The inter-rater reliability of a standardised classification system for pregnancy-related lumbopelvic pain

Annelie Gutke, Gunilla Kjellby-Wendt and Birgitta Öberg

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INTRODUCTION

Lumbopelvic pain is a complication of pregnancy for half of all women (Wu et al. 2004). Severe, persistent pain is reported in 8% of women 2 years after delivery (Albert et al. 2001). Thus pregnancy represents a specific risk for lumbopelvic pain as well as long-standing lumbopelvic pain after delivery.

One subgroup of lumbopelvic pain that is often related to pregnancy is pelvic girdle pain (PGP). PGP is reported by 20% of women and is experienced between the posterior iliac crest and the gluteal fold, predominantly at the level of the sacroiliac joints and potentially radiating to the posterior thigh (Vleeming et al. 2008). Pain can also be experienced in conjunction with, or exclusively in, the symphysis. Lumbar pain originates in the lumbar spine region and may present with pain radiating down in the leg (Ostgaard et al. 1996). Due to the different clinical presentations and impact among lumbopelvic pain subgroups (Ostgaard et al. 1994b; Sturesson et al. 1997; Gutke et al. 2006) and subsequent variations in the specific management of each syndrome, it is important to differentiate PGP and lumbar pain in relation to pregnancy.

In general, the first step is a diagnostic triage that differentiates between serious pathology, nerve root problems, and non-specific lumbopelvic pain (van Tulder et al. 2006). The majority of patients fall into the category of non-specific lumbopelvic pain. Further classification is needed (Bouter et al. 1998; Fritz et al. 2003; Kent and Keating 2004) in order to develop and choose specific treatment strategies.

Several classification systems relevant to physiotherapists have been identified for lumbopelvic pain patients (Delitto et al. 1995; McKenzie and May 2003; Petersen et al. 2004; Fritz et al. 2006; O'Sullivan and Beales 2007) The advantage of classification by the Mechanical and Diagnostic Therapy (MDT) concept (McKenzie and May 2003) is that pelvic pain provocation tests have been evaluated within the MDT protocol and have a reported sensitivity of 0.91 and specificity of 0.83 in the detection of sacroiliac joint syndrome (Laslett et al. 2003). Additionally, with the classification system, the origin of pain was identified in 67% of the general lumbopelvic pain population (Laslett et al. 2005b). Since pregnancy is a specific condition, with hormonal and biomechanical changes, the classification system needs to be tested on pregnant women.

According to current guidelines (Vleeming et al. 2008), classification of PGP requires the exclusion of lumbar causes. Several tests have been described for examining the lumbar spine in pregnancy (Ostgaard et al. 1994b; Kristiansson and Svardsudd 1996; Sturesson et al. 1997), but the test reaction, in terms of pain or stiffness, is not specific enough to exclude intervertebral disc pathology, which is probably the most common structural source of non-specific lumbopelvic pain (Bogduk 1995). There is no difference in the prevalence of disc abnormalities between pregnant and nonpregnant populations (Weinreb et al. 1989). Many researchers rely on pain provocation tests for identifying PGP, though it has been suggested that the risk of a false positive is higher when no identification of discogenic pain is performed (Laslett et al. 2003). Furthermore, the previously used assessments in non-specific pregnancy-related lumbopelvic pain have not been tested for reliability (Ostgaard et al. 1996; Stuge et al. 2004; Nilsson-Wikmar et al. 2005) only the separate tests

(Ostgaard et al. 1994a; Albert et al. 2000). Reliability of the assessment as a whole is an important aspect of a valid classification system.

The aim of this study was to evaluate the reliability of a standardised classification system for lumbopelvic pain in pregnancy among examiners.

MATERIAL AND METHODS

Study group

Swedish-speaking women registered at one antenatal care clinic housed in a demographically diverse borough of 12.400 people were approached for participation. All pregnant women with an expected normal pregnancy, as determined by midwives, and lumbopelvic pain localised below the costal margin and above the inferior gluteal folds, with or without leg pain (van Tulder et al. 2006), were asked to participate.

The women received written and verbal information about the study from their midwife before giving oral consent. Women were excluded if they had a systemic locomotor system disease; verified diagnosis of spinal problems in the previous two months; or a history of fracture, neoplasm, or previous spinal, pelvic, or femur surgery. Forty-one women with lumbopelvic pain could be included potentially but 10 were excluded (7 did not want to participate, mostly due to lack of time; 1 too close to given birth; 1 pain free; 1 in physiotherapy treatment).

The Regional Research Ethics Committee approved the study (Ö 414-00 and T 352-06).

Assessment procedures of lumbopelvic pain

The women were examined by two physiotherapists with 17 and 19 years of clinical experience in the management of lumbopelvic pain. The examiners had completed

post graduate training within the MDT concept including advanced problem solving; one examiner had undertaken the Credentialling Examination within the concept. The two examiners discussed and agreed upon the criteria prior to the study, but they did not train for the examination procedure or the individual tests. The women were allocated to the two examiners as follows. Two women were scheduled for the same time. When they arrived at the clinic, the woman whose name was first alphabetically, drew a lot stating which of the two examiners would assess her first. The women filled out a questionnaire regarding current gestational week, pain intensity, pain location using a pain drawing, and previous lumbopelvic pain. After the first assessment, the women were examined by the second examiner. The examiners were blinded to each other's result of classification until the data collection was closed.

The participants were classified into one of three groups based on the pain location and the clinical examination including a standard history: PGP, lumbar pain, or PGP and lumbar pain (combined pain). The standard history focused on known characteristics of lumbar pain (McKenzie and May 2003), and PGP (Mens et al. 1996; Ostgaard et al. 1996; Sturesson et al. 1997), and the responses or tolerance to different positions and activities of daily life such as bending, sitting, standing, walking, and lying. The range of motion of the back was evaluated during standing flexion, extension, and lateral flexion.

Five pelvic pain provocation tests were performed in the sequence described below. The choice of tests was based on a study where pelvic pain provocation tests were included within the MDT protocol according to Laslett et al (Laslett et al. 2003). Since pregnant women were examined in our study, the thigh thrust test in the protocol by

Laslett et al was changed into the posterior pelvic pain provocation test (Ostgaard et al. 1994a). In order to consider a pelvic pain provocation test as positive, it had to reproduce the woman's familiar pain regarding location and quality.

1. Distraction test. The participant lay supine as the examiner applied a posteriorly directed force to both anterior superior iliac spines (Laslett et al. 2005c).
2. Posterior pelvic pain provocation test. The participant lay supine with a 90 degree flexion at the hip and knee on the examined side. The examiner stabilized the contralateral side of the pelvis over the superior anterior iliac spine. Light manual pressure was applied on the patient's flexed knee along the longitudinal axis of the femur. The test was performed bilaterally (Ostgaard et al. 1994a).
3. Gaenslen's test. The participant lay supine near the edge of the table. One leg hung over the edge of the table and the hip and knee of the other leg were flexed towards the patient's chest. The examiner applied pressure to the flexed knee towards the chest and counter pressure to the knee of the hanging leg towards the floor. The test was performed bilaterally (Laslett et al. 2005c).
4. Compression test. The participant lay on their side with the hip and knee flexed to an approximate right angle. The examiner knelt behind the participant on the table and applied pressure vertically downward on the upper iliac crest (Laslett et al. 2005c).
5. Sacral thrust. The participant was prone or lay on their side when the abdomen was too large. The examiner applied light pressure perpendicular to the sacrum (modified from Laslett et al 2005c;(Laslett et al. 2005c).

In order to exclude problems with the hip, a rotation range-of-motion test was performed in supine or sitting position. The active straight leg raise test (Mens et al.

1999) was performed, followed by a neurological examination in the lower extremities (muscle testing, reflex testing, sensation, and nerve tension). The mechanical assessment of the lumbar spine was based on the MDT protocol (McKenzie and May 2003). The participant performed flexion and extension, in both the standing and lying position, in sets of 5-10 repetitions. If needed, lateral flexion was added to the protocol. When extension during standing and lying was impossible because of the large pregnant abdomen, range of motion was examined by observation of curve reversal by active lumbar flexion and extension in sitting. Baseline symptoms were noted, as were the effects on symptoms during and immediately following the movements. If, as a result of the repeated movements or positions, the radiating symptoms regressed proximally (centralisation) or the opposite, progressed distally (peripheralisation), the symptoms were considered discogenic (Donelson et al. 1990) and, thus, as lumbar pain. After the examination, the women were classified into three groups based on the criteria decided on before the examination.

Criteria for lumbopelvic pain subgroups

The criteria for being assigned to the PGP group were:

- pain experienced distal to L5, between the posterior iliac crest and the gluteal fold, with or without radiation in the posterior thigh and calf and with or without pain in the symphysis.
- pain reproducible by at least two out of the five pelvic pain provocation tests (two tests bilaterally) (Laslett et al. 2005a).
- no centralisation or peripheralisation phenomenon and no change in lumbar pain or the range of motion from repeated movements according to the MDT classification
- onset of PGP was required to be in relation to pregnancy.

The criteria for being assigned to the lumbar pain group were:

- pain experienced in the lumbar region, with or without radiation to the leg
- reproducible pain and/or a change in the range of motion from repeated movements or different positions of the lumbar spine or an experience of centralisation and/or peripheralisation during examination
- fewer than two positive pelvic pain provocation tests

The criteria for being assigned to the combined pain group were:

- pain in the lumbar region as well as between the posterior iliac crest and the gluteal fold, with or without radiation in the posterior thigh and calf, and with or without pain in the symphysis
- two or more positive pain provocation tests
- pain and/or a change in the range of motion from repeated movements or different positions of the lumbar spine, or experienced centralisation and/or peripheralisation.

After classification, the women were referred to a specialist physiotherapist for treatment.

Statistics

Descriptive data is presented as median values, 25 and 75 percentile and ranges. Agreement between the two examiners was calculated as a percentage of the number of agreed upon classifications divided by the total number of women. Agreement with chance correction was calculated using Cohen's Kappa statistics with 95% confidence intervals (Altman 1991). We calculated prevalence and biased adjusted kappa coefficient with 95% confidence intervals.

RESULTS

Between September and December 2006, 31 pregnant women with lumbopelvic pain were examined by the two independent examiners (descriptive data, Table 1). Nineteen women (61%) had experience of lumbopelvic pain before the present pregnancy. Agreement among the examiners for the three syndromes lumbar pain, PGP, and combined pain was 87% (27/31)(Table 2)(Table 3), with a Kappa coefficient of 0.79 (95% CI 0.60-0.98); which is regarded as substantial agreement beyond chance (Landis and Koch 1977) (Table 4). Prevalence and bias adjusted kappa coefficient (PABAK) was 0.81 (95% CI 0.63-0.99). Reliability for the separate test is shown in Table 5.

Table 1 Study group characteristics.

Variable median (25;75 percentile) range	(n=31)
Age years	28 (26;31) 20-36
Gestational weeks	27 (22;30) 13-38
No of years with lumbopelvic pain	2 (0;7,5) 0-15
Pain intensity VAS mm (0-100)	38 (29;62) 0-87

Table 2 The result of the classification. The disagreed cases in italics.

Subject no	Classification (testing order) Examiner A	Examiner B
1	Combined pain (1)	Combined pain (2)
2	*Pelvic girdle pain (1)*	*Combined pain (2)*
3	Pelvic girdle pain (2)	Pelvic girdle pain (1)
4	Pelvic girdle pain (1)	Pelvic girdle pain (2)
5	Combined pain (1)	Combined pain (2)
6	Pelvic girdle pain (2)	Pelvic girdle pain (1)
7	Combined pain (1)	Combined pain (2)
8	Pelvic girdle pain (1)	Pelvic girdle pain (2)
9	Combined pain (2)	Combined pain (1)
10	Lumbar pain (1)	Lumbar pain (2)
11	*Lumbar pain (2)*	*Combined pain (1)*
12	Lumbar pain (1)	Lumbar pain (2)
13	Pelvic girdle pain (2)	Pelvic girdle pain (1)
14	Pelvic girdle pain (1)	Pelvic girdle pain (2)
15	Pelvic girdle pain (2)	Pelvic girdle pain (1)
16	*Lumbar pain (1)*	*Pelvic girdle pain (2)*
17	*Pelvic girdle pain (2)*	*Combined pain (1)*
18	Combined pain (2)	Combined pain (1)
19	Pelvic girdle pain (1)	Pelvic girdle pain (2)
20	Pelvic girdle pain (2)	Pelvic girdle pain (1)
21	Pelvic girdle pain (1)	Pelvic girdle pain (2)
22	Combined pain (2)	Combined pain (1)
23	Combined pain (1)	Combined pain (2)
24	Lumbar pain (2)	Lumbar pain (1)
25	Combined pain (1)	Combined pain (2)
26	Pelvic girdle pain (2)	Pelvic girdle pain (1)
27	Pelvic girdle pain (1)	Pelvic girdle pain (2)
28	Pelvic girdle pain (2)	Pelvic girdle pain (1)
29	Pelvic girdle pain (1)	Pelvic girdle pain (2)
30	Lumbar pain (1)	Lumbar pain (2)
31	Combined pain (1)	Combined pain (2)

Table 3 Classification of the lumbopelvic pain by examiner A and examiner B.

	n	Examiner B			
		Lumbar pain	Pelvic girdle pain	Combined pelvic girdle and lumbar pain	Total
Examiner A	Lumbar pain	**4**	1	1	6
	Pelvic girdle pain	0	**14**	2	16
	Combined pelvic girdle and lumbar pain	0	0	**9**	9
	Total	4	15	12	31

Bold text indicates agreement between the examiners.

Table 4 Kappa coefficient and prevalence and bias adjusted kappa coefficient (PABAK) with 95% confidence intervals (CI) of the pain subgroups.

Classification	p_o	p_e	*k (+/-CI)*	*PABAK (+/-CI)*
Lumbar Pain	0,94	0,73	0,76 (0,32)	0,87 (0,17)
Pelvic girdle pain	0,90	0,50	0,81 (0,21)	0,81 (0,21)
Combined pelvic girdle and lumbar pain	0,90	0,55	0,79 (0,23)	0,81 (0,21)
Overall kappa coefficient	0,87	0,39	0,79 (0,19)	0,81 (0,18)

Table 5 Kappa coefficient and prevalence and bias adjusted kappa coefficient (PABAK) with 95% confidence intervals (CI) of the individual pelvic pain provocation tests.

Pelvic pain provocation test	Percentage agreement	*k (+/-CI)*	*PABAK (+/-CI)*
Distraction test	0,74	0,47 (0,32)	0,48 (0,31)
Posterior pelvic pain provocation test right	0,90	0,80 (0,21)	0,81 (0,21)
Posterior pelvic pain provocation test left	0,77	0,50 (0,33)	0,55 (0,29)
Gaenslen's test right	0,72	0,41 (0,34)	0,45 (0,32)
Gaenslen's test left	0,75	0,50 (0,32)	0,50 (0,32)
Compression test	0,86	0,52 (0,44)	0,72 (0,25)
Sacral thrust	0,86	0,66 (0,31)	0,72 (0,25)

DISCUSSION

The present study showed a substantial agreement between two examiners for the classification of non-specific lumbopelvic pain into lumbar pain and PGP in pregnant women. Since no training of the classification system was done, the result should be applicable on therapist experienced in lumbopelvic pain management with training within the MDT concept. The tested group is representative of women in all state of pregnancy and with the whole range of lumbopelvic pain from light to severe. It is likely though that pregnant women seeking care for lumbopelvic pain within primary care are the more severe cases within our sample.

The etiology of PGP is unknown and thereby, there is no gold standard to validate a classification of PGP against (Hansen et al. 2005). The role of hormonal and biomechanical changes during pregnancy have been discussed including muscle

function (Kristiansson et al. 1996; Sihvonen et al. 1998; Noren et al. 2002; Gutke et al. 2008a). The three non-specific lumbopelvic pain subgroups in pregnancy, lumbar pain, PGP, and combined pain have shown important differences regarding disability, pain intensity, health, depressive symptoms and different courses (Gutke et al. 2006; Gutke et al. 2007; Gutke et al. 2008b). Recently, psychosocial aspects have been added to the discussion of etiology (Hansen et al. 2005; Bastiaenen et al. 2006; O'Sullivan and Beales 2007). In a clinical reasoning leading to choice of treatment, the identified differences among subgroups as well as both biomedical and psychosocial factors need to be considered (McCarthy et al.; O'Sullivan and Beales 2007).

The classification used in the present study is focused on biomedical factors although several aspects should be considered when developing a complete classification system. Subgroups may be based on pathoanatomical factors, clinical characteristics, and psychosocial factors or on differential prognosis and differential response to treatment (Long et al. 2004; McCarthy et al. 2004; Dunn et al. 2006). The factors might be mutually exclusive or complementary. One way to further develop our classification system is to include the factors into the classification system. Another is to use the biomedical classification system supplemented by instruments evaluating psychosocial and prognostic factors. Additionally, assessment of the muscle function seems to be relevant in pregnancy-related lumbopelvic pain (Sihvonen et al. 1998; Noren et al. 2002; Gutke et al. 2008a).

Several classification systems relevant to physiotherapists have shown promising results regarding reliability (Kilpikoski et al. 2002; Petersen et al. 2004; Dankaerts et

al. 2006; Vibe Fersum et al. 2008), validity (Laslett et al. 2005b), and usefulness in choice of treatment (Fritz et al. 2003; Long et al. 2004). The classification system presented by O'Sullivan is one of few within lumbopelvic pain management that includes psychosocical factors in the classification process (McCarthy et al. 2004; O'Sullivan and Beales 2007). None of above classification system has yet fulfilled all the requirements of a classification system i.e. good reliability and validity, as well as guidance of treatment for all subgroups.

When examining pregnant women with lumbopelvic pain using a biomedical classification system, it is not sufficient to identify red flag conditions and those with nerve root syndrome, and then consider the remainder as a heterogeneous group of non-specific lumbopelvic pain. Discogenic problems and PGP also need to be identified because clinical experience and previous research suggest specific treatment strategies (Ostgaard et al. 1996; Long et al. 2004; Stuge et al. 2004). Further subclassification of PGP and lumbar pain is needed (Fritz et al. 2003; O'Sullivan and Beales 2007). The classification system by O'Sullivan, includes an extensive subgrouping of lumbar pain and PGP and may be applicable for pregnancy-related lumbopelvic pain. It is likely though that identification of discogenic pain need to be further developed in the classification system for the choice of treatment.

It is stated in the PGP guidelines that classification can only be made after excluding lumbar pain (Vleeming et al. 2008). The present lumbopelvic pain classification incorporates the pelvic pain provocation tests into a mechanical assessment of the lumbar spine - MDT- according to Laslett et al. 2003 (Laslett et al. 2003). The

standardised classification system, includes guideline-recommended examination components; standardised history, neurological examination, and evaluation of red flag signs (van Tulder et al. 2006). The MDT examination for centralization, is the only non-invasive method with evidence to support the notion that discogenic pain may have a distinct clinical picture (Donelson et al. 1997; Laslett et al. 2005c). Since discogenic pain probably is the most common structural source of non-specific lumbopelvic pain (Bogduk 1995), the repeated movements assessment in the MDT protocol most likely detects discogenic pain more efficiently than the previously used assessments of pregnancy-related lumbopelvic pain that used single movement testing (Ostgaard et al. 1994b; Kristiansson and Svardsudd 1996; Sturesson et al. 1997). Furthermore, the present procedure probably decreases the risk of false positive pelvic pain provocation tests when exclusion of discogenic pain has been made (Laslett et al. 2003).

The aim of the present study was to evaluate a classification system. In order to contribute to the discussion on which pelvic pain provocation test to use, analysis of reliability of the individual tests was made. Among the cases with an agreed upon classification, the majority with PGP had a positive posterior pelvic pain provocation test and/or sacral thrust test (PGP 13/14; combined pain 6/9) and the tests were negative in all women with lumbar pain. The two tests with the highest reliability thus seem appropriate for classification of PGP.

Limitations and recommendations for future studies

The present study is based on a small sample. Further studies need be done before we know the generalisability of the classification system. The clinical reasoning does

not include all factors that need to be accounted for. Likewise it is not complete in relation to choice of treatment for all subgroups. Although the present study shows that commonly used classification methods are applicable for pregnant women, the validity of the classification system for pregnancy-related lumbopelvic pain is not confirmed since we do not know the etiology.

Using a design with two examiners conducting consecutive evaluations, the second examiner may identify reactions resulting from the fact that the two examinations follow each other. In the MDT protocol, repeated movements are one part of the assessment and a discogenic response (increase/decrease of pain and/or change in ROM) could potentially appear during the second assessment due to the total number of repetitions. A consequence might be that the first examiner classifies the patient's lumbopelvic pain as PGP and the second as combined pain. There was a tendency for examiner B to classify combined pain more often in women without an agreed upon classification. However, in two of these three cases, examiner B did the examination firstly, which decreases the probability of this potential weakness (Table 2).

The women were examined on one occasion, which may have been insufficient for identifying the pain in some women whose symptoms were centralized over the course of several examinations (Werneke et al. 1999). A consequence may be that the examiners classified PGP more often, instead of combined pain. It is yet unknown if repeated assessment leads to more accurate classification. Additionally, the phenomenon of centralisation/aberrant movements may be labile and, therefore impossible to reliably replicate on another day (Fritz et al. 2006).

Clinical and scientific implications

In conclusion, this is the first study to evaluate the inter-rater reliability of a standardised pregnancy-related lumbopelvic pain classification system. The cause of lumbopelvic pain is still unknown in the majority of patients, pregnant as well as nonpregnant. Therefore, assessment procedures that show promising results for identifying subgroups requiring specific guidance for the prevention and management of lumbopelvic pain (Fritz et al. 2003; Long et al. 2004) are important and of the greatest interest for primary health care researchers (Bouter et al. 1998). Overall, this may be a first step in differentiating PGP from lumbar pain. In the choice of treatment strategies, further classification of PGP as well as lumbar pain is probably important and psychosocial factors and muscle function needs to be considered.

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