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ORIGINAL ARTICLE

Multidimensional evaluation of pain during early and late labor: a comparison of nulliparous and multiparous women

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ABSTRACT

Background: Labor pain has a sensory and an affective component. This study was undertaken to evaluate whether the quality and intensity of the cognitive descriptors of labor pain may be influenced by parity and stage of labor.

Methods: One hundred and eighty-four parturients were divided into four groups according to parity (nulliparous and multiparous women) and stage of labor (early and late) and were given a modified version of the short-form McGill Pain Questionnaire that included the 23 most frequently reported labor pain descriptors. In addition, parturients were asked to report intensity of pain on a visual analogue pain scale and using the present pain intensity index.

Results: The most frequent descriptors used were cramping, pulling, hot, stinging, aching, heavy, tiring, exhausting and unbearable. The descriptors, “tiring” and “exhausting”, were used primarily by nulliparous women ($P < 0.001$). The intensity of “cramping”, “stinging” and “aching” was greater in nulliparous women ($P < 0.0001$) and the intensity of “heavy”, “stinging”, and “aching” increased as labor progressed in both groups ($P < 0.001$). Mean intensity of pain increased as cervical dilation increased in both nulliparous and multiparous women. The visual analogue pain scale and present pain intensity index were strongly correlated ($\tau = 0.63$; $P < 0.0001$). Low fetal station was associated with greater pain scores in nulliparous women ($P < 0.026$).

Conclusions: Affective and cognitive components of labor pain are frequently communicated with a restricted number of pain descriptors and may be affected by obstetric variables. An understanding of labor pain in a multidimensional framework provides the basis for a woman-centered approach to labor pain management.

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Keywords: Labor; Pain; McGill Pain Questionnaire

Introduction

Labor pain is a complex, subjective, multidimensional experience. Although acute pain, such as that associated with labor, is considered to have both a sensory and an affective component, in both research and clinical practice only the intensity of pain is usually investigated.

The verbal rating scale and visual analogue pain scale are commonly used to assess labor pain, but both describe intensity of pain and not specific characteristics of pain.

The McGill Pain Questionnaire (MPQ) has become one of the most widely used tests for the complete characterization of pain.^{1–3} It consists primarily of three major classes of word descriptors (sensory, affective

and evaluative) that are used by patients to specify subjective pain experiences and is capable of discriminating among different types of pain.^{1–3} Previous studies using the MPQ identified words that best described labor pain,^{1–3} reported a wide variation in the intensity of pain throughout labor⁴ for both nulliparous and multiparous women, and determined some predictors of labor pain including menstrual difficulties, socioeconomic status and childbirth preparation class attendance.^{3,5}

This study was undertaken to evaluate whether the quality and intensity of cognitive descriptors of labor pain are influenced by parity and stages of labor, using a modified short-form version of the McGill Pain Questionnaire (SF-MPQ).⁶ The SF-MPQ correlates consistently and significantly with the standard form and is a useful tool in situations in which the standard MPQ takes too long to administer, such as labor pain. We sought to evaluate whether parity or stage of labor affected the intensity of labor pain, as assessed by the Visual Analogue Pain Scale (VAPS) and Present Pain Intensity Index (PPI).

Accepted May 2009

This study was presented in part at the Annual Meeting of the European Society of Anaesthesiology, Copenhagen, Denmark.

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Methods

The study was approved by our ethics committee. Women who were planning to deliver at the Città di Roma Hospital, Rome or S. Raffaele Hospital, Milano and attended our hospitals' childbirth preparation classes were enrolled during the classes. Those with a previous diagnosis of dysmenorrhea were excluded from the study.

Parturients who were in active spontaneous labor and had received no analgesia answered the questionnaire during active labor. They were divided into four groups according to parity: nulliparous and multiparous (only secundipara) and whether in early (cervical dilatation ≤ 5 cm) or late (cervical dilatation 6–10 cm) labor.

The SF-MPQ consists of 15 pain descriptors (11 sensory and 4 affective), which are rated on an intensity scale as 0=none, 1=mild; 2=moderate or 3=severe.⁶ We used a modified version of the SF-MPQ that included the 23 most frequently chosen words (pain descriptors) to describe labor pain (see Appendix).⁷

In accordance with the original methods described by Melzack⁸ to limit the unreliability of responses, all parturients were interviewed by trained investigators and were asked to answer the SF-MPQ immediately after a uterine contraction. The pain descriptors from the Italian translation of the McGill Pain Questionnaire were used.⁹ The investigator instructed the parturient to select only those pain descriptors that characterized what was being experienced at the time the questionnaire was administered and, if needed, assisted the parturient in understanding the meaning of the pain descriptors.⁸

In addition, all the parturients were asked to report intensity of pain at the peak of a uterine contraction on a VAPS and PPI. VAPS was assessed using a slide rule with the patient's side unmarked and the observer's side marked from 0 to 100 mm, where 0 represented "no pain" and 100 represented "worst pain ever". PPI was assessed by asking the parturient her pain intensity and grading it as 0 (no pain), 1 (mild), 2 (discomforting), 3 (distressing), 4 (horrible) and 5 (excruciating).

Data are reported as mean \pm SD or median (interquartile range: IQR) where appropriate. Statistics were performed using R 2.6 (R Development Core Team, 2007). Multiple comparisons were performed with Kruskal-Wallis and Mann-Whitney tests; multiplicity was adjusted using the Bonferroni correction. Correlations between VAPS and PPI and between intensity of VAPS, PPI and intensity of each pain descriptor were assessed by Kendall's τ correlation and Spearman correlation tests. *P* values were adjusted for multiplicity using Bonferroni-Holm correction. An adjusted *P* value of <0.05 was considered to be statistically significant.

The sample size was chosen by simulating repeated data sets when the Kruskal-Wallis test at $P < 0.05$ achieved more than 80% power. The power analysis was calibrated for an unbalanced design due to the nature of

the sample (different parity and stages of labor). A sample size of 90 nulliparous (60 early, 30 late) and 45 multiparous (30 early, 15 late) was estimated to be necessary to achieve a power of 80% in rejecting the null hypothesis of equal intensity for each pain descriptor with ANOVA; the effect assumed was a mean difference of one standard deviation between the smallest and largest mean for each descriptor after Bonferroni correction. The Mann-Whitney test was used for continuous variables to investigate the inter-group variability between the pain scores obtained from the two institutions.

Results

Of 184 parturients enrolled in the study, 17 did not complete the questionnaire and were excluded. The 167 remaining parturients included 121 nulliparous parturients (71 and 50 in early and late labor, respectively) and 46 multiparous parturients (28 and 18 in early and late labor, respectively).

Maternal characteristics are described in Table 1. All women reported pain during labor. Of the 23 pain descriptors, the most frequently used ($>50\%$) were: "cramping", "pulling", "hot", "stinging", "aching", "heavy", "tiring", "exhausting" and "unbearable". The profile of descriptors chosen and their relative intensities are reported in Table 2. Multiple comparisons of the descriptors noted that "tiring" and "exhausting" were used primarily by nulliparous women ($P < 0.001$). The intensity of "cramping", "stinging" and "aching" was greater in nulliparous women ($P < 0.0001$), with the intensity of "stinging", "aching" and "heavy" increasing as labor progressed in both groups ($P < 0.001$). The intensity of affective ("tiring" and "exhausting") and evaluative ("unbearable") descriptors was significantly greater in the early stage of labor in nulliparous than in multiparous women ($P < 0.00001$).

Mean intensity of pain (VAPS and PPI) increased as cervical dilation increased in both nulliparous and multiparous women (Table 3). VAPS and PPI were strongly correlated ($\tau = 0.63$; $P < 0.0001$). The intensity of both the sensory and affective pain descriptors strongly correlated with the intensity of both VAPS and PPI ($P < 0.00001$). Lower fetal station was associated with greater pain scores in nulliparous women ($P < 0.026$).

There was no significant inter-group variability between the two institutions involved in this study.

Discussion

Labor pain has at least two dimensions: a sensory or physical dimension with the transmission of pain stimuli to the brain and an affective dimension stemming from the interpretation of these stimuli through a wide variety of emotional, social, cultural and cognitive variables unique to the individual.¹⁰ In both research and clinical

Table 1 Maternal characteristics

	Nulliparous group		Multiparous group	
	Early labor n=71	Late labor n=50	Early labor n=28	Late labor n=18
Age (years)	27.4 ± 3.2	27 ± 3.2	28.3 ± 2.8	28.2 ± 2.7
Weight (kg)	70.6 ± 5.8	70.6 ± 5.8	71.5 ± 4.7	71.7 ± 4.5
Height (cm)	165.3 ± 6.1	165.3 ± 6.1	166.8 ± 4.3	166.4 ± 4.1
Gestation (wks)	39.3 ± 0.6	39.3 ± 0.6	38.5 ± 0.4	38.8 ± 0.3

Results are expressed as mean (± SD).

Table 2 Intensity of the most frequently used descriptors

	Nulliparous group		Multiparous group		<i>P</i>
	Early labor	Late labor	Early labor	Late labor	
Cramping	2 (0-3)	3 (2-3)	2 (1-3)	1 (0-3)	NS
Pulling	1 (0-3)	2 (0-3)	1 (0-2)	2 (0-3)	NS
Hot	1 (0-2)	2 (0-3)	0.5 (0-2)	1.5 (0-3)	0.0557
Stinging	3 (2-3)	3 (3-3)	2 (0-3)	3 (3-3)	0.001
Aching	3 (2-3)	3 (3-3)	2 (0.75-3)	3 (3-3)	0.0001
Heavy	2 (0-3)	3 (2-3)	1 (0-2)	0.5 (0-1.75)	0.0026
Tiring	3 (1-3)	3 (2-3)	0 (0-1.25)	2.5 (0-3)	0.0001
Exhausting	2 (0-3)	3 (0.25-3)	0 (0-0)	3 (0-3)	0.0003
Unbearable	2 (0-3)	2 (0-3)	0 (0-0)	2 (1-3)	0.0027

Data are medians (IQR). *P* value: differences between the four groups.

Table 3 Intensity of pain

	Nulliparous group		Multiparous group	
	Early labor	Late labor	Early labor	Late labor
PPI	4.4 ± 0.75	4.8 ± 0.50	4.1 ± 0.56	4.7 ± 0.42
VAPS	7.6 ± 0.81	8.0 ± 0.6	7.2 ± 0.65	8.2 ± 0.6

Data are mean (± SD). PPI: Present Pain Intensity; VAPS: Visual Analogue Pain Scale.

VAPS was assessed 0 to 100: 0 “no pain” and 100 r “worst pain ever”. PPI was assessed by asking the parturient her pain intensity and grading it as 0 (no pain), 1 (mild), 2 (discomforting), 3 (distressing), 4 (horrible) and 5 (excruciating).

practice, the primary outcome of interest is frequently only the occurrence and intensity of the sensory dimension of pain.

Our present knowledge of labor pain descriptors is based on one previous study that used the SF-MPQ⁶ on an uncontrolled, very small sample of women (n = 20) with no information on them or their labor characteristics. By contrast, with an adequately powered sample of parturients in our study, we were able to identify the nine most commonly used labor pain descriptors. Labor pain was described in more than 50% of cases, as “cramping”, “pulling”, “hot”, “stinging”, “aching”, “heavy”, “tiring”, “exhausting” and “unbearable”, regardless of stage of labor or parity. However, the choice and intensity of some labor pain descriptors varied with the progression of labor and parity. Sensory pain was experienced with greater intensity as assessed by both VAPS and PPI as labor progressed. This result

is consistent with previous findings that intensity of labor pain increases with cervical dilatation.^{4,11}

Three previous studies with nulliparous women in early labor have reported greater pain than with multiparous women.^{3,4,12} However, in two of these studies no statistical analysis was performed.^{3,4} In the third,¹² the mean VAPS scores were reported to be 9 vs. 8.6 in nulliparous and multiparous women, respectively and, although this result was statistically significant, it may not be considered clinically meaningful. In our study, parturients were divided into four groups according to cervical dilatation and parity and no significant differences were observed in either VAPS or PPI between nulliparous and multiparous women at similar stages of labor.

Low fetal station was associated with greater pain scores in nulliparous women. This might be explained by a slower and more gradual fetal descent and progress of parturition in nulliparous women, perhaps allowing for more intense stimulation of pelvic and cervical nociceptors by the fetal head in early labor.

In this study we demonstrated that affective and cognitive components of labor pain can be described by a restricted number of pain descriptors that may be influenced by obstetric variables such as parity and progress of labor. Affective descriptors of pain, such as “tiring” and “exhausting”, were reported to be of greater intensity and occurring more frequently in nulliparous than multiparous women. Of interest, affective descriptors are more often reported by patients with chronic pain,² versus sensory descriptors, which are usually reported to

describe acute pain. We speculate that the longer duration of labor in nulliparous women may be required to acquire an affective dimension of pain.

We identified the most commonly used pain descriptors as well as the intensity of pain experienced throughout labor, which we believe can contribute to a better understanding of the different components of labor pain. With this information it may be possible to improve labor analgesia, particularly because it has been demonstrated that opioids may regulate the affective components of pain in both volunteers using MPQ¹³ and in laboring women.¹⁴ An understanding of labor pain in a multidimensional framework provides the basis for a woman-centered approach to labor pain management. Further research will need to evaluate the effects of different analgesic mixtures, including a broad range of pharmacologic and nonpharmacologic interventions, on the perception and treatment of labor pain.

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Appendix

The modified version of the short-form McGill Pain Questionnaire which included the 23 most frequently chosen words to describe labor pain (pain descriptors) and their intensity.

	None	Mild	Moderate	Severe
Throbbing				
Jumping				
Shooting				
Stabbing				
Sharp				
Gnawing				
Cramping				
Tugging				
Pulling				
Hot				
Burning				
Stinging				
Aching				
Heavy				
Tender				
Splitting				
Tiring				
Exhausting				
Sickening				
Fearful				
Punishing				
Cruel				
Unbearable				