise also has a positive effect on pain, disability and/or sick leave in those with pregnancy related-LBP, but less evidence for those with PGP. Several studies demonstrated that stabilization exercises are effective in reducing pain and disability during pregnancy. |
| A | Belogolovsky, 201546 | 5 studies (n=143):3 RCTs2 cohort studies  | Did not complete | All but one study reported significant improvements in pain and all but 2 studies reported improvements in functional outcomes relative to controls. The authors suggested that the most effective exercise programs had 2 important qualities in common: 1) functionality, positional transitions and variety as well as 2) supervision by exercise experts. In addition, other interventions investigated, such as yoga and hip/pelvic exercises, significantly diminished pain. |
| A | Lillios, 201247 | 7 studies (n=1,973):4 RCTs 2 quasi-experimental designs (lacking randomization) 1 RCT (lacking a true control group) | PEDro scale:Overall:Fair to good. 2 High 4 Fair 1 Low  | This SR concluded that there was no evidence to support exercise as the standard treatment for pregnancy related LPB and/or PGP nor is there a consensus as to the most effective treatment approach for this population. These authors suggest in order to have the most impact on pregnancy-related LBP or PGP, exercises should be specific incorporating local and global stabilizers and should be tailored to the individual. |
| A | Boissonnault, 201248 | 11 studies (n=1,891): 7 RCTs2 quasi-RCT design2 RCTs (lacking a control group) | PEDro scale:3 Good, 6 Fair, 2 Poor | Overall, the authors believe that exercise may decrease LBP and PGP during pregnancy. However, they warn that, despite the strengths (attention to precision or accuracy of results) of 3 high-quality RCTs, drawing clinical conclusions must be done with caution and recognition of some of the methodological flaws. |
| L | Van Kampen, 201552 | 17 studies (n=3,578):3 RCTs | PEDro Scale: 3 High | Although the results were inconclusive, the majority of studies in this review confirm the utility of exercise to decrease pain and disability.  |
| **OMT** | H | Liddle, 201540 (update from previous) 89-91 | 34 studies (n=5,121): 1 RCT | GRADE:1 Low | Significantly improved pain and related functional disability more than a waiting list control. |
| A | van Benten, 201488 | 22 studies (n=3,826): 1 RCT  | CBRG Internal ValidityCheck:1 GoodOverall: Moderate quality | Although 1 RCT provided high-quality evidence that OMT improves pain and disability within groups and only disability between groups, the studies are limited, and there is no evidence that manual therapy should be recommended for treatment of pregnancy-related lumbopelvic pain. |
| **CAM** | H | Hall, 201639 | 11 full text articles (n=1,198):10 RCTs | Cochrane Risk of Bias tool:No overall scores were given. | Overall, they concluded that there is limited evidence to support the use of CAM to help manage pregnancy-related LBP and/or PGP. |
| A | Close, 201449 | 8 studies (n=1,042):6 RCTs1 pilot RCT1 feasibility RCT | GRADE: Overall: Low strength | Without enough high-quality trials, these authors suggested there is limited evidence to support the use of CAM for managing pregnancy-related back pain. However, they do recognize that circumstances (i.e., pain becomes intolerable) may consider CAM therapy as it does have a good safety profile. |
| **Support devices** | A | Gutke,31 2015 | 56 studies (n, not provided):1 RCT | PEDro scale:1 Moderate | The use of a pelvic belt significantly decreased pain intensity. A pelvic belt may be a first treatment choice to stabilize the pelvis before exercise treatment has taken effect. |
| A | van Benten, 201488 | 22 studies (n=3,826): 1 RCT  | CBRG Internal ValidityCheck:1 GoodOverall: Moderate quality. | There is no evidence to suggest the use of material support, such as belts, improves pregnancy-related back pain. |
| A | Richards, 201245 | 4 studies (n=566)1 RCT | CASP:Low to moderate risk of bias | Although there were improvements in pain in both groups, no differences were seen between groups.  |
| L | Ho, 200953 | 10 studies (n=1909): 7 RCTs1 quasi-RCT2 CCTs | Not completed | This critical review suggests the effectiveness of using maternity support belts to reduce pregnancy-related LBP and/or PGP remains inconclusive. However, wearing a support belt, compared to no specific treatment, may be beneficial for pain relief and improved functional status in pregnant women experiencing LBP and/or PGP. There is limited evidence that using a support belt by itself prevents and/or treats pregnancy related LBP and/or PGP |
| **Patient education** | A | Gutke, 201531 | 56 studies (n, not provided): 3 CCTs  | PEDro scale:1 Moderate2 Low | Women experienced less discomfort and decreased pain when compared with controls. However, the 3 CCTs were part of a multimodal approach to care.  |
| **Physiotherapy** | A | Stuge, 200344 | 9 trials (n=1,350):1 RCT1 Quasi-RCT 1 CCT | Quality assessment form: 2 Moderate to Low | Although there is not strong evidence to recommend physiotherapy as an intervention to help treat or prevent pregnancy-related back pain, the authors indicate that physiotherapy should be individualized. |

\*Scottish Intercollegiate Guideline Network (SIGN) Quality rating: >9=high quality, low risk of bias (H); 6-9=acceptable quality, moderate risk of bias (A); <6=low quality, high risk of bias (L)

CAM = Complementary and alternative medicine; CASP = Clinical appraiser skills program; CBRG = Cochrane Back Review Group; CCT = Controlled clinical trial; Disability rating index = DRI; GRADE = Grading of recommendations, assessment, development, evaluation; LBP = Low back pain; MOM = Musculoskeletal and obstetric management; OMT = Osteopathic manipulative therapy; PGP = Pelvic girdle pain; PEDro = Physiotherapy Evidence Database scale; UOBC = Usual obstetric care; wk = week; wks = weeks

**Table 4: Risk of bias assessment of included randomized controlled trials34**

|  |  |
| --- | --- |
| **First Author and Year Published** | **Itemsa on SIGN Checklist** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **Total** | **Qualityb** |
| Beyaz, 201159 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 3 | L |
| Carr, 200367 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 | L |
| Depledge, 200571 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Dumas, 199563 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 5 | L |
| Eggen, 201279 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 7 | A |
| Elden, 200569 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Figueira, 201461 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 3 | L |
| Garshasbi, 200560 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 5 | L |
| George, 201374 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Haakstad, 201578 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 6 | A |
| Hensel, 201565 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 7 | A |
| Kaplan, 201686 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 5 | L |
| Keskin, 201166 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Kihlstrand, 199962 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 5 | L |
| Kalus, 200885 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 8 | A |
| Kordi, 201272 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | L |
| Kluge, 201177 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 6 | A |
| Licciardone, 201064 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Mahishale, 201482 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | L |
| Miquelutti, 201380 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 8 | A |
| Morkved, 200776 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 8 | A |
| Nilsson-Wikmar, 200570 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 7 | A |
| Ostgaard, 199483 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 4 | L |
| Ozdemir, 201581 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 8 | A |
| Peterson, 201273 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 7 | A |
| Sedaghati, 200758 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 4 | L |
| Stafne, 201275 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 9 | H |
| Suputtitada, 200256 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 7 | A |
| Thomas, 198968 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 4 | L |
| Wedenberg, 200087 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 5 | L |

SIGN, Scottish Intercollegiate Guideline Network
a,bSee Figure 3 for Quality assessment SIGN checklist itemsa and scoringb for for randomized controlled trial

Carr, Thomas, Kordi, Noren

**Table 5: Risk of bias assessment of included cohort studies34**

|  |  |  |
| --- | --- | --- |
| **First Author and Published year** | **Itemsa on SIGN checklist** |  |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **Total** | **Qualityb** |
| Morino, 201657 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 7 | A |
| Noren, 199784 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | L |

SIGN, Scottish Intercollegiate Guideline Network

a,bSee Figure 4 for Quality assessment SIGN checklist itemsa and scoringb for cohort studies

**Table 6: Randomized controlled trials and cohort studies of effectiveness by condition and treatment and**

**quality during pregnancy (risk of bias) rating from high to low**

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **Treatment** | **Quality** | **First Author, Year Published** |
| **LBP** | Exercise  | Acceptable | Suputtitada, 200256  |
| Acceptable | \*Morino, 201657 |
| Low | Sedaghati, 200758 |
| Low  | Beyaz, 201159 |
| Low | Garshasbi, 200560 |
| Low | Figueira, 201461 |
| Low | Dumas, 199563 |
| Low | Kihlstrand, 199962 |
| OMT | High | Licciardone, 201064  |
| Acceptable | Hensel, 201565 |
| Electrotherapy | High | Keskin, 201166 |
| Support devices  | Low | Carr, 200367 |
| Low | Thomas, 198968 |
| **PGP** | Exercise  | High | Elden, 200569 |
| Acceptable | Nilsson-Wikmar, 200570 |
| Support devices | High | Depledge, 200571 |
| Low | Kordi, 201372 |
| **LBP and/or PGP** | SMT/mobilizations | Acceptable | Peterson, 201273 |
| Multimodal care | High | George, 201374 |
| Exercise | High | Stafne, 201275  |
| Acceptable | Morkved, 200776 |
| Acceptable | Kluge, 201177 |
| Acceptable | Haakstad, 201578 |
| Acceptable | Eggen, 201279 |
| Acceptable | Miquelutti, 201380 |
| Acceptable | Ozdemir, 201581 |
| Low | Mahishale, 201482  |
| Low | Ostgaard, 199483 |
| Low | \*Noren, 199784 |
| Support devices | Acceptable | Kalus, 200885 |
| Low | Kaplan, 201686 |
| Physiotherapy | Low | Wedenberg, 200087 |

\*Cohort study

OMT = Osteopathic manipulative therapy; SMT = Spinal manipulative therapy

**Table 7a: Evidence tables for included randomized controlled trials and cohort studies\* in the treatment of**

**pregnancy-related LBP (High and Acceptable evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean age, Gestational age, and Mean onset** | **Intervention and Dosage** | **Comparison Group(s) and Dosage** | **Outcome measures and timeline of measures (within gestation)** | **Outcome (within and non-VAS between groups)\*Underlined timepoints only** | **\*\*Converted:****VAS (100 mm) between groups mean change difference (95% CI)**TG vs CG: | **Conclusion** | **Limitations** |
| ***Exercise*** |
| Suputtitada, 200256Acceptable | n=74, primigravida with or without LBPAge:20-34 (range)GA:26-30 wks Onset: Most experienced back pain during pregnancy.  | TG: Sitting Pelvic Tilts conducted at home 3 days/wk and with the exercise instructor 2 days/wk Increasing tilts from 4 up to 10 cycles  | CG: No exercise | Primary:Proportion of women with painVAS (10 cm) Participant rated severity of pain(0-‘No Pain’; 10-‘Worst Possible Pain’)Measurement Timepoints: 26-30 wks 34-38 wks (8 wks following start of study) | *Within group:* Proportion (% pain change):TG: 90.7%CG: 2.8%VAS (Mean change)TG: -5.09 cm, p<0.001CG: 0.28 cm, NS *Between groups:*Proportion (% pain change):TG vs CG: 87.9%, p<0.001VAS (Mean change)TG vs CG: -5.46 cm, p<0.001 | -53.2 (-53.72 to -52.7) | Sitting pelvic tilt exercise was found to decrease the proportion and intensity of back pain in primiparas women during their third trimester. | Within group difference calculated using an ‘unpaired t-test’.  |
| Morino, 201657\*Acceptable | n=156, pregnant women with or without LBPAge (mean yrs):TG1=31.5TG2=32.9GA:Less than 8 wksOnset:Not state | TG1: LBP group (at home walking)TG2: non-LBP groups (at home walking)Wear pedometer after usual prenatal checkup for 1 week bimonthly (8-11, 16-19, 24-27 and 32-35 wks gestation) | CG: None | ODIAvg steps/dayMeasurements:8, 12, 16, 20, 24, 28, 32 and 36 wks gestation\*calculated without the item “sex life” | *Within group:*ODITG1: progressively increased during pregnancy, p<0.0063Avg steps/day1st to 2nd Tri:TG1: 1, 226, p<0.013TG2: 248, p=NS2nd TriTG1: -500, p=NSTG2: 1, 138, p=NS2nd to 3rd triTG1: -1,020, p<0.013TG2: -408, p=NS*Between group:*ODITG1 vs TG2 at each gestational measure, p<0.0063 | NA | Acute increases of daily step count in early pregnancy may be a risk factor for the development of LBP.A gradual increase in steps after mid-pregnancy has been suggested to decrease the risk for the development of LBP. | Large number of drop outDifference in activity levels from other studies making the results difficult to compare |
| ***Osteopathic Manipulative Therapy (OMT)*** |
| Licciardone, 201064High | n=146, 3rd tri pregnant women with or without LBPAge (mean yrs)TG=23.8CG1=23.7CG2=23.8GA: 28-30 wks Onset: Not stated. | TG: UOBC + OMT-Standardized OMT protocol Up to 7 tx in conjunction with OB appointments at 30, 32, 34, 36, 37, 38 and 39 wks gestation30 min  | CG1: UOBC + SUTCG2: UOBC | NRS 11-point-Average level of pain-0-‘no pain’; 10-‘worst possible pain’(NOTE: Analyzed as if obtained from a 10 cm VAS)RDMQMeasurementTimepoints:30, 32, 34, 36, 37, 38 and 39 wks (only determined effect size, which considered all timepoints) | *Within Group:*Not presented; no response from author upon request of information*Between Group:*NRS (Effect size (95% CI))TG vs CG1: 0.14 (−0.26-0.55), p=0.48TG vs CG2: 0.27 (−0.13-0.68), p=0.18RMDQ (Effect size (95% CI))TG vs CG1: 0.35 cm (−0.06-0.76), p=0.09TG vs CG2: 0.72 cm (0.31-1.14), p<0.001 | vs CG1:-2.7 (not able to determine 95% CI)vs CG2:-1.4 (not able to determine 95% CI) | While not statistically significant OMT lessened LBP and disability with back-specific functioning deteriorating less in the OMT group. | Not balanced on some baseline characteristics (i.e., race/ethnicity; illicit drug use, health insurance type, employment).Standardized OMT protocol, not individualized.Beta was only 70%.No descriptive statistics provided for outcome measures; reader can not verify findings. |
| Hensel, 201565Acceptable | n=400, 3rd tri pregnant women Age (mean yrs):TG=24.0CG1=24.1CG2=24.7GA:30 wks Onset:Not stated  | TG:OMT-Standardized OMT protocol7 visits within 24 hrs of OB visits over 9 wks20 min | CG1: PUT7 visits within 24 hrs of OB visits 20 minover 9 wksCG2: UOBC | Primary: Quadruple VAS (pain intensity at 4 timepoints – now, average, best, worst)-0 to 100 scale, with higher values indicating higher painRMDQ MeasurementTimepoints: 30, 32, 34, 36, 37, 38, and 39 wks (only determined effect size, which considered all time points)  | *Within groups:*RMDQ (effect size)TG: 0.676CG1: 0.469CG2: 2.926VAS (now) (effect size)TG: -0.299CG1: -0.034CG2: 0.707VAS (average) (effect size)TG: -0.205CG1: -0.364CG2: 0.175VAS (best) (effect size)TG: -0.202CG1: -0.154CG2: 0.478VAS (worst) (effect size)TG: -0.482CG1: -0.641CG2: 0.296*Between gro*ups:RMDQ (effect size (95%CI))TG vs CG1: 0.21 (-0.73 to 1.14), p>0.999TG and CG2: -2.25 (-3.18 to -1.32), p<0.001VAS (now) (effect size difference (95%CI))TG vs CG1: -0.27 (-0.70 to 0.17), p=0.439TG vs CG2: -1.01 (-1.44 to -0.57), p<0.001VAS (average) (effect size difference (95%CI))TG vs CG1: 0.16 (-0.24 to 0.56), p>0.999TG vs CG2: -0.38 (-0.78 to 0.02), p=0.065VAS (best) (effect size difference (95%CI))TG vs CG1: -0.05 (-0.38 to 0.28), p>0.999TG vs CG2: -0.68 (-1.00 to -0.36), p<0.001VAS (worst) (effect size difference (95%CI))TG vs CG1: 0.16 (-0.22 to 0.54), p=0.946TG vs CG2: -0.78 (-1.15 to -0.40), p<0.01 | VAS (now):vs CG1: -1.0 (not able to determine 95% CI)vs CG2: -14.0 mm (not able to determine 95% CI)VAS (average):vs CG1: 5.0 (not able to determine 95% CI)vsCG2: -8.0 (not able to determine 95% CI)VAS (best): vs CG1: -0.5 (not able to determine 95% CI)vs CG2: -13.0 mm (not able to determine 95% CI)VAS (worst):vs CG1: 7.5 (not able to determine 95% CI)vs CG2: -10 (not able to determine 95% CI)\*\*Estimated mean change difference (visit 1 to 7) from Figure 2 | OMT was effective to mitigate pain and disability compared to the CG2 group but did not differ from the CG1 group. | Only 44% of the participant received the desired number of tx visitsStandardized OMT protocol, not individualized. |
| ***Electrotherapy*** |
| Keskin, 201166High | n=88, pregnant women with LBPAge (mean yrs): TG1=30.7TG2=29.7TG3=29.1CG=29.2GA (median wk):TG1=32.0TG2=32.0TG3=32.0CG=32.0Onset: During pregnancy  | TG1: Exercise= home exercise program10 x/ session, 2x daily 3 wksTG2: Acetaminophen1x500mg paracetamol tablet 2x/day3wksTG3: TENS6 sessions 2x/wk 3 wks | CG**:**Not stated | VAS (‘intermittent scale’)-assess the severity of pain-0-‘nopain’; 10-‘worst pain imaginable’-RMDQMeasurementTimepoints:32 wks (baseline);35 wks (3 wks following intervention) | *Within group:*VAS (median change):TG1: -1, p<0.001TG2: -1, p<0.001TG3: -3, p<0.001CG: 1, p=0.003RMDQ (median change):TG1: -2, p<0.001TG2: -2 p<0.001TG3: -8.5, p<0.001CG: 1, p=0.002*Between group:*VASAll 3 TGs vs CG: p<0.001TG3 vs TG1 and TG2: p<0.001TG1 vs TG2: p=0.694RMDQAll 3 TGs vs CG: p<0.001TG1 vs TG2: p=0.506 | vs CG: -40 (not able to determine 95% CI)vs TG1: -20 (not able to determine 95% CI)vs TG2: -20 (not able to determine 95% CI)\*\*Estimated mean change difference from Figure 3 | Although exercise and acetaminophen helped to relieve LBP during the 3rd tri, TENS application seemed to be more effective.TENS also appears to be a safe tx choice during pregnancy. | Small sample sizes.No explanation of control group**.**Median pre-tx VAS scores differed significantlyamong groups. |

\*Cohort study

Avg = average; BPP = Birth preparation program = BPP; CG = Comparison group; CI = Confidence interval; cm = Centimeter; GA = Gestational age; hrs = Hours; LBP = Low back pain; mg = milligrams; min = Minute; NRS = Numerical rating scale; NS = Non-significant; OB = Obstetrician; ODI = Oswestry disability index; OMT = Osteopathic manipulative therapy; PGP = Pelvic girdle pain; Prev = Prevalence; PUT = Placebo ultrasound treatment; RMDQ = Roland-Morris disability questionnaire; SUT = Sham ultrasound therapy; TENS = Transcutaneous electrical nerve stimulation; TG = Treatment group; Tri = Trimester; tx = treatment; UOBC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

**Table 7b: Evidence tables for included randomized controlled trials in the treatment of pregnancy-related PGP**

**(High and Acceptable evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean age, Gestational age, and Mean onset** | **Intervention and Dosage** | **Comparison Group(s) and Dosage** | **Outcome measures and timeline of measures (within gestation)** | **Outcome (within and non-VAS between groups)\*Underlined timepoints only** | **\*\*Converted:****VAS (100 mm) between groups mean change difference (95% CI)** | **Conclusion** | **Limitations** |
| ***Exercise*** |
| Elden, 200569High | n=386, pregnant women with PGPAge (Mean yrs):TG1=30.6TG2=30.0CG=30.8GA (Mean wks): All groups: 24 Onset: Prior to enrollment (12-31 wks) | TG1: Stabilizing exercises, massage, stretching + standard tx6 hrs of individualized care over 6 wks and asked to perform exercises regularlyTG2: Acupuncture + general tx2x/wk for 6 wks | CG: General tx: information, stabilizing pelvic belt and home exercise program | Morning VAS (100mm)Evening VAS (100mm)No bookends providedMeasurements: Baseline and 1 wk following last treatment | *\*median**Within group:*Morning VAS:TG1: -4TG2: -8CG: 4Evening VAS:TG1: -15TG2: -34CG: -5 | *\*median*Morning VAS:vs CG: -9(-12.8 to -1.7)vs TG2: 3(-0.3 to 7.8)Evening VAS:vs CG: -13(-17.5 to -2.7)vs TG2: 14(3.3 to 18.1) | Stabilizing exercise (or acupuncture, slightly superior) in addition to standard tx resulted in a reduction PGP | Only examined differences before and after 6 wks of care during pregnancy, although daily VAS measurements taken No long-term follow-up |
| Nilsson-Wikmar, 200570Acceptable | n=118, pregnant women with PGP Age (Mean yrs):TG1=29.5TG2=29.7CG=28.4 GA (Mean wks): TG1=22 TG2=21 CG=25 Onset:*Before gestation-*TG1: n=14TG2: n=11CG: n=9*12-24 wks gestation-*TG1: n=20TG2: n=24CG: n=18*25-32 wks gestation-*TG1: n=7TG2: n=2CG: n=13 | TG1: Home exercise + CG3 exercises aimed at stabilizing muscles around the pelvic girdleTG2: In-clinic exercise + CG4 different strengthening and stabilizing exercises3 sets, 15 reps 2x/wk Until 39 wks (PT gave instructions 2x) | CG: Information + non-elastic belt Access to call PT with concerns | Primary:VAS (100mm) for painPain Drawing (not included in this review)DRIMeasurements: Inclusion, 38 wks gestation, 3, 6, 12 mos postpartum | *\*median**Within group:*VAS:TG1: 4 mmTG2: 15 mmCG: 0 mmDRI TG1: 28 mmTG2: 19 mmCG: 24 mm*Between Group:*DRITG1 vs CG: -4 mmTG2 vs CG: -5 mm | *\*median*TG1 vs CG: 4 (not able to determine 95% CI)TG2 vs CG: 15 (not able to determine 95% CI) | No statistical significance between groups, but all groups, improved.  | Manuscript included both pregnancy and post-partum data.In-clinic exercise group included patients statistically significantly earlier than other groups. |
| ***Support devices*** |
| Depledge, 200571 High | n=87, pregnant women with symphysis pubis painAge: 29.5 yrsGA:Not reportedOnset 25.9 wks  | TG1: Exercise + AdviceTG2: Exercise + Advice + NRSB TG3: Exercise + Advice + RSBExercises 3x/ daily for 1 wk | CG:None | RMDQ (Modified)PSFSAvg NRS (101-point)Worst NRS (101-pts)Measurements:Baseline and 1 wk after tx | *\*(% change)**Within Group* RMDQ:TG1: -22.7%TG2: -15.9%TG3: -17.0%p<0.001, for allPSFS:TG1: -38.6%TG2: -25.4%TG3: -30.4%p<0.001, for allAvg NRS:TG1: -31.8%TG2: -13.9%TG3: -29.2%p<0.001, for allWorst NSR:TG1: -22.6%TG2: -12.7%TG3: -10.8%*Between Groups:* RMDQ, PSFS: NS | Avg NRS:TG1 vs TG2: 11(1.4 to 20.6)TG1 vs TG3: 0(-8.5 to 8.5)TG2 vs TG3: -11(-21.7 to -0.3)Worst NSR:TG1 vs TG2: 12(2.8 to 21.2)TG1 vs TG3: 6(-1.3 to 13.3)TG2 vs TG3: -6(-16.5 to 4.5)\*\*Estimated mean change difference from Figures 4 and 5 | No significant difference was found between groups (except for average NRS), but all groups had significant decreases in all measures. | No untreated comparison group.Short tx time (1 week)Many of the participants found the belts uncomfortable.Unsure who and how the questionnaires were administered. |

am = Morning; avg = Average; CG = Comparison group; DRI = Disability rating index; GA = Gestational age; hrs = Hours; min = Minute; mm = Millimeter; mos = Months; NRS = Numerical rating scale; NS = Non-significant; OB = Obstetrician; ODI = Oswestry Disability Index; OMT = Osteopathic manipulative treatment; PGP = pelvic girdle pain; pm= Evening; Prev = Prevalence; PSFS = Patient specific functional scale; PT = Physiotherapist; pts = Points; reps = Repetitions; NRS = Numeric rating scale; NRSB = Non-rigid support belt; NS = non-significant; RMDQ = Roland-Morris Disability questionnaire; RSB = Rigid support belt; SUT = Sham ultrasound therapy; TENS = Transcutaneous electrical nerve stimulation; TG = Treatment group; tri = Trimester tx = Treatment; UOBC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

**Table 7c: Evidence tables for included randomized controlled trials in the treatment of pregnancy-related**

**LBP and/or PGP (High and Acceptable evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean age, Gestational age, and Mean onset** | **Intervention and Dosage** | **Comparison Group(s) and Dosage** | **Outcome measures and timeline of measures (within gestation)** | **Outcome (within and non-VAS between groups)\*Underlined timepoints only** | **\*\*Converted:****VAS (100 mm) between groups mean change difference (95% CI)**TG vs CG | **Conclusion** | **Limitations** |
| ***SMT/mobilization*** |
| Peterson, 201273Acceptable | n=57, pregnant women with LBP and/or PGP reproducible by palpationAge (Mean yrs): TG1=31.1TG2=29.7CG=28.7 GA (Mean wk):TG1=25.7TG2=27.0CG=23.7Onset: TG1=16.1TG2=13.9CG=11.6 | TG1: SMT= HVLA for L/S and SI JT; blocks used to adjust Sacro Occiptial Technique Category II pelvis; activator to adjust pelvisTG 2:NET=chiropracticmind-body technique; combines desensitization procedures with elements of Five Element Chinese medicine + chiropractic adjustmentParalleled prenatal care schedule; 1x/mo until 28 wks; 2x/mo until 36 wks; 1x/wk thereafter | CG: Individualized home exercises + information5x/wk15 min | Primary:RMDQSecondary:NPRS (11-pts; no bookends provided)Measurements:Each tx (variable) – Baseline and 36 wks | *Within group:*RMDQTG1**=-**4.6TG2=-3.6CG=**-**4.6NPRS (Mean difference):TG1=-1.6TG2=-0.8CG=-1.5 *Between group:*RMDQ (mean change differences)TG1 vs CG: 2.0, p=0.995TG1 vs TG2: 1.6, p=0.45TG2 vs CG: 0.3, p=0.712 | TG1 vs CG: -1.0(-13.0 to 11.0)TG1 vs TG2: -0.8(-19.4 to 0.3)TG2 vs CG: 0.7(-3.7 to 1.8) | All 3 interventions provide clinically meaningful improvement in function and pain intensity. No between group differences were noted. | Insufficient time avail for satisfactory recruitment.Potential investigator bias for tx effects.Participants entering study at any point during pregnancy therefore hard to complete protocols.Imputation method could have led to bias. |
| ***Multimodal care*** |
| George, 201374Acceptable | n=169, pregnant women with LPB and/or PGPAge (Mean yrs):TG=27.3CG=26.6GA (Mean wk):TG= 3.5CG=23.2Onset:Not stated | TG: UOBC + MOMWeekly visits with chiropractic specialist who provided education, manual therapy and stability exercises (to be done 2x/day) | CG: UOBC Obstetric provider could recommend tx options | NRS(0: no pain -10: maximum level of pain)QDQMeasurements:Baseline (24-28 wks) and 33 wks gestation | *Within Group:*NRS:TG=-2.9, p<0.01CG=-0.1, p=0.62QDQ:TG= -1.0, p<0.01CG= 0.6, p<0.01*Between groups:*QDQTG vs CG: -1.6, p<0.001 | -28.0(-35.2 to -20.8) | Combination of manual therapy, exercise and patient education reduces pain and disability when applied at 24-33 wks gestation compared to UOBC. | Low enrollment versus those screened.Responses to complaints of LBP and/or PGP vary among obstetric providers.Cannot discern which tx or combo of tx gave the most clinical benefit.Did not use sham txs, nor was placebo controlled.Did not evaluate prophylactic tx. |
| ***Exercise*** |
| Stafne, 201275High | n=855, pregnant women with or without LBP and/or PGPAge (Mean yrs): TG=30.5CG=30.4GA: Enrolled 18-22 wksOnset:Not stated | TG: Group exercise: standardized aerobic + strengthening+ stretching + balance 1x/wk with PT for 60 min 12 wksHome exercises: Same as above2x/wk for 45 min12 wksWritten information on PFM exercises, diet and pregnancy-related LPP | CG: UOBC+ customary informationWritten information on PFM exercises, diet and pregnancy-related LPP(Could exercise on their own) | Self-report of LBP and/or PGPDRI (100 mm)Morning Disability VAS (100 mm)Evening Disability VAS (100 mm)Measurements: Baseline 18-22 wks and follow up 32-36 wks gestation | *Within Groups:*Frequency of pain difference (% change)TG: -17%CG:14%Morning Disability VAS (mean change)TG: 9.9 mmCG: 7.2 mmEvening Disability VAS (mean change)TG: 10.3 mmCG: 7.6 mmDRI (mean change)TG: 12.0 mmCG: 12.4 mm*Between groups:*Frequency of pain difference (% change difference)TG vs CG: 3%, p=0.76Morning VAS (% change difference)2.7, p=0.80Evening VAS (% change difference) 2.7, p=0.92 DRI (change difference)TG vs CG: -0.4, p=0.48 | *No pain scale provided.* | Exercise did not affect LBP and/or PGP but women who exercised handled pain better (i.e., less sick leave). | Exercise adherence—some evidence that more adherent women had a slightly decreased OR of LBP and/or PGP.An earlier intervention may have had different outcomes.Self-reports of LBP and/or PGP and sick leave.Did not differentiate between LBP and PGP. |
| Miquelutti, 201380Acceptable | n=205, nulliparous pregnant womenAge (mean yrs): TG=22.9CG=22.9GA (Mean wks):TG=20.7CG=20.4Onset:Not stated | TG: BPP= Education and exercise Same days as prenatal visits50 min/ session | CG: UOBC | PrevLBPPrevPGPVAS LBP (10 cm) VAS PGP (10 cm) Average pain over preceding day No bookends providedMeasurement Timepoints: 18-24 wks, 28-30 wks and 36-38 wks | *Within groups:* PrevLBP (% change)TG: 4.7%CG: -1.8%PrevPGP (% change)TG: 13.8%CG: 12.6%VAS LBP (Mean change)TG: 0.4 cmCG: 0.3 cmVAS PGP (Mean change)TG: 1.7 cmCG: 1.2 cm*Between groups:* PrevLBP (RR (95% CI))TG vs CG: 1.01 (0.79 to 1.27) PrevPGP (RR (95% CI)) TG vs CG: 1.02 (0.62 to 1.68)VAS LBP (Mean difference (95% CI))TG vs CG: 0.34 cm (-0.61 to- 1.28)VAS PGP (Mean difference (95% CI))TG vs CG: -0.38 cm(-2.09 to -1.33) | LBP: 1.0(0.01 to 1.99)PGP: 5.0 (3.13 to 6.87) | No difference in LBP and/or PGP was found between groups. (i.e., less sick leave). | Primary outcome in the study was gestational diabetes and glucose metabolism. Some evidence that more adherent women had a slightly decreased OR of LBP and/or PGPSelf-reports of LBP and/or PGP and sick leave.Did not differentiate between LBP and/or PGP. |
| Ozdemir, 201581 Acceptable | n=96, pregnant women with LBP and/or PGPAge (mean yrs):TG=29.2CG=30.1GA (mean wks): TG=26.1CG=27.3 Onset: TG=19.3 wks gestationCG=20.2 wks gestation | TG: Education + individualized home exercise program3 days/ wk30 min. | CG: UOBC4 wks –follow-up phone calls | VAS (100 mm) Participant rated severity of LBP and PGP at rest and during activity(0-‘No hurt’; 10-‘Hurts worst’)ODIMeasurement Timepoints: 19-20 wks (baseline), 23-24 wks (after 4 wks) | *Within group:*VAS (rest) (Mean change)TG: -20.69 mm, p<0.001CG: 6.25 mm, p=0.204VAS (activity) (Mean change)TG: -25.31 mm, p<0.001CG: 2.69mm, p=0.258ODI (Mean change)TG: -5.85, p<0.001CG: 0.67, p=0.546*Between Groups:*VAS (rest)TG vs CG: -26.94 mm; p< 0.001VAS (activity)TG vs CG: -28.00 mm; p<0.001ODITG vs CG: -5.56; p<0.001 | Rest:-26.94 mm (-27.95 to -25.93)Activity:-28.00 mm (-28.47 to -27.53) | A 4-wk individualized counseling and home exercise program was more effective than standard tx at relieving LBP. | Compliance with home exercise.Possible self-report bias.Diagnosis of LBP was based on oral history from patient. |
| Morkved 200776Acceptable | n=301, nulliparous pregnant women with or without self-reports of LPP (LBP and PGP)Age (Mean yrs): TG=28.0 CG=26.9 GA:Enrolled at 20 wksOnset:Not stated | TG: Group exercises: aerobic + strength + stretch + CG1 x/week 60 min12 wksHome exercises for PFM contractions + CG2x/day8-12 rep  | CG: Customary information from their midwife or general practitioner (could exercise on their own) | PrevLBP and/or PGPPain drawings DRIMeasurements: 20 and 36-wks gestation and 3 mo postpartum | *Within Group:*PrevLBP and/or PGP (% change) and DRI:Not reportedPain drawing:TG: 1.0CG: 13.0*Between Group:*PrevLBP and/or PGP (% change):TG vs CG: -12%, p=0.033DRI (Median difference):TG vs CG: -5, p=0.011 | *No pain scale included.* | A 12-wk specially designed training program was effective in preventing PrevLBP and/or PGP pain at 36-wks gestation. | Use of only self-reports and pain drawings and no clinic tests of LPP.Not all women had LBP and/or PGP. |
| Kluge, 201177Acceptable | n=50, pregnant women with LBP and/or PGPAge (Mean yrs):TG=27CG=29GA (Mean wk):TG=20CG=20Onset: Pain started during current pregnancy, prior to enrollment (16-24 wks) | TG: Group exercise: for TVA and PFM + (progress to lower body strength) + stretch/relaxHome exercise program (same as above) Back care and posture advice + pamphlet + UOBC 10-wk exercise programEvery 2nd wk it was group led30-45 minIntensity progressed in stages:1 and 2–4 wks each3–2 wks | CG: Back care and posture advice and pamphlet + UOBC | 6-item Pain Questionnaire each with a 0-10 scale(bookend not provided)Likert-modified RMDQMeasurements:Baseline and 10 wks following intervention | *Within group:* Pain Questionnaire (Median change)TG: -11.5, p<0.01CG: 2.0, p=0.89Likert-modified RMDQ (Mean change)TG: -31.5, p=0.06CG: -0.5, p=0.70*Between groups*: After interventionPain Questionnaire TG vs CG: p= <0.01Likert-modified RMDQ TG vs CG: p=0.03 | -13.5 (not able to determine 95% CI)\*\*Based on the 6-item pain questionnaire | Exercise intervention improved pain intensity and functional ability between groups.  | Sample size did not meet power calculation. Poor exercise compliance. |
| Eggen, 201279 Acceptable  | n=257, pregnant womenAge (Mean yrs): TG1=30.6CG=30.0GA (Mean wk)TG=16.3CG=16.4Onset:Not stated | Group-based exercise (aerobic +strengthening), information, and home exercises (knee bends, hip stretch, stability)Group exercise= 1x/wk60 min 20 wks  | CG: UOBC Visits every 4th week to primary care centres | Primary:PrevLBP PrevPGPSecondary:Morning NSR (11-pt)Evening NSR (11-pt)0-no pain10-pain as bad as it can beRMDQ Measurements:Baseline (prior to 20), 24, 28, 32 and 36 wks | *Within Group* PrevLBP (% change)TG: 13.2%CG: 16.9%PrevPGP (% change)TG: 31.9%CG: 34.2%Morning NSR:TG: 1.2 ptsCG: 1.2 ptsEvening NSR:TG: 1.5 ptsCG: 1.6 ptsRMDQ:TG: 2.1 ptsCG: 2.2 pts*Between Group:*PrevLBP (% change)TG vs CG: -3.7%PrevPGP (% change) TG vs CG: -2.3%RMDQ:TG vs CG: -0.1 pts | Morning NRS:0 pts(-0.9 to 0.9)Evening NRS: -1.0 pts(-2.2 to 0.2) | Group exercise did not reduce the prevalence of pregnancy LBP or PGP. | Possible Type II error with 70% power.Adverse event not measured.Imbalance between groups in terms of PGP in previous pregnancy.Considered women with and without LBP or PGP.Not enough exercise classes at 1x/week. |
| Haakstad, 201578Acceptable | n=105, sedentary nulliparous womenAge (Mean yrs):TG= 31.2CG= 30.3 GA (Mean wk):TG= 17.3 CG= 18.0 Onset:Not stated | Group exercise + home exercise moderate self-imposed physical activity 40 min endurance 20 min strength training and relaxation2 or 3x/wk minimum of 12 wksHome exercise moderate self-imposed physical activity30 mins on non-group exercise days) | CG: UOBC(They were neither encouraged or discouraged from exercising) | Primary:PrevLBPPrevPGP Secondary: Limitation of ADLs and physical activitiesMeasurements:Baseline (between 12-14 wks), 36-38 wks (post intervention) and 6-8 wks postpartum | NS differences seen at any point.*Within Group:**Post-intervention* PGP (% change):TG: 11.2%CG:16.9%LBP (% change): TG: 16.4%CG: 10.7%*Postpartum* PGP (% change):TG: -12.9%CG: 1.5%LBP (% change):TG: -10.2CG: -21.5*Between group:**Post-intervention* PGP (% change difference):TG vs CG: -5.7%LBP (% change difference):TG vs CG: 5.7%*Postpartum* PGP (% change difference): TG vs CG= -11.4%LBP (% change difference):TG vsCG -11.3%VAS  | *No pain scale included* | No difference in proportion of women with pain between both tx groups and time pts. | Secondary analysis of a study evaluating the effectiveness of exercise on maternal weight gain.Sample size, was not based on *a priori* power calculations for PGP and LBP outcomes, based on gestational weight gain.High loss to follow-up at post test.Low adherence to group exercise classes. |
| ***Support devices*** |
| Kalus, 200885Acceptable | n=115, pregnant women with LBP or PGPAge: not reported but stated no differences between groupsGA (Mean wk):TG=28.2 CG=29.2 Onset:Not stated | TG: Belly Bra®Self-selected duration and frequency of wear for 3 wks | CG: Tubigrip Self-selected duration and frequency of wear for 3 wks | Primary:VAS (0-no pain to 10-worst pain ever in life pts)ADLsLikert Scale (1-10 pts):SleepingSit to standSittingWalking WorkingMeasurements: Baseline and 3 wks following intervention | *Within Group* VAS (Mean change):TG: -1.6 pts, p=0.001CG: -1.3 pts, p=0.003Likert Scale: (Mean change)TG: Range -2.7 to -1.3; all items SSCG: Range -1.4 to -0.6; all but sitting and walking SS*Between Group*Likert Scale: Range -1.4 to -0.5; all SS but sitting | 20.0 (-12.5 to 07.4) | Both grps associated with a decrease in pain intensity, but no significant difference between groups. TG more effective than the CG in decreasing pain associated with some ADLs.  | The CG garment not formally evaluated.High loss of participants to follow-up.Timeline of the intervention (3-wks).No long-term effects of the study device.Other tx could be used in the study and control groups |

ADLs = Activities of daily living; am = Morning; Avg = Average; CG = Comparison group; cm = Centimeters; DRI = Disability Rating Index; GA = Gestational age; hrs = Hours; HVLA = High velocity low amplitude thrust; LBP = Low back pain; L/S = Lumbar spine; min = Minute; mins = minutes; mm = Millimeters; mo = Month; mos = Months; MOM = Musculoskeletal and obstetric management; NPRS = numeric pain rating scale; NRS = numerical rating scale; NS = non-significant; OB = Obstetrician; ODI = Oswestry disability index; OMT = Osteopathic manipulative therapy; PGP = Pelvic girdle pain; PFM = Pelvic floor muscles; pm = Evening; Prev = Prevalence; PSFS = Patient specific functional scale; PT = Physiotherapist; pts = points; reps = Repetitions; NET = Neuroemotional technique; NRS = Numeric rating scale; RMDQ = Roland-Morris disability questionnaire; QDQ = Quebec disability questionnaire; RR = SI JT = Sacroiliac joint; SS = Statistically significant; SUT = Sham ultrasound therapy; TENS = Transcutaneous electrical nerve stimulation; TG = Treatment group; tri = Trimester; TVA = Transversus abdominus; tx = Treatment; UBOC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

**Table 8a: Evidence tables for included randomized controlled trials in the treatment of pregnancy-related LBP (Low evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean Age, Gestational Age, and Mean onset** | **Intervention** | **Comparison Group(s)** | **Dosage** | **Outcome measures and timeline of measures** | **Outcome (Mean change within and between groups)** | **Conclusion** | **Limitations** |
| ***Exercise*** |
| Sedaghati, 200758Low | n= 100, women with or without LBPAge (Mean yrs):TG= 23.3CG= 23.3GA:Between 20-22 wks gestationOnset:Not stated | TG:Group exercise (strengthening, stretching and cycling) | CG:Not stated | 3 x/wk8 wks | QDQMeasurements:Baseline (20-22 wks) and 8 wks later | *Within groups:*TG= 0.8, p=0.11CG= 5.8, p=0.00*Between groups:*QOD (Mean difference)At BaselineCG vs TG= 1.45 p=0.22QOD (Mean difference)PosttestCG vs TG = 6.5, p<0.0001 | Exercise during the 2nd half of pregnancy demonstrated no increase in LBP compared to controls | Group sizes differedNo description of what the pre-test LBP was |
| Dumas, 199563Low | n=65, sedentary pregnant womenAge (mean yrs)TG: 28.8CG: 29.8GA: Enrolled after 12 wksOnset: Not stated | TG: Group exercise: aerobics, calisthenics, relaxation | CG: no exercise/sedentary | TG: Group exercise 1 hour3x/weekUntil term | Prev of pain – Prevalence of an episode of moderate or severe painBack pain classification scale/Diary (0-5 scale: 0= no pain, 5= intense, incapacitating pain, almost impossible to do anything until it lessens)Functional limitations (1-3 scale; 1= no difficulties, 2= painful but possible, 3= no possible due to pain) | *Within groups:* Not reported*Between groups:*Prev of pain: no significant difference between the two groups were found at any period of pregnancyBack pain classification scale: No significant difference between the two groups was found at any time-period combination showing no reduction of back pain due to exercise. Functional limitations: No significant differences between the two groups.  | Group exercise classes designed according to guidelines had no detectable effect on back pain during pregnancy. | No randomization of groups; divided according to preference |
| Beyaz, 201159Low | n= 36, healthy pregnant womenAge (Mean yrs):TG= 24.5CG= 25.2GA (Mean wks):TG= 18.5CG= 19.5Onset:Not reported | TG:Group exercise + information (including birth prep information at 30 wks)  | CG:Information from their OB clinic | TG:3x/wkEncouraged to walk on the days not participating in the classUntil 30-33 wk gestation. After which they could continue until 37 wks | VASMeasurements: Baseline (2nd tri) and post-intervention (30-33rd wk) | *Within groups:*VAS (Raw data not reported)TG: decreased, p<0.001CG: increased, p=0.0001*Between groups:*Not reported | Exercise program was effective at preventing LBP in pregnant women | Small sample sizeUnequal group sizesNo randomization process for groups; participants assigned to groups based on availabilityOccupational demands significantly different (heavier) in TG than CG |
| Garshasbi, 200560Low  | n=212, pregnant womenAge (Mean yrs):TG=26CG=26GA: Enrolled 17-22 wksOnset:Not stated | TG:Group exercise(strengthening specific muscles) | CG:No exercise | TG:3x/wk 12 wks 60 min/ session | KEBK\* | *Within group:*KEBK (Mean change)TG: 6.88, p<0.001CG: 1.37, p<0.001*Between groups:* Following interventionKEBKCG vs TG, p= 0.006 | Exercise was effective in reducing low back pain intensity.  | No power calculationOutcome measure is limited and was modifiedNo mention of attrition rateNo intention to treat analysisNo mention of participant blinding to group allocation |
| Figueira, 201461Low  | n= 40, pregnant women with or without LBPAge (Mean yrs):TG=25CG=26GA (Mean wks):TG=23.9 CG=23.4 Onset:Not stated  | TG: Group exercise (sessions of static flexibilizing) | CG: UOBC | TG:2x/wk45 min/ session 18 sessions.  | VAS  | *Within group* With LBPVAS (% change)TG: -56.4, p=<0.005CG: 2.9, p=0.34*Between groups* VAS (Mean change)Post-testCG vs TG, p=<0.005 | Exercise was effective in reducing low back pain intensity in comparison to conventional prenatal tx  | No power calculationNo sham or no tx comparison group Simple random samplingNo blindingNo mention of attrition |
| Kihlstrand, 199962 Low | n= 258, pregnant women with or without back/LBPAge (Mean yrs):TG= 28CG= 29GA:Enrollment could begin before the 19th wkOnset:Not reported | TG=Group exercise (water gymnastics) | CG=No tx | Water gymnastics:10 classes12-15 women60 min: 30 min of physical training and 30 min of relaxation exercises | worstVAS (10 cm)mildestVAS (10 cm)nowVAS (10 cm)Measurements:18 and 34 wks and 7 days postpartumNote: nowVAS was recorded every day from 18 wks gestation until labour  | *Within group:*Not reported*Between group:*nowVAS At 18 wksCG vs TG, p= NSBetween 33-38 wksCG vs TG, SS lower for TG, but p-value not givenworstVAS At 18 wksCG vs TG, p=0.893At 34 wksCG vs TG, p=0.2307 days postpartumCG vs TG, p=0.034 | Water gymnastics during the 2nd half of pregnancy significantly reduces the intensity of back/LBP | Randomization concernsPoor blindingDifferences between groupsNo mention of reason for dropouts.  |

|  |  |
| --- | --- |
| ***Support devices*** |  |
| Carr, 200367Low | n=40, pregnant women, self-report of LBP over the previous wkAge (Mean yrs):GA (Mean wks):TG= 27.6 CG= 27.3 Onset:In the last week | TG=Loving Comfort back support | CG=No tx until after the TG finished wearing the belt | TG: wear support belt for 2 wks, during waking hrs | NRS (0-10) for painNRS (0-10) for function | *Within group:*Average Pain (Mean Difference)TG:-1.08, p=NSCG:-1.38, p=NSFamily Functional Activities (Mean Difference)TG: 0.99, p=0.01CG: -0.87 p=0.01*Between group:*Average Pain (Mean Difference)TG vs CG: 0.3, p=NSFamily Functional Activities (Mean Difference)TG vs CG: 0.49 | The use of a maternity belt may reduce pain scores and lessen the effects of pregnancy-related LBP | Pilot studyLack of randomizationSmall group sizeExperience of the TG |
| Thomas, 198968Low | n= 92, pregnant women, with or without backacheAge (Mean yrs):Not reportedGA (Mean wk):TG=36 CG=36Onset:Varied throughout pregnancy | TG=Ozzlo pillowPatients crossed over in the second wk | CG=Regular pillowPatients crossed over in the second wk | Each participant took either the TG or CG pillow for the 1st wkThen switched pillows for the 2nd wk | amVAS (100 mm)pmVAS (100 mm)Measurements:Each day and night of the week | *Within group:*Not reported*Between group:*amVAS (Mean difference)TG vs CG= -4, p=0.04pmVASTG vs CG= -6, p=0.005 | Supporting the abdomen in the lateral recumbent position may benefit women in late pregnancyUsing the specially designed pillow may be of greater help than a normal pillow | No baseline VAS measures were obtainedAge demographic not reportedShort duration of the study |

am = morning; CG = Comparison group; GA = Gestational age; hrs = Hours; KEBK = questionnaire for low back pain intensity changed according to Iranian culture and behaviors; LBP = Low back pain; NRS = Numeric rating scale; OB = Obstetrics; ODI = Oswestry disability index; pm = evening; QDQ = Quebec disability questionnaire; SS = Statistically significant; TG = Treatment group; tx = treatment; UOBC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

**Table 8b: Evidence tables for included randomized controlled trials in the treatment of pregnancy-related PGP (Low evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean Age, Gestational Age, and Mean onset** | **Intervention** | **Comparison Group(s)** | **Dosage** | **Outcome measures and timeline of measures** | **Outcome (Mean change within and between groups)** | **Conclusion** | **Limitations** |

|  |
| --- |
| ***Support devices*** |
| Kordi, 201372 Low | n=105, pregnant women with PGP Age: TG1=26.5TG2=28.3CG= 25.3GA (Mean wks): TG1=24.7 TG2= 26.5 CG=25.5 Onset:During pregnancy  | TG1: Exercise=home-based exercise program + information TG2:Non-rigid lumbopelvic belt + information | CG:Information | TG1:Aerobic exercise= 64-76% HRmax25 min/ session Stretching10-20 sec holds3-5 x/ session2x/day, Strengthening exercise: 3-10 sec3-5x/ session2x/day All exercises 3x/wk for 6 wksTG2: Wear belt during the course of the study, could remove for sleep | Primary: ODI (Persian version)VAS (100 mm)Measurement: Baseline, 3rd + 6th wk  | *Within group:*VASTG1: -27.1TG2: -53.4CG: -5.8ODITG1: -14.0TG2: -20.5CG: -6.6*Between groups*VASTG1 vs CG: -21.3, p<0.001TG2 vs CG: -47.6, p<0.001TG2 vs TG1: -26.3, p<0.001ODITG1 vs CG: -7.4, p<0.001TG2 vs CG: -13.9, p<0.001TG2 vs TG1: -6.5, p=0.008 | Short-term lumbopelvic belt + information in t of pregnant women with PGP is superior to exercise + information or information alone.Exercise plus information also out performed the control group to a statistically significant degree.  | Lack of long-term follow-up.Groups were not equal in VAS and ODI at baselineOnly 20-32 weeks pregnant at baseline included |

CG = Comparison group; GA = Gestational age; hrs = Hours; OB = Obstetrics; ODI = Oswestry Disability Index; PGP = Pelvic girdle pain; SS = Statistically significant; TG = Treatment group; UOBC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

**Table 8c: Evidence tables for included randomized controlled trials and cohort studies\* in the treatment of**

**pregnancy-related LBP and/or PGP (Low evidence only)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Citation and Quality** | **Patient population, Mean Age, Gestational Age, and Mean onset** | **Intervention** | **Comparison Group(s)** | **Dosage** | **Outcome measures and timeline of measures** | **Outcome (Mean change within and between groups)** | **Conclusion** | **Limitations** |

|  |
| --- |
| ***Exercise*** |
| Noren, 199784\*Low | n= 135, pregnant women with LBP and/or PGPAge (Mean yrs):Not reported. But stated no significant difference between intervention and control group from another clinicGA (Mean wk)TG= 26CG=26Onset:Wk 18 | TG: Individualized program of information + exercise | CG:Information | 5 visits | VAS maxVAS minVAS present | *Within group:*VAS max @ 36 wks (Mean difference)VAS max = -1.1, p<0.05VAS minValues not reported, p=NSVas presentValues not reported, p=NS*Between Group:*Not reported | Sick leave for LBP and PGP was reduced with an individualized program of information and exercise.  | Assessors were not blindedStudy was not randomized at 1 clinic2 different assessors; 1 for the TG and 1 for CG |
| Mahishale, 201482Low  | n= 210, pregnant women with PGP and LBPAge:Between18-40; age was well matched between groups. No specific numbers reported. GA: 16-34 wks; GA was well matched between groups. No specific numbers reported.Onset:Not stated | TG: Specific exercise protocol/program based on pain presentation: TG1: LP TG2: SJPTG3: SPP  | CG: Non-specific exercise program based on pain presentation: CG1: LJP CG2: SJPCG3: SPP  | 5 consecutive days30 min/ sessions  | VASMODQMeasurements: 1st day pre-intervention and 5 days post-intervention | *Within Group:*Pre vs PosttestVASTG1, TG2, TG3, p=0.0001CG1, CG2, CG3, p=0.0001MODQTG1, TG2, TG3, p=0.0001CG1, CG2, CG3, p=0.0001*Between groups:* PosttestVASC1 vs TG1, p=0.0001C2 vs TG2, p=0.285C3 vs TG3, p=0.0001MODQC1 vs TG1, p=0.0001C2 vs TG2, p=0.974C3 vs TG3, p=0.0001 | Specific tailored exercise protocol was more beneficial for lumbar pain and symphysis pubis pain. There was no additional benefit for sacroiliac joint pain.  | Convenience sampling. No power calculation. No intention to treat analysis.Short-term follow-up. |
| Ostgaard, 199483Low | n=407, women with LBP or PGP during pregnancyAge:No statistically significant differences existed among groups. Specifics regarding baseline characteristics not reported.GA: TG1: before the 20th wk of pregnancyTG2: between 18-32 wksOnset: before 18th week of pregnancy  | TG1: Back school education (group)Training program: anatomy, posture physiology, lifting and work technique, muscle and relaxation trainingSacroiliac belt (if needed)TG2: Back school education (individual)Training program (see above) Home exercises: individualizedSacroiliac belt (if needed) | CG: UOBC | TG1: Group class (5-8 participants)2 x 45 min Given before 20-wks gestationTG2: Individualized sessions: 5x30 min Between 18-32 wks gestation | VASSick leaveMeasurements: Baseline (before 18 wk gestation), 36 wks gestation, 8 wks postpartum | *Within group:*VASNot reportedSick leaveLess common in TG2*Between Group:*VASDid not differ among the groups during pregnancyCG vs TG2 at 8-weeks post-partum, p=0.05 in the LBP group onlySick leaveCG vs TG2, p<0.05CG vs TG1, NS\*\*no specific numbers were presented in the paper to draw mean changes.\*\* | Back pain problems can be reduced by individual education programs starting in early pregnancyHowever, there was no significant difference between groups in pain intensity reduction during pregnancy.  | No baseline informationPoor randomization method No power calculation No mention of concealment method |
| ***Support devices*** |
| Kaplan, 201686Low  | n=71, pregnant women with LBP and/or PGPAge (Mean yrs):TG=24CG=25GA: TG=21.8 wksCG=21.9 wks Onset: Not stated. | TG:KT therapy+ Paracetamol (1500 mg/day) | CG:Paracetamol (1500mg/day for 5 days) | 5 days | VAS rest (10 cm) VAS motion (10 cm)RMDQ (Turkish version)Measurements:Baseline and 5 days | *Within group:* Baseline to 5th dayVAS rest (Mean change):TG: 6.21 (2.06), p<0.001CG: 3.98 (1.48), p<0.001VAS motion (Mean change):TG: 6.37 (1.96), p<0.001CG: 4.21 (1.71), p<0.001RMDQ (% improvement):TG: 70.30 (22.78), p<0.001CG: 48.45 (14.32), p<0.001*Between groups:* TG significantly superior in all outcome measures compared to controls.p= <0.001VAS rest (Mean change):CG vs TG: -2.23, p<0.001CG: 3.98 (1.48), p<0.001VAS motion (Mean change):CG vs TG: -2.16, p<0.001RMDQ (% improvement):CG vs TG: -21.85, p<0.001 | Kinesio tape had additional benefit in comparison to paracetamol therapy alone. No serious adverse events with exception of a few local allergic reactions from the Kinesio tape.  | No mention of randomization and allocation methods. No power calculation and no intention to treat analysis. Short-term. No sham taping application.  |
| ***Physiotherapy*** |
| Wedenberg, 200087Low | n= 60, pregnant women with LBP and/or PGPAge=TG1: 28.4TG2: 29.4GA=TG1: 24.2TG2: 24.2 | TG1: Acupuncture TG2: Individualized physiotherapy according to pre-tx evaluation | CG;N/A | TG1: 3x/wk during first 2 wks, then 2x/wk, totaling 10 tx for 1 mo 30 minTG2:1-2 x/wk, totaling 10 tx 6-8 wks50 min | Before txamVAS (0-10)pmVAS (0-10)During txamVAS (0-10)pmVAS (0-10)After txamVAS (0-10)pmVAS (0-10)DRIMeasurements:Before, during and after (within 1 wk) intervention | *Within group:*Before and during tx:VASNot reportedAfter txamVASTG1: -2.5, p<0.01TG2: -1.4, p=NSpmVASTG1: -5.7, p<0.01TG2: -2.1, p<0.01DRI:Before and during tx: Values not reportedAfter tx:Values not reportedTG1: Significantly less following tx except “dressing/undressing”TG2: Not stated*Between group:*Before txVASNot reportedDRITG1 and TG2, NSAfter txam VAS TG1 p=0.02pm VAS TG1 p<0.01DRIValues not reportedBut TG1 significantly less than corresponding values of TG2 after tv, p value not reported  | Acupuncturemay relieve pain and disability in LBP. Physiotherapy did not relieve pain to same extent, but halted worsening, did not diminish disability  | Small study No true control groupHigh number of dropout in physiotherapy group (none in acupuncture group) Demonstrates short-term effects only |

am = morning; CG = Comparison group; DRI = Disability rating index; GA = Gestational age; hrs = Hours; KT = Kinesio tape; LBP = Low back pain; LJP = Lumbar joint pain; mg = Milligrams; min = Minute; MODQ- Modified Oswestry disability questionnaire; NRS = Numeric rating scale; NS = Non-signficant; OB = Obstetrics; ODI = Oswestry disability index; pm = Evening; QDQ = Quebec disability questionnaire; RMDQ = Roland-Morris disability questionnaire; SJP = Sacroiliac joint pain; SPP = Symphysis pubis pain; SS = Statistically significant; TG = Treatment group; tx = Treatment; UOBC = Usual obstetric care; VAS = Visual analog scale; vs = Versus; wk = Week; wks = Weeks; yrs = Years

References

1. Malmqvist S, Kjaermann I, Andersen K, Økland I, Brønnick K, Larsen JP. Prevalence of low back and pelvic pain during pregnancy in a Norwegian population. *J Manipulative Physiol Ther.* 2012;35(4):272-278.

2. Kovacs FM, Garcia E, Royuela A, González L, Abraira V. Prevalence and factors associated with low back pain and pelvic girdle pain during pregnancy: a multicenter study conducted in the Spanish National Health Service. *Spine.* 2012;37(17):1516-1533.

3. Gutke A, Ostgaard H, Oberg B. Pelvic girdle pain and lumbar pain in pregnancy: a cohort study of the consequences in terms of health and functioning. *Spine.* 2006;31:149-155.

4. Stapleton DB, MacLennan AH, Kristiansson P. The prevalence of recalled low back pain during and after pregnancy: a South Australian population survey. *The Australian & New Zealand Journal Of Obstetrics & Gynaecology.* 2002;42(5):482-485.

5. Endresen E. Pelvic pain and low back pain in pregnant women - an epidemiological study. *Scandinavian Journal Of Rheumatology.* 1995;2:135-141.

6. Lisi AJ. Chiropractic spinal manipulation for low back pain of pregnancy: a retrospective case series. *Journal of midwifery and womens health.* 2006;51(1):e7-e10.

7. Sipko T, Grygier D, Barczyk K, Eliasz G. The occurrence of strain symptoms in the lumbosacral region and pelvis during pregnancy and after childbirth. *J Manipulative Physiol Ther.* 2010;33(5):370-377.

8. Fast A, Weiss L, Ducommun EJ, Medina E, Butler JG. Low-back pain in pregnancy. Abdominal muscles, sit-up performance, and back pain. *Spine.* 1990;15(1):28-30.

9. Kristiansson P, Savardsudd K, von Schoultz B. Back pain during pregnancy. A prospective study. *Spine.* 1996;21(6):702-709.

10. Mens J, Vleeming A, Stoeckart R, Stam H, Snijders C. Understanding peripartum pelvic pain. Implications of a patient survey. *Spine.* 1996;21:1363-1370.

11. Ostgaard H, Andersson G. Postpartum low-back pain. *Spine.* 1992;17(1):53-55.

12. Aas-Jakobsen E, Miller J. Chiropractic care during pregnancy: Survey of 100 patients presenting to a private clinic in Oslo, Norway. *J Clin Chiropr Pediatr.* 2010;11(2):771-774.

13. Browning M. Low back and pelvic girdle pain of pregnancy: Recommendations for diagnosis and clinical management. *J Clin Chiropr Pediatr.* 2010;11(2):775-779.

14. Brynhildsen J, Hansson A, Persson A, Hammar M. Follow-up of pateints with low back pain during pregnancy. *Obstet Gynecol.* 1998;91:182-186.

15. Stapleton DB, MacLennan AH, Kristiansson P. The prevalence of recalled low back pain during and after pregnancy: a South Australian population survey. *Aust N Z J Obstet Gynaecol.* 2002;42(5):482-485.

16. Turgut F, Turgut M, Cetinashin M. A prospective study of persistent back pain after pregnancy. *Eur J Obstet Gynecol Reprod Biol.* 1998;80(1):45-48.

17. Lindal E, A K, Arnardottir S, Hallgrimsson J. Low back pain, smoking and employment during pregnancy and after delivery – a 3-month follow-up study. *Journal of Obstetrics And Gynaecology* 2000;20(3):263-266.

18. Mogren I. BMI, pain and hypermobility are determinants of long-term outcome for women with low back pain and pelvic pain during pregnancy. *Eur Spine J.* 2006;15(7):1093-1102.

19. Ostgaard HC, Roos-Hansson E, Zetherström G. Regression of back and posterior pelvic pain after pregnancy. *Spine.* 1996;21(23):2777-2780.

20. Vermani E, Mittal R, Weeks A. Pelvic girdle pain and low back pain in pregnancy: a review. *Pain Prac.* 2010;10(1):60-71.

21. Stuber KJ, Smith DL. Chiropractic treatment of pregnancy-related low back pain: A systematic review of the evidence [review]. *J Manipulative Physiol Ther.* 2008;31(6):447-454.

22. Gutke A, Lundberg M, Ostgaard H, Oberg B. Impact of postpartum lumbopelvic pain on disability, pain intensity, health-related quality of life, activity level, kinesiophobia, and depressive symptoms. *Euro Spine J.* 2011;20(3):440-448.

23. Gutke A, Sjodahl J, Oberg B. Specific muscle stabilizing as home exercises for persistent pelvic girdle pain after pregnancy: A randomized, controlled clinical trial. *Journal of Rehabiliation Medicine.* 2010;42:7.

24. Sadr S, Pourkiani-Allah-Abad N, Stuber KJ. The treatment experience of patients with low back pain during pregnancy and their chiropractors: a qualitative study. *Chiropr Man Therap.* 2012;20(1):32-39.

25. Wang S-M, DeZinno P, Fermo L, et al. Complementary and alternative medicine for low-back pain in pregnancy: a cross-sectional survey. *Journal Of Alternative And Complementary Medicine.* 2005;11(3):459-464.

26. Ranzini A, Allen A, Lai Y. Use of complementary medicine and therapies among obstetric pateints. . *Obstetrics & Gynecology.* 2001;97(4 Suppl 1)):S46.

27. Yuen T, Wells K, Benoit S, Yohanathan S, Capelletti L, Stuber K. Therapeutic interventions employed by Greater Toronto Area chiropractors on pregnant patients: results of a cross-sectional online survey. *J Can Chiropr Assoc.* 2013;57(2):132-142.

28. Cunningham F, Leveno K, Bloom S, et al. *Williams Obstetrics.* 23rd ed. New York: McGraw Medical; 2010.

29. Ray-Griffith S, Wendel M, Stowe Z, Magann E. Chronic pain during pregnancy: a review of the literature. *Int J Womens Health.* 2018;10:153-164.

30. Moher D, Liberati A, Tetzlaff J, Altman D. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Br Med J.* 2009;339:b2535.

31. Gutke A, Betten C, Degerskar K, Pousette S, Olsen M. Treatments for pregnancy-related lumbopelvic pain: A systematic reivew of physiotherapy modalities. *Acta Obstet Gynecol Scand.* 2015;94(11):12.

32. Hawk C, Minkalis A, Khorsan R, et al. Systematic review of nondrug, nonsurgical treatment of shoulder conditions. *J Manipulative Physiol Ther.* 2017;40(5):293-319.

33. Harbour R, Lowe G, Twaddle S. Scottish Intercollegiate Guidelines Network: the first 15 years (1993-2008). *J R Coll Physicians Edinb.* 2011;41:163-138.

34. Scottish International Guideline Network. SIGN Checklist Web site. <https://www.sign.ac.uk/checklists-and-notes.html>. Published 2001-2019. Accessed December 2017, 2017.

35. Bronford G, Haas M, Evans R, Leininger B, Triano J. Effectiveness of manual therapies: the UK evidence report. *Chiropr Osteopat.* 2010;18:3.

36. Clar C, Tsertsvadze A, Court R, Hundt G, Clarke A, Sutcliffe P. Clincal effectiveness of manual therapy for the management of musculoskeletal and non-musculoskeletal conditions: systematic review and update of UK evidence report. *Chiropr Man Ther.* 2014;22(1):12.

37. Cochrane Handbook for Systematic Reivews of Interventions. In: Higgins J, Green S, eds.2011: [www.handbook.cochrane.org](file:///C%3A%5CUsers%5Ccarolann%5CDocuments%5CPregnancy%20Research%5CDelphi%20Project%5CChiro%20Care%20Write%20up%5C2019%20Manuscript%5CFinal%20drafts%5CSept%202019%20final%20drat%5CPregnancy%5Cwww.handbook.cochrane.org).

38. Ruffini N DAG, Cardinali L, Frondaroli F, Cerritelli F. Osteopathic manipulative treatment in gynecology and obstetrics: A systematic review. *Complement Ther Med.* 2016;26:7.

39. Hall K CH, Sundberg T, Ward L, Adams J, Moore C, Sibbritt D, Lauche R. The effectiveness of complementary manual therapies for pregnancy-related back and pelvic pain. A systematic review with meta-analysis. *Medicine.* 2016;95:10.

40. Liddle SD, Pennick V. Interventions for preventing and treating low-back and pelvic pain during pregnancy. *The Cochrane Database Of Systematic Reviews.* 2015(9):CD001139.

41. Khorsan R HC, Lisi AJ, Kizhakkeveettil A. Manipulative Therapy for Pregnancy and Related Conditions. A systematic review. *Obstet Gynecol Surv.* 2009;64(6):12.

42. Nascimento SL SF, Cecatti JG. Physical exercise during pregnancy: A systematic review. *Current Opinion in Obstetric and Gynecology.* 2012:8.

43. Waller B LJ, Daly D. Therapeutic aquatic exercise in the treatment of low back pain: A systematic review. *Clin Rehabil.* 2009;23:12.

44. Stuge B, Hilde G, Vøllestad N. Physical therapy for pregnancy-related low back and pelvic pain: a systematic review. *Acta Obstet Gynecol Scand.* 2003;82(11):983-990.

45. Richards E VKG, Virgara R, Harris P. Does antenatal physical therapy for pregnant women with low back pain or pelvic pain improve funtional outcomes? A systematic review. *ACTA Obstet Gynecol Scand.* 2012;91:8.

46. Belogolovsky I, Katzman W, Christopherson N, Rivera M, Allen DD. The effectiveness of exercise in treatment of pregnancy-related lumbar and pelvic girdle pain: A meta-analysis and evidence-based review. *J Women’s Health Phys Therap.* 2015;39(2):12.

47. Lillios S YJ. The effects of core and lower extremity strengthening on pregnancy-related low back and pelvic girdle pain: A systematic review. 2012;36(3):9.

48. Boissonnault JS KJ, Pearcy K. The role of exercise in the management of pelvic girdle and low back pain in pregnancy: A systematic review of the literature. *J Womens Health Phys Therap.* 2012;36(2):9.

49. Close C, Sinclair M, Liddle SD, Madden E, McCullough JEM, Hughes C. A systematic review investigating the effectiveness of Complementary and Alternative Medicine (CAM) for the management of low back and/or pelvic pain (LBPP) in pregnancy. *J Adv Nurs.* 2014;70(8):1702-1716.

50. van Benten E, Pool J, Mens J, Pool-Goudzwaard A. Recommendations for physical therapists on the treatment of lumbopelvic pain during pregnancy: a systematic review. *J Orthop Sports Phys Ther.* 2014;44(7):464.

51. Verstraete EH VG, Parewijck W. Pelvic girdle pain during or after pregnancy: a reveiw of recent evidence and a clinical care path proposal. *Facts Views Vis ObGyn.* 2013;5(1):11.

52. Van Kampen M, Devoogdt N, De Groef A, Gielen A, Geraerts I. The efficacy of physiotherapy for the prevention and treatment of prenatal symptoms: a systematic review. *International Urogynecology Journal.* 2015;26(11):1575-1586.

53. Ho SS, Yu WW, Lao TT, Chow DH, Chung JW, Li Y. Effectiveness of maternity support belts in reducing low back pain during pregnancy: a review. *J Clin Nurs.* 2009;18(11):1523-1532.

54. Granath A, Hellgren M, RK G. Water aerobics reduces sick leave due to low back pain during pregnanyc. *J Obstet Gynecol Neonatal Nurs.* 2006;35(4):7.

55. Chaudry S, Rashid F, Shah S. Effectivenss of core stabilzation exercises along with postural correction in postpartum back pain. *Rawal Medical Journal.* 2013;38(3):4.

56. Suputtitada A, Wacharapreechanont T, Chaisayan P. Effect of the "sitting pelvic tilt exercise" during the third trimester in primigravidas on back pain. *J Med Assoc Thai.* 2002;85 Suppl 1:S170-S179.

57. Morino S, Kajiwara Y, Ishihara M, et al. The relationship between the daily step counts and low back pain during pregnancy. *Clinical And Experimental Obstetrics & Gynecology.* 2016;43(2):192-197.

58. Sedaghati P, Ziaee V, Ardjmand A. The effect of an ergometric training program on pregnants weight gain and low back pain [Journal: Article]. *Gaz Med Ital.* 2007;166(6):209-213. <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/751/CN-00708751/frame.html>.

59. Beyaz E, Ozcan E, Ketenci A, Beyaz M. The effectiveness of pregnancy rehabilitation: Effects on low back pain and calf cramps during pregnancy and pregnancy outcome [Journal: Article]. *Nobel Medicus.* 2011;7(2):67-74. <http://onlinelibrary.wiley.com/o/cochrane/clcentral/articles/083/CN-00890083/frame.html>.

60. Garshasbi A, Faghih Zadeh S. The effect of exercise on the intensity of low back pain in pregnant women. *Int J Gynaecol Obstet.* 2005;88(3):271-275.

61. Figueira HA, de Souza Vale RG, Guedes Rodrigues WF, Figueira AA, Figueira JA, Martin Dantas EH. Pregnancy-Related Low Back Pain Relief after Maximum Static Flexibility Program. *Health (1949-4998).* 2014;6(21):2966-2972.

62. Kihlstrand M, Stenman B, Nilsson S, Axelsson O. Water-gymnastics reduced the intensity of back/low back pain in pregnant women. *Acta Obstet Gynecol Scand.* 1999;78(3):180-185.

63. Dumas G, Reid J, Wolfe L, Griffin M, McGrath M. Exercise, posture, and back pain during pregnancy. Part 2. Exercise and back pain [Journal: Article]. *Clin Biomech.* 1995;10(2):104-109.

64. Licciardone J, Buchanan S, Hensel K, King H, Fulda K, Stoll S. Osteopathic manipulative treatment of back pain and related symptoms during pregnancy: a randomized controlled trial. *Am J Obstet Gynecol.* 2010;202(1):43.e41-48.

65. Hensel KL, Buchanan S, Brown SK, Rodriguez M, Cruser d A. Pregnancy Research on Osteopathic Manipulation Optimizing Treatment Effects: the PROMOTE study [Randomized Controlled Trial; Research Support, N.I.H., Extramural; Research Support, Non-U.S. Gov't]. *Am J Obstet Gynecol.* 2015;212(1):108.e101-109. doi:10.1016/j.ajog.2014.07.043.

66. Keskin E, Onur O, Keskin H, Gumus I, Kafali H, Turhan N. Transcutaneous electrical nerve stimulation improves low back pain during pregnancy [Randomized Controlled Trial]. *Gynecol Obstet Invest.* 2012;74(1):76-83. doi:10.1159/000337720.

67. Carr C. Use of a maternity support binder for relief of pregnancy-related back pain. *J Obstet Gynecol Neonatal Nurs.* 2003;32(4):495-502.

68. Thomas I, Nicklin J, Pollock H, Faulkner K. Evaluation of a maternity cushion (Ozzlo pillow) for backache and insomnia in late pregnancy. *Aust N Z J Obstet Gynaecol.* 1989;29(2):133-138.

69. Elden H, Ladfors L, Olsen MF, Ostgaard H-C, Hagberg H. Effects of acupuncture and stabilising exercises as adjunct to standard treatment in pregnant women with pelvic girdle pain: randomised single blind controlled trial. *BMJ (Clinical Research Ed).* 2005;330(7494):761-761.

70. Nilsson-Wikmar L, Holm K, Oijerstedt R, Harms-Ringdahl K. Effect of three different physical therapy treatments on pain and activity in pregnant women with pelvic girdle pain: a randomized clinical trial with 3, 6, and 12 months follow-up postpartum. *Spine.* 2005;30(8):850-856.

71. Depledge J, McNair PJ, Keal-Smith C, Williams M. Management of symphysis pubis dysfunction during pregnancy using exercise and pelvic support belts. *Phys Ther.* 2005;85(12):1290-1300.

72. Kordi R, Abolhasani M, Rostami M, Hantoushzadeh S, Mansournia MA, Vasheghani-Farahani F. Comparison between the effect of lumbopelvic belt and home based pelvic stabilizing exercise on pregnant women with pelvic girdle pain; a randomized controlled trial. *J Back Musculoskelet Rehabil.* 2013;26(2):133-139.

73. Peterson C, Haas M, Gregory W. A pilot randomized controlled trial comparing the efficacy of exercise, spinal manipulation, and neuro emotional technique for the treatment of pregnancy-related low back pain. *Chiropr Man Therap.* 2012;20(1):18-18.

74. George J, Skaggs C, Thompson P. A Randomized Controlled Trial Comparing a Multimodal Intervention and Standard Obstetrics Care for Low Back and Pelvic Pain in Pregnancy. *Am J Obstet Gynecol.* 2013;208(4):295.e1-7.

75. Stafne S, Salvesen K, Romundstad P, Stuge B, Mørkved S. Does regular exercise during pregnancy influence lumbopelvic pain? A randomized controlled trial [Multicenter Study; Randomized Controlled Trial; Research Support, Non-U.S. Gov't]. *Acta Obstet Gynecol Scand.* 2012;91(5):552-559.

76. Mørkved S, Salvesen KA, Schei B, Lydersen S, Bø K. Does group training during pregnancy prevent lumbopelvic pain? A randomized clinical trial. *Acta Obstet Gynecol Scand.* 2007;86(3):276-282.

77. Kluge J, Hall D, Louw Q, Theron G, Grové D. Specific exercises to treat pregnancy-related low back pain in a South African population. *Int J Gynaecol Obstet.* 2011;113(3):187-191.

78. Haakstad L, Bø K. Effect of a regular exercise programme on pelvic girdle and low back pain in previously inactive pregnant women: A randomized controlled trial. *J Rehabil Med.* 2015;47(3):229-234.

79. Eggen MH, Stuge B, Mowinckel P, Jensen KS, Hagen KB. Can supervised group exercises including ergonomic advice reduce the prevalence and severity of low back pain and pelvic girdle pain in pregnancy? A randomized controlled trial. *Phys Ther.* 2012;92(6):781-790.

80. Miquelutti MA, Cecatti JG, Makuch MY. Evaluation of a birth preparation program on lumbopelvic pain, urinary incontinence, anxiety and exercise: a randomized controlled trial. *BMC Pregnancy Childbirth.* 2013;13:154-154.

81. Ozdemir S, Bebis H, Ortabag T, Acikel C. Evaluation of the efficacy of an exercise program for pregnant women with low back and pelvic pain: a prospective randomized controlled trial. *J Adv Nurs.* 2015;71(8):1926-1939.

82. Mahishale A, Patted S. Effectiveness of Tailor Made Exercise Intervention for Low Back Pain and Pelvic Pain during Pregnancy - A Randomized Controlled Trial. *Indian J Physiother Occup Ther.* 2014;8(4):143-148.

83. Ostgaard H, Zetherström G, Roos-Hansson E, Svanberg B. Reduction of back and posterior pelvic pain in pregnancy. *Spine.* 1994;19(8):894-900.

84. Noren L, Ostgaard S, Nielsen T, Ostgaard H. Reduction of sick leave for lumbar back and posterior pelvic pain in pregnancy. *Spine.* 1997;22(18):2157-2160.

85. Kalus S, Kornman L, Quinlivan J. Managing back pain in pregnancy using a support garment: a randomised trial. *BJOG.* 2008;115(1):68-75.

86. Kaplan S, Alpayci M, Karaman E, et al. Short-term effects of kinesio taping in women with pregnancy-related low back pain: A randomized controlled clinical trial [Journal: Article]. *Med Sci Monit.* 2016;22:1297-1301. doi:10.12659/MSM.898353.

87. Wedenberg K, Moen B, Norling A. A prospective randomized study comparing acupuncture with physiotherapy for low-back and pelvic pain in pregnancy. *Acta Obstet Gynecol Scand.* 2000;79(5):331-335.

88. van Benten E, Pool J, Mens J, Pool-Goudzwaard A. Recommendations for physical therapists on the treatment of lumbopelvic pain during pregnancy: a systematic review. *J Orthopc Sports Phys Ther.* 2014;44(7):464.

89. Young G, Jewell D. Interventions for preventing and treating backache in pregnancy. *Cochrane Database Sys Rev.* 2000(2):CD001139.

90. Pennick VE, Young G. Interventions for preventing and treating pelvic and back pain in pregnancy. *Cochrane Database Sys Rev.* 2007(2):CD001139.

91. Pennick V, Liddle SD. Interventions for preventing and treating pelvic and back pain in pregnancy. *Cochrane Database Sys Rev.* 2013(8):CD001139.