Factors Affecting Post Caesarean Pain Intensity among Women in the Northern Peninsular of Malaysia

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ABSTRACT

Introduction: Caesarean section (CS) rate has increased considerably during the past years, accounting for 15% to 25% of births. During post-CS period, moderate to severe postoperative pain is a regularly reported problem. Ideally, the intensity of postoperative pain should be predicted so as to customize analgesia.

Aim: To document the CS rate, assess the pain intensity and preoperative factors that may predict post caesarean pain among women in the Obstetric unit of a Hospital Pulau Pinang in Malaysia.

Materials and Methods: A retrospective chart review of 400 caesarean deliveries was conducted between January 2013 and June 2014. The study encompassed patient's demographic data and obstetrics data. The overall pain scores since the time of surgery (2, 4, 8, 12, 24 and 48 hours postoperatively at rest and while moving) were assessed by visual analogue scale (VAS). The data were analyzed by using SPSS software (version 21.0 for Windows).

Results: The results demonstrate that within a 48 hours postoperative period, the average pain at rest and while moving was 0.40±0.013 and 0.83±0.017 (VAS score), respectively. Logistic regression identified that a higher BMI (≥30) (OR 1.056; 95% CI=1.003 to 1.113, p=0.04), an increase in operation time (> 60 minutes) (OR 1.009; 95% CI=1.000 to 1.018, p=0.049), Single women (OR 11.597; 95% CI=1.382 to 97.320, p=0.024), blood group type O (OR 1.857; 95% CI=0.543 to 2.040, p = 0.001) and general anesthesia (OR 3.689; 95% CI=1.653 to 8.232, p=0.001) were found to be independent predictors for postcaesarean pain intensity.

Conclusion: This study concluded that CS rate is 28% among women in the obstetric unit of a Hospital Pulau Pinang and the pain experienced by the study participants was mild. Moreover, the predictive factors for pain intensity may aid in identifying patients at greater risk for postoperative pain. This study concluded that the predictive methods proposed may aid in identifying patients at greater risk for postoperative pain.

INTRODUCTION

Pain is a major problem in surgery, including CS. Over the past two decade, there was a dramatic rise in CS proportion; making it the most frequent surgery performed worldwide [1]. Caesarean section normally induce moderate to severe pain in the first 48 hours post operation [2]. In spite of the progresses in the understanding of pathophysiology of post surgery pain and development of new analgesics and delivery techniques, many patients still suffer from moderate to severe postoperative pain after caesarean section [3].

The World Health Organization (WHO) reported in 2003 that pain is the leading cause of death and disease burden worldwide [4]. Acute pain is still a major factor that affects both patients and hospital staff. The intensity of feeling pain varies from patient to patient, depending on patient's pain threshold, family and hospital staff support. Having a baby is considered a pleasant event, but it can be traumatic if the mother is in pain during childbirth [5].

Traditionally, it has been challenging to predict the intensity of post caesarean pain and analgesic needs due to large interpatient variability in the severity of pain experienced, in addition difficulties in predicting the response to an individual analgesic regimen. Factors associated with significant postoperative pain include the duration of surgery, probably as a consequence of more extensive dissection and a lower dermatomal level of sensory anesthesia at the time of incision, which may contribute to a greater nociceptive input to the spinal cord and enhanced central sensitization [6]. A series of preoperative physical (thermal pain threshold) and psychological tests have been shown to predict the upper 20th percentile of post

caesarean pain scores with a sensitivity between 0.71-0.80 and a specificity of 0.76 to 0.80 and to show improved prediction over single test models [7,8].

Pain is a subjective experience and is difficult to objectively quantify. As pain assessment requires the translation of a subjective quality into an objective one, the pain scores commonly in use may not necessarily reflect the patient's pain. In spite of this, the VAS is a useful tool for the statistical study of pain. The VAS is useful in assessing both pain intensity and pain relief [9]. The VAS is a 100 mm line with "no pain" at one end and "worst imaginable" at the other end. This scale is a very elementary form of assessment; whereby patients are expected to point on the line the quantity of pain they are experiencing [10]. The VAS has been evaluated comprehensively by many researchers over the years and has usually been found to be valid and reliable [11,12]. However, patients with visual impairment find this scale difficult to use and some elderly patients have difficulty marking on the line [13]. The overall aim of the current study was to document the CS rate, assess the pain intensity and preoperative factors that may predict post caesarean pain among women in the obstetric unit of a Hospital Pulau Pinang in Malaysia.

MATERIALS AND METHODS

Study Design

A retrospective chart review of caesarean deliveries was conducted at a Hospital Pulau Pinang in Malaysia from January 2013 to June 2014. Study investigator used the patient's medical chart to search

for 400 consecutive caesarean deliveries that fitted the criteria of the study. This study included all women who had delivered a child through caesarean including (emergency and elective caesarean) in the maternity department of Hospital Pulau Pinang from January 2013 to June 2014 with completed data charts. In addition, the study excluded drug/alcohol dependence patient, psychiatric disorder and normal delivery.

The information found in the records was entered into a predesigned proforma including (medical record number, age, race, body mass index (BMI), marital status, duration of surgery, duration of hospital stay, type of CS section, type of anesthesia used and assessment of pain severity). The ethical approval of this study was granted by the National Institutes of Health (NIH), Ministry of Health, Malaysia, with research number NMRR-14-559-19654.

Sampling and Sample Size

A sample size was calculated according to the following assumption: prevalence of caesarean section (28%) was taken from a study setting in Penang (1479 caesarean cases from 5214 deliveries in 2013, this information was taken after a discussion with the head of department of the maternity hospital as the latest estimates indicate that the prevalence of CS in Penang was 17.4% in 2006 [14]), a confidence interval (CI) of 95% and an allowable margin of error of 5%, by using the Raosoft online equation the calculated sample size was 306. With 30% uncompleted data, the target number was 400.

Visual Analogue Scale (VAS)

The scientific measurement of pain is challenging, since pain is a subjective experiences. Nevertheless, several methods for the assessment of acute pain have been developed and are used in both clinical and research practice. The outcome measurement used in this study was postoperative pain; this outcome was based on a physician's evaluation since this study was a retrospective. The VAS uses a straight, non-graded line with the extremes of intensity on either end to measure pain intensity. Usually, a 100 mm ruler is used to measure VAS. One end (scored as 0) is defined as "not at all", while the other end (scored as 10) is defined as "worst imaginable". Since the current study was retrospective, VAS was used to assess the intensity of pain according to the information available in the patient's chart. Pain assessment was repeated at the following time intervals 2, 4, 8, 12, 24 and 48 hours postoperatively. Moreover, the overall VAS score since the time of surgery was calculated.

STATISTICAL ANALYSIS

The collected data was analyzed using SPSS software (version 21). The results are presented as a mean with 95% confidence limits or standard deviations. p-value <0.05 was accepted as statistically significant. Non parametric tests (Kruskul-Wallis H and Mann-Whitney U test) were used to find factors affecting pain intensity, which is the dependent variable while confounding factors (age, race, body mass index, marital status, operation time, duration of hospital stay, blood group and type of anesthesia used) as independent variables. In addition, logistic regression analysis was employed to predict the effect of the significant variables on the intensity of pain.

RESULTS

The mean age for the women was 30.36±4.8 years (range = 17-45 years). The mean weight was 73.35±14.3 kilograms (range = 38.00-129.8 kg) and the mean height was 156±0.61 centimeters (range = 143 cm-175 cm). The body mass index (BMI) was less than 30 for 63.5% of patients and more than 30 for the rest. BMI ranged between 18 and 58 with a mean of 29.89. Regarding marital status, 97.3% were married. In addition 76.5% were Malay, 14.5% were Chinese and 9% were Indian. In addition, 63.25% of the patients had

an emergency caesarean, while 36.75 % had an elective caesarean, 89.75% received spinal anesthesia, while 7% received general anesthesia and 3.25% received epidural anesthesia. A summary of the sample characteristics is presented in [Table/Fig-1].

[Table/Fig-2] provides information about the prevalence of patients

Demographic characteristics		Number	Percentage
Age (years)	≤ 31	242	60.5%
	> 31	158	39.5%
Race	Malay	306	76.5%
	Chinese	58	14.5%
	Indian	36	9.0%
BMI (kg/m²)	<30	254	63.5%
	≥30	146	36.5%
Marital status	Married	389	97.3%
	Single a	7	1.8%
	Widow b	4	1.0%
Operation time	≤60 minutes	228	57.0%
	>60 minutes	172	43.0%
Duration of hospital stay (days)	≤ 4	288	72.0%
	> 4	112	28.0%
Blood group	A	114	28.5%
	B	147	36.8%
	AB	25	6.3%
	O	114	28.5%
Type of CS	Emergency	253	63.25%
	Elective	147	36.75%
Type of anaesthesia	General anaesthesia	28	7 %
	Epidural anaesthesia	13	3.25%
	Spinal anaesthesia	359	89.75%

[Table/Fig-1]: Demographic characteristics for 400 patients having CS in HPP from January 2013- June 2014.
BMI = body mass index, CS = caesarean section, a single = currently single without partner, b widow = partner died during pregnancy, HPP= Hospital Pulau

having each pain score among women having a caesarean section in Pinang. Within a 48 hour postoperative period, the average pain at rest and while moving were 0.40±0.013 and 0.83±0.017 (VAS score), respectively. [Table/Fig-2] shows the prevalence of patients having each pain score, the majority of patients (65.9%) had no pain (VAS 0) and (33.6%) of the patients had mild pain at rest (VAS 1-3). However (35.0%) had no pain (VAS 0) and (63.7%) had mild pain with movement (VAS 1-3).

To compare pain scores during different time points after surgery Freidman test was performed. The results revealed that there was statistically significant difference between the pain scores at 2, 4, 8, 12, 24 and 48 hours post-surgery, $\chi2$ (5) = 300, p = 0.001 [Table/Fig-3]. In addition, the result showed that the pain score was highest at 12 hour (1.02 ± 0.695 VAS score) postoperatively.

*VAS score	At rest (n=2400**) Number (%)	With movement (n =2400) Number (%)
0	1582 (65.9%)	840 (35.0%)
1	738 (30.8%)	1277 (53.2%)
2	63 (2.6%)	230 (9.6%)
3	4 (0.2%)	21 (0.9%)
4	3 (0.1%)	16 (0.6%)
5	2 (0.1%)	2 (0.1%)
6	2 (0.1%)	-
7	6 (0.3%)	4 (0.2%)
8	-	10 (0.4%)
9	-	-
10	-	-
Total	2400 (100.0%)	2400 (100.0%)

[Table/Fig-2]: Distribution of the patients for each pain intensity within 48 hours after surgery (n=2400 pain score reading) in 400 caesarean patient.
*VAS= visual analogue scale, **n = number of pain score reading (6 reading for each patient)
Data represented as number and percentage for each VAS score (0-10)

Time	Mean ± SD	Range	p-value
At 2 hours	0.55 ± 1.105	0-8	
At 4 hours	0.80 ± 1.107	0-8	
At 8 hours	0.90 ± 0.971	0-8	0.001*
At 12 hours	1.02 ± 0.695	0-5	
At 24 hours	0.88 ± 0.611	0-4	
At 48 hour	0.69 ± 0.570	0-3	

[Table/Fig-3]: Comparison of pain scores during 2, 4, 8, 12, 24 and 48 hours postoperatively in caesarean patients at HPP.
Freidman test, SD = Standard Deviation, * Significant (p-value <0.05)

Factors Affecting Pain Score

To determine the effect of demographic characteristics on the intensity of pain Mann-Whitney U test and Kruskal-Wallis H test was performed. The Kruskal-Wallis H test revealed that there was a statistically significant difference in pain score between the marital status of the patients, different anesthetic techniques and blood groups. The Mann-Whitney U test showed that there was a statistically significant difference in pain score depending on body mass index, operation time, duration of hospital stay and age, as shown in [Table/Fig-4].

Variables		Number (%)	Pain score (VAS) Mean ± SD	p-value
Age** (years)	≤31	242(60.5%)	0.16 ± 0.510	0.05*
	>31	158(39.5%)	0.23 ± 0.881	
Marital status***	Single	7 (1.8%)	1.43 ± 1.272	0.014*
	Married	389(97.3%)	0.54 ± 1.101	
	Widow	4 (1.0%)	0.25 ± 0.500	
Anaesthetic technique***	General	28 (7%)	1.04 ± 1.875	0.001*
	Epidural	13 (3.25%)	0.08 ± 0.277	
	Spinal	359 (89.75%)	0.13 ± 0.434	
Operation time** (minutes)	≤ 60	228 (57.0%)	0.07 ± 0.343	0.02*
	> 60	172 (43.0%)	1.64 ± 1.732	
BMI ** (kg/m²)	< 30	254 (63.5%)	0.56 ± 1.301	0.001*
	≥ 30	146 (36.5%)	1.46 ± 1.654	
Duration of hospital stay (days) **	≤ 4	288 (72.0%)	0.13 ± 0.430	0.05*
	> 4	112 (28.0%)	0.33 ± 1.077	
Blood group***	A	114 (28.5%)	0.54 ± 0.970	0.04*
	B	147 (26.8%)	0.58 ± 1.276	
	AB	25 (6.3%)	0.12 ± 0.332	
	O	114 (28.5%)	0.62 ± 1.092	

[Table/Fig-4]: Factors affecting pain score in 400 caesarean patients at HPP.
* Significant (p-value <0.05), ** Mann-Whitney U test, *** Kruskal-Wallis H test, CS = caesarean section, BMI = body mass index

Finally, a logistic regression was performed to ascertain the effects of age, marital status, anesthetic techniques, operation time, BMI, duration of hospital stay and blood group on the pain intensity scores. A higher BMI, as well as an increase in operation time were associated with increasing pain scores. Single women (currently single) suffered from more intense pain compared to married women and widows. Blood group O had a higher mean rank in terms of pain intensity than other blood groups. Also regarding anesthetic techniques, patients with general anesthesia had a higher pain score than spinal and epidural. These variables were found to be independent predictors for post caesarean pain intensity, as shown in [Table/Fig-5].

Variables		Estimate coefficient	OR	95% Confidence interval		p-value
				Lower bound	Upper bound	
Marital status	Single	2.451	11.597	1.382	97.320	0.024*
	Married	-1.214	0.297	0.085	1.032	0.056
	Widow	- 0.484	0.616	0.064	5.981	0.676
Age (years)	>31	0.102	1.108	0.600	2.044	0.743
	≤31	0				
Length of hospital stay (days)	≤ 4	0.601	1.825	0.977	3.409	0.059
	>4	0				
Anaesthetic techniques	General	1.305	3.689	1.653	8.232	0.001*
	Epidural	0.241	1.272	0.730	2.216	2.187
	Spinal	- 0.361	0.697	0.559	0.868	0.001*
BMI (kg/m2)	<30	0.055	1.056	1.003	1.113	0.04*
	≥30	0				
Operation time (minutes)	≤ 60	0.009	1.009	1.000	1.018	0.049*
	> 60	0				
Blood group	A	-0.103	0.902	0.570	1.427	0.659
	B	0.021	0.979	0.639	1.500	0.922
	AB	-1.440	0.237	0.070	0.806	0.021*
	O	0.619	1.857	0.543	2.040	0.001*

[Table/Fig-5]: Contribution factors effect on pain scores for caesarean patients in HPP.
Binary logistic regression, CS = caesarean section, PCA = patient control analgesia, OR = odds ratio, * Significant (p-value <0.05)

DISCUSSION

The highest pain score occurred mostly at the 12 hour postoperative period. However, in postoperative patients, it is better to measure pain while moving rather than pain while resting. This study demonstrated that most of the patients (65.9%) presented no pain (VAS 0) and 33.6% of patients presented mild pain at rest (VAS 1-3), while 35.0% had no pain (VAS 0) and 63.7% of the patients experienced mild pain at movement (VAS 1-3); the general pain scores were low and comparable to other studies [15-18].

This study identified many factors affecting the intensity of pain at rest and while moving postoperatively, a higher BMI, an increase in operation time, single women, blood group O, general anesthesia led to a higher score in terms of pain intensity. These variables were found to be independent predictors of pain intensity.

Several studies have been devoted to search for preoperative factors that may predict the level of postoperative pain. However, analysis of these studies shows conflicting results. For instance, whereas some investigators found a correlation between different characteristics of personality like level of preoperative stress, anxiety and tension with postoperative pain, others did not find such a correlation [19-23].

This study revealed that BMI is one of the most significant predictors of post caesarean pain. Those patients who experienced pain were significantly heavier and taller than those patients who did not suffer any pain. It is possible that the patients with a higher body mass index might have had an inadequate dose of opioid compared to those patients with a lower body mass index. Further education of anesthesiologists regarding this issue is needed. This finding is in line with a study by Chung F et al., [24].

Moreover, the duration of surgery was a predictive factor of post caesarean pain, an increase in operation time was significantly correlated with an increase in pain scores, Fecho K et al found that higher surgical complexity (commonly resulting in a longer operation duration) correlated with higher pain scores [25].

In this study, the frequency of pain was higher in patients who underwent general anesthesia than patients with regional anesthesia, the reason for this difference is not known. It is possible that the stronger blockade of central impulse traffic in regional anesthesia may have a protective effect on the development of pain in some patients. This notion is supported by a study of caesarean deliveries in which general anesthesia compared with spinal anesthesia was correlated with a higher frequency of chronic pain after one year [26]. It may be speculated that noxious input to the central nervous system is lower during spinal anesthesia than during general anesthesia. Both experimental and some clinical studies have shown that an afferent barrage of noxious input can generate a central sensitization in second order noxious responding neurons and that such central sensitization may be associated with an increased risk of persistent pain. If the noxious input is insufficiently blocked by the anesthetic and analgesic agents, this may result in central sensitization [27]. The higher pain score in patients who underwent general anesthesia may in part also be explained by the fact that general anesthesia is usually restricted to urgent cases. This in turn may leave the patient with a traumatic memory of the caesarean section. In addition, Massicotte L et al., compared spinal anesthesia with general anesthesia on morphine requirement and postoperative pain score after abdominal hysterectomy; they found that postoperative pain at rest was lower in the spinal anesthesia group up to the 18th hour and under stress up to the 48th hour as well as spinal anesthesia group consumed about two times less morphine at each time interval than the general anesthesia group [28]. In another study Kessous R et al., conducted a case-control study on 153 patients under either spinal anesthesia or general anesthesia for caesarean section. The results indicated that postoperative meperidine requirements in the first 24 hours were significantly higher in the general anesthesia group than under spinal anesthesia and the pain scores were graded after eight hours in the general anesthesia group versus the spinal anesthesia groups. This was reversed at 48 hours [29]. Imbelloni LE et al., reported the importance of postoperative pain relief in laparoscopic cholecystectomy and concluded that spinal anesthesia was associated with an extremely low level of postoperative pain and resulted in a better recovery than general anesthesia [30]. In another study, Gonano C et al., concluded that patients in the general anesthesia group admitted to the post anesthesia care unit had a higher pain score and needed more analgesic than patients in the spinal anesthesia group (both p<0.01) [31].

The finding of this study demonstrated that marital status was also a predictive factor regarding post caesarean pain. Single women had a higher mean rank in terms of pain than married women. The mechanisms by which marital status might predict pain are both physiological and psychosocial. In a French study, 78 subjects were accompanied in labor, 60 of them reported that they found their husband's presence at the birth useful. These women had significantly lower levels of pain when compared with all other women, i.e. women whose husbands were present at the birth, but who were not reported as being of help, or women whose husbands were absent [32]. Surgery is a stressful situation that evokes both physiologic and emotional reactions [33]. Previous studies have therefore focused on the potential impact of psychologic factors and personal characteristics on the level of postoperative pain [22-23].

LIMITATION

A retrospective chart review may result in collecting inaccurately charted information from the medical record. Some charts had more thorough charting than others. Misinterpretation of meaning in the written documentation is also a possible source of error. Extraneous variables such as environmental conditions and socioeconomic status cannot be controlled, may not even be identified and may affect the results. In this study, the nurses evaluated pain by using the VAS score. Preoperative anxiety and pain expectations may correlate with the degree of reported postoperative pain. Future studies should use VAS scores and measure preoperative anxiety and pain expectations. Despite these limitations, this study provides valuable information regarding the post caesarean pain as well as factors affecting pain intensity.

CONCLUSION

This study shows that caesarean section rate is approximately 28% in Pinang. Moreover, the pain experienced by the study participants was mild and become more intense during sitting down and standing up, or walking. Finally, the study has shown that an increase in BMI, an increase in operating time, being a single women, having blood group type O and general anesthesia were independent predictors of post caesarean pain intensity. As very few studies have been conducted regarding exact incidence and possible contributing factors of the development of pain after caesarean section in Malaysia, it is suggested that more studies are required to be conducted in this country. Further efforts should be made to develop effective strategies for the prevention and treatment of postoperative pain in the caesarean patient.

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