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Comparative Analyses of Pain, Depressed Mood and Sleep Disturbance Symptoms in Women before and after Hysterectomy

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Abstract

Hysterectomy affects several aspects of a woman's health, and persons considering a surgery should be aware of its effectiveness for relief of symptoms and long term effects on quality of life. The aims of the study were to examine pain, depressed mood, and sleep disturbance symptoms of women before and six weeks after hysterectomy; compare the physiological and social variables related to the symptoms, and examine the levels of symptom severity between abdominal vs vaginal hysterectomy. A pre and post measures study collected data from a prospective sample of 26 of the 36 culturally diverse women who were scheduled for hysterectomy using subjective questionnaires and objective wrist actigraphy monitoring for sleep and wake time. Results indicated that the majority of participants reported moderate amounts of pain before surgery however an average pain score did not vary over time. Depressed mood scores in women with laparoscopic vaginal hysterectomy significantly decreased from the baseline to six weeks after surgery, showing less severity of depression after surgery. Compared to the baseline measures, wrist actigraphy recordings showed increases in the numbers of awakening, wake after sleep onset and day time sleep during six weeks after surgery indicating that women had more sleep disturbance postoperatively. However, compared to women who had the abdominal surgery, those with vaginal hysterectomy reported a significantly severe sleep disturbance at six weeks after surgery; and younger women experienced more wake time at night. Evidence based findings indicated that hysterectomy relieved pain however women continued to experience disturbed sleep patterns six weeks after surgery, suggesting further research is needed in light of women's health.

Keywords: Hysterectomy, pain, depressed mood, sleep disturbance, TAH and LAVH

1. Introduction

Hysterectomy relieves preoperative symptoms including heavy bleeding and pain; however it may carry a substantial risk of morbidity such as sleep disturbance and depressed mood. Current evidences indicate that after a hysterectomy, women experience further complications during the recovery period that might vary with the type of surgical procedure. During this period, the quantity and quality of sleep as well as other symptoms such as pain, anxiety, and depressive symptoms might be influenced by various demographic and biopsychosocial factors. Despite limited evidence that sleep problems may occur frequently during the recovery period, only a few researchers have systematically examined symptom outcomes in women after hysterectomy. This study investigated the pain, depressed mood, and sleep disturbance symptoms experienced by women before and after hysterectomy and compared their multi-dimensional biopsychosocial variables including surgical procedures related to the symptoms.

2. Literature review

Hysterectomy was one of the most common gynecological surgeries in the United States [1-4]. According to the National Center of Health Statistics, approximately 600,000 hysterectomies were performed annually in the United States. It also was one of the most frequently performed surgeries among women all over the world with annual rates of 50,000 in Canada [5-6], 1.8/1000 in Denmark [1], 4.1/1000 in Finland [1], and 11,000 in Portugal [4]. The most common indications for a hysterectomy comprised of leiomyoma, endometriosis, prolapse of the uterus, cancer of the reproductive tract, adenomyosis, fibroids, and heavy bleeding [7-9]. Varying rates of surgical cases were reported in literature, however approximately 40% of hysterectomies were elective [10], and 90% were operated for a benign condition [11].

A hysterectomy could be done in various ways; such as vaginal hysterectomy, abdominal hysterectomy, laparoscopic assisted vaginal or total hysterectomy, and robotic assisted hysterectomy. The choice might depend on diagnoses and physicians' ability to perform procedures on their patients. Total abdominal hysterectomy (TAH) was performed more commonly for myomas [12] and presence of malignancy [13] however it was associated with a worse patient experience relative to the other types of procedures [14]. In a study, 60% underwent TAH, and those women experienced higher levels of pain and depressed mood after TAH compared to laparoscopic assisted vaginal hysterectomy [15]. Li and colleagues [16] claimed that both procedures had similar efficacy and morbidity rates for women with cervical cancer. Susini and colleagues [17] argued that laparoscopic assisted vaginal hysterectomy (LAVH) had both advantages and disadvantages. An advantage of LAVH was the ability to inspect the tissue with laparoscopy once vaginal cuff closure was completed; however the complication rate did not exceed that of TAH when performed by well-trained physicians. Robotic assisted surgery for endometrial cancer has further been shown to reduce blood loss, while maintaining the benefits of laparoscopic techniques [18-19] however its lengthy preparation and operating time would contribute to an exorbitant price and cause cost inefficiency.

Although the research addressed the substantial numbers of positive effects such as relief of physical symptoms and improvements of social and psychological functioning, the appropriateness of using hysterectomy to treat non-malignant conditions remained controversial [10]. Research showed the possible reasons of negative physical and psychological outcomes after hysterectomy; such as depression [20-21], sleep disturbance and fatigue [22, 7], pelvic pain [23], sexual dysfunction [24-25, 11], and urinary incontinence or symptoms [26].

Sleep disturbance is one of the most prevalent symptoms following hysterectomy. Kim and Lee [7] reported that three weeks after surgery, women's self-reported sleep disturbance was significantly higher than baseline. Similarly, after adjustment for factors such as current psychological, vasomotor, and somatic symptoms and waking frequently at night to use the toilet, a study on self-reported sleep difficulty during the menopausal transition demonstrated that women with hysterectomy remained at higher risk for moderate sleep difficulty [27]. Another study evaluated the sleep patterns before gynecologic surgery that indicated sleep quality was only impaired in the very last night before surgery [28]. Moreover, no significant association between the nature of the planned surgery and preoperative sleep characteristics was shown in the study. A study by researchers [29] compared two groups receiving treatments, one receiving the GnRH agonist and other receiving hysterectomy for treatment of dysfunctional uterine bleeding in premenopausal women and concluded that there was no significant differences existed between two treatment groups in sleep disorders after two-years of follow up.

Pain before and after hysterectomy has been discussed in the literature. Although Solnik and Munro [30] suggested that women experiencing chronic pelvic pain should be counseled against hysterectomy until a more clear etiology was identified, Tiwana and colleague [31] claimed that women with chronic pelvic pain must consider hysterectomy. It is quite common for women to experience chronic pain following hysterectomy. Brandsborg and colleagues [1] argued that chronic pain was prevalent in women with hysterectomy; on their study, 5-32% of women reported to experience pain. Chronic pelvic pain persisted after surgery in 22% of cases [32] and 19% of cases that needed a further intervention to cure this problem [12]. Furthermore, Darnall and Li [33] reported that 29% of the female sample (n = 323) aged between18 and 45 at a chronic pain clinic reported to experience pain: They suggested that hysterectomy might confer risk for pain-related dysfunction and opioid prescription in women 45 years of age and younger. Hysterectomy also was used to treat chronic pelvic pain in the past. In a comparative study of pre-hysterectomy cases, pelvic pain and abdominal pain were reduced five years post hysterectomy [34]. However, several studies demonstrated that in the absence of any obvious pathology, 21-40% of women undergoing hysterectomy to treat chronic pelvic pain might continue to experience pain after the surgery [23], no more than 60-70% might achieve significant pain relief, and 3-5% might suffer worsening of pain or had new onsets of pain [35]. Therefore, it was suggested that women with chronic pelvic pain could consider hysterectomy [31] if they had pelvic varices and were ruled out having non-reproductive causes of pain after a careful pre-operative assessment [23,35].

In regards to pain after hysterectomy, researchers examined whether the severity of acute postoperative pain differed between laparoscopic (LH) or laparoscopically assisted vaginal hysterectomy (LAVH) and vaginal hysterectomy, and found LH was associated with reduced need of analgesics and lower acute pain scores than LAVH [36]. A study in Finland comparing hysterectomy with levonorgestrel-releasing intrauterine system (LNG-IUS) as a treatment for menorrhagia showed that both treatments reduced lower abdominal pain: However, only LNG-IUS use, not hysterectomy, had beneficial effects on back pain [37]. In a study on predictors of acute postsurgical pain in women undergoing hysterectomy due to benign disorders, Pinto and colleagues [4] found that younger age, pre-surgical pain, pain due to other causes, and pain catastrophizing appeared to be the main predictors of pain severity at 48 hours after the operation, while presurgical anxiety also predicted pain intensity after surgery. Their findings revealed the joint influence of demographic, clinical, and psychological factors on postsurgical pain intensity and severity.

In addition to the physical outcomes, much has been written about the possible psychological effects from hysterectomy. 50% of women had obvious abnormal emotions before hysterectomy, and the surgery could cause strong mental stress reactions [21]. Of the statistics, however, women with hysterectomy were not higher in negative affect or negative attitudes toward aging and menopause compared to those without hysterectomy [38]. In a study on 113 women during an eight-week post hysterectomy period, Cohen and colleagues [2] found the significant overall positive changes in anxiety, depression, and hostility: They indicated that the positive changes could be due to women's high self-esteem, which might partially be attributed to the high educational level of the sample. The findings from the study by Farquhar et al. [34] also showed lower depression scores five years following hysterectomy. Nonetheless, Sehlo and Ramadani [20] found that the prevalence of major depressive episode (MDE) was significantly higher in women having hysterectomy compared with women having cholecystectomy. Moreover, the prevalence and severity of MDE was significantly higher in the nullipara group than the multipara group. They declared that hysterectomy increased the risk of MDE that should be diagnosed and treated promptly [20]. Ewalds-Kvist and associates [39] also found that married nullipara suffered from enhanced depression post-surgery.

When evaluating the relationship between hysterectomy and the psychological health afterwards, Cooper, Mishra, Hardy, & Kuh [40] emphasized the importance to take previous psychological status into account: Their findings suggested that women who underwent hysterectomy at a young age might require more support than those who maintained good psychological health in middle age. Similarly, Vandyk, Brenner, Tranmer, and Kerkhof [41] also found that young women with high levels of anxiety and pain that needed a hysterectomy were at high risk of experiencing psychological distress before and after their operation.

The association between hysterectomy and psychological outcomes has aroused the interest of the researcher not only in the United States but outside the US. Researchers in Japan demonstrated that depressed women had a higher incidence of hysterectomy and/or oophorectomy than non-depressed women [42]. By comparing mastectomy patients with hysterec-

tomy patients in a study conducted in Turkey, Keskin & Gumus [25] found that mastectomy patients were more depressive while hysterectomy patients demonstrated more problems in expression of emotions as well as greater sexual problems and difficulties with spousal relationships. Wang, Lambert, & Lambert [43] demonstrated a study on 105 Chinese women with hysterectomy before their scheduled discharge: The findings showed that 4.8% experienced depression; and the best predictors of depression were self-blame and employment status. These results imply that besides physical and psychological factors, social and economic well-being of the post-hysterectomy women were affected.

Without complications, most women with a LAVH require a few weeks of recovery time, however those who undergo an abdominal hysterectomy may require six to eight weeks of longer recovery periods. This study aimed to examine symptoms experienced by women with hysterectomy; compared their perceived pain, depressed mood and sleep disturbance symptoms before and six weeks after hysterectomy; and examined the relationships between their symptoms and biopsychosocial variables including types of surgical procedures, TAH vs LAVH.

3. Methods

The pre and post measures study examined pain, depressed mood and sleep disturbance symptoms experienced by a sample of 26 culturally diverse women before and after hysterectomy and evaluated the relationship between their symptoms and biopsychosocial contextual variables. After describing the women's experience of pain, depressed mood and disturbed sleep, the symptoms were compared to determine the differences in symptom severity between two surgical procedures; total abdominal vs. laparoscopic hysterectomy.

3.1. Research participants and procedures

The Institutional Review Board on Human Research approved the study. The inclusion criteria included: (a) women above 30 years of age, (b) no history of pregnancy or surgery for the past one year, (c) no history of mental illnesses, and (d) no history taking psychotropic drugs in the past one year. Potential participants were accessed through the flyer provided by the investigator in the two women's clinics at two to three weeks prior to surgery. Once women expressed an interest in participating in the study, they were asked to call the investigator who would provide the details of the study and obtain informed consent, their health history, and baseline data that included physiologic, psychological and social variables as well as sleep-wake patterns and symptoms. They were given information about instructions on how to manage a wrist actigraph although this instruction was repeated at the time of wearing the actigraph by the researcher as participants needed to wear a wrist actigraph for 48 hours, between three days to two weeks before their scheduled surgery. Once discharged from the hospital, women were asked to wear the wrist actigraph in their home to monitor activity continuously for 48 hours at six weeks after surgery. At each time point, they were also asked to complete standardized questionnaires that measure pain and depressed mood. Participants were

informed to record their sleep and wake times on a diary. Standardized questionnaires used for this study took approximately 15 minutes to complete. After each 48-hour session, the investigator collected the wrist actigraph and diary from the participant's home.

3.2. Measurements

The women's biopsychosocial and symptom variables were evaluated using standardized questionnaires completed by participants and objective actigraphy data for sleep efficiency and sleep-wake patterns. Physiologic factors included age at preoperative baseline as well as whether the surgery was a laparotomy approach to total abdominal hysterectomy (TAH) or laparoscopic assisted vaginal hysterectomy/vaginal hysterectomy (LAVH). Social factors included ethnicity (African/Black, Asian, Caucasian/European, or Hispanic), marital status (single, married, divorced, or widowed), education (graduates of high school, college, or post-graduate work), employment (full- or part-time, homemaker, or retired), and numbers of children. These data were collected as part of the health history baseline data.

Symptom measures included pain, depressed mood and sleep disturbance. Pain was measured at baseline and six weeks after surgery with the Wisconsin Brief Pain Inventory (BPI) to address multidimensional aspects of pain. Participants were asked to circle a number to describe the extent to which pain interfered with various activities from 0 (does not interfere) to 10 (completely interfere), during the past week. Internal consistency reliability of the severity and interference subscales on the BPI revealed Cronbach alpha coefficients of 0.89 and 0.90 in this sample.

Depressed mood was measured with the 21-item Beck Depression Inventory (BDI) pre-operatively and at six weeks after surgery by having the participant rate their perception of mood intensity from 0 (absence of depression) to 3 (the most severe depression). The BDI has established test-retest reliability ranges of 0.74 to 0.95 with elderly and depressive subjects. Internal consistency (Cronbach alpha coefficient) for this study was 0.93 preoperatively. The cutoffs scores were 0–13 (minimal depression); 14–19 (mild depression); 20–28 (moderate depression); and (29–63) severe depression. Higher total scores indicate more severe depressive symptoms.

Sleep history was assessed at baseline with the 19-item Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, latency, duration, and disturbances in the past month. A global sleep quality score could range from 0 to 21 and a higher score reflecting more severe sleep disturbance and poor sleep quality. Internal consistency reliability (Cronbach alpha coefficient) was 0.73 in this sample. Current sleep disturbance was assessed using the 21-item General Sleep Disturbance Scale (GSDS). Items on the GSDS assess sleep quality and quantity during the past week on a scale of 0 (not at all) to 7 (every day). Scores can range from 0 to 147 (Lee, 1992). Internal consistency reliability (Cronbach alpha coefficient) for this study was 0.87.

Objective sleep parameters were measured using wrist actigraphy (Ambulatory Monitoring, Inc., Ardsley, NY); a non-invasive watch-like tool that provided sleep-wake patterns via an accelerometer that detected wrist movements of participants over 48 hours at baseline and six weeks after surgery. The actigraph worn by participants' non-dominant wrist detects motion

and quantifies the number of movements over a preprogrammed interval (30-second epochs). It has been demonstrated to be reliable and valid with polysomnographic measures of sleep in clinical settings. In surgical patients including women with hysterectomy, in whom traditional sleep monitoring could be difficult, actigraphy would be indicated for characterizing sleep. Wrist actigraphy has accompanying software for an automatic sleep scoring algorithm to allow for quantifying activity and sleep time without bias by researchers, and objectively determines time spent asleep and awake during the night. Sleep parameters of interest included: (a) Total sleep time (TST) in minutes, from the time of 'lights out' to final awakening; (b) sleep efficiency in percentages, of time asleep while in bed; (c) sleep onset latency (SOL) in minutes, between bed time and the first block of inactivity after bed time; (d) awake after sleep onset (WASO) in minutes, awake between sleep onset and wake time; (e) number of awakenings lasting at least 3 minutes; and (f) day time sleep in minutes. A sleep diary was also used for self-monitoring of participant's sleep and daytime activities. Actigraphy data were collected for an average of 3.5 days. Data for each variable was averaged over the recorded time. A sleep diary is useful in conjunction with actigraphy and provides an indication of type of daily activity, including time in bed, trips to the bathroom, or exercise.

3.3. Data analyses

Data were analyzed using descriptive and inferential statistics. Objective sleep data were first downloaded from the actigraph into a personal computer using an interface unit, and then analyzed using Action W4 (Ambulatory Monitoring, Inc., Ardsley, NY) automatic sleep analysis software. Because of a potential 'first-night' adaptation effect, only the second night of sleep data was used for analyses at each time. Pearson product moment correlation coefficients were used to establish significant relationships between the symptom outcome variables (pain, depressed mood and sleep disturbance) and biopsychosocial contextual variables. Multiple regression analyses were performed for those variables with high coefficients (r >.30). Repeated measures analysis of variance (RMANOVA) was used to test for within-subject changes in severity of symptom scores from baseline and to test between subjects by type of surgical procedure.

4. Results

Participants ranged in age from 35 to 81 years, with a mean age of 50 (median age 48) ± 10 years. There were 12 Caucasians, 6 African/Black Americans, 4 Asian Americans, and 4 Hispanic women. Over two third of the participants (69%) were employed full-time outside the home, and 77% of them had more than a high school education. Fifteen women were married, six were single, and four were separated or divorced. The majority (73%) had children, and 69% reported a net family annual income of more than $62,000. Time since diagnosis of their disease processes ranged from 1.5 month to 15 years. Four women experienced complications after TAH that included infection, severe leg pain due to thrombosis, or chronic diarrhea.

Descriptive statistics at baseline and six weeks after surgery showed significant changes in their symptom experience. Pain interfered with general activities preoperatively (5.6 ± 1.6) however began to decrease and remain at the lower level by the sixth week (4.7 ± 3.15) after hysterectomy. Eighteen women scored higher means at baseline than postoperatively, indicating that pain had interfered with their general activities; walking, mood, work, sleep, and enjoyment of life before surgery. The Hispanic women perceived significantly higher postoperative pain interference than did the Caucasian women or Black women. The 15 women who had TAH perceived significantly higher pain scores than the 11 women who had LAVH, both before and after surgery (F = 14.48, p <.01). Women with TAH also scored high on depressed mood than women with LVH after surgery (F = 4.49, p = 0.05).

Although less than expected, the severity of depressed mood varied greatly in this sample, but averaged 8 ± 2.8 at baseline and decreased to 6 ± 1.71 at six weeks after surgery. Caucasian women (11 ± 3.6) perceived significantly higher depressed mood scores than Hispanic women (8 ± 2.8) pre-operatively (F = 4.65, p = 0.05). Their scores however reversed at six weeks after surgery, showing that Hispanic women perceived significantly higher depressed mood scores (9 ± 2.8) than Caucasians (5 ± 1.4) or Black Americans (6 ± 1.7). These scores could be arbitrary as they ranged within a minimal depression level that might not be concerns as indicated on BPI.

Furthermore, there was a significant difference in severity of depressed mood perceived by women with TAH and LAVH groups. Women with TAH rated significantly higher scores on a depressed mood inventory than women with LAVH (F = 4.49, p = 0.05) at six weeks after surgery. For example, although depressed mood scores did not change significantly in women with TAH from the baseline (7.1 ± 1.8) to six weeks after surgery (6.4 ± 2.0), the scores in women with LAVH significantly decreased from the baseline (6.3 ± 1.4) to six weeks after surgery (2.5 ± 0.5) [see TABLE1], showing less severity of depressed mood after surgery. There were no significant differences in symptom severity between women with children and women without children, or between married and single women.

Current sleep disturbance score measured by GSDS in women with TAH averaged 42.1 ± 5.1 at baseline and 38.7 ± 4.9 at six weeks after surgery; and women with LAVH averaged 35 ± 4.1 at baseline and 42.8 ± 5.1 at six weeks after surgery. Women with TAH scored higher on sleep disturbance than women with LAVH at baseline however the scores reversed at six weeks after surgery; women with LAVH scored high on GSDS, indicating that they experienced significantly increased levels of sleep disturbance after surgery.

Latent sleep disturbance scores measured by the Pittsburg sleep quality index (PSQI) in women with TAH and LAVH averaged 7.4 ± 1.1 and 7.6 ± 1.2 respectively at baseline. Compared to the baseline, the average sleep scores of women with TAH (7.5 ± 1.2) and LAVH (7.8 ± 1.3) increased at six weeks after surgery, indicating that their sleep patterns did not improve after surgery over time. Table 1 displays comparison charts of mean differences of pain, depressed mood and sleep disturbance in women with two types of surgical procedures before and six weeks after surgery.

Symptom lists at baseline and 6 weeks after surgery	TAH (n = 15) Mean (SE)	LAVH (n = 11) Mean (SE)
Pain intensity (0-10)		
Baseline	5.6 (2.1)	3.4 (0)
6 weeks after surgery	4.7 (3.6)	3.3 (1)
Beck Depressed Mood (0-63)		
Baseline	7.1 (1.8)	6.3 (1.4)
6 weeks after surgery	6.4 (2.0)	2.5 (0.5)
PSQI-Sleep Disturbance in last week (0-21)		
Baseline	7.4 (1.1)	7.6 (1.2)
6 weeks after surgery	7.5 (1.2)	7.8 (1.3)
GSDS-Sleep Disturbance, current (0-147)		
Baseline	42.1 (5.1)	35 (4.2)
6 weeks after surgery	38.7 (4.9)	42.8 (5.2)

Table 1. Comparison of mean differences of pain, depressed mood, and sleep disturbance in women before and six weeks after total abdominal hysterectomy (TAH) and laparoscopic assisted vaginal hysterectomy (LAVH)

Subjective sleep disturbance was evident at all-time points, with mean PSQI global scores greater than 5, the established cut point for severe sleep disturbance [see TABLE1]. Hispanic and Black women experienced significantly higher PSQI scores than Caucasian or Asian American women at baseline. Similarly, the Black women perceived significantly higher current sleep disturbance on the GSDS than did the Caucasian women at baseline (F = 8.1, p = 0.015). There were no significant differences in self-reported sleep quality between TAH and LAVH groups.

The sleep actigraphy data are reported on the Table 2 that displays means and standard deviations of sleep data at the baseline and six weeks after surgery. The total sleep time (TST) for the second night of sleep recording at baseline ranged from 301 minutes to 720 minutes with a mean of 392 ± 121 minutes, and number of awakenings ranged from 3 to 21, with a mean of 10 ± 6.0. At six weeks after surgery, the TST ranged from 180 minutes to 540 minutes with a mean of 402 ± 126 minutes. Sleep efficiency decreased from 89% (SD = 8) at the baseline to 82% (SD = 16) at six weeks after surgery. The mean wake after sleep-onset (WASO) increased from 8.48 ± 7.36 minutes to 14.69 ± 12.50 minutes, indicating increase in sleep disturbance. The

numbers of awakenings significantly increased from 10 ± 6 at baseline to 20 ± 8 at six weeks after surgery (F = 2.0, p < 0.02). An additional finding, after surgery, was that the daytime sleep increased to compensate for lack of sleep at night. When actigraphy sleep data were compared by type of surgical procedure, there were no statistically significant differences between TAH and LAVH groups.

Time	Total Sleep Time (minutes)	Sleep Efficiency (%)	Wake After Sleep Onset (minutes)	Number of Awakenings	Sleep Onset Latency (minutes)	Day Sleep (minutes)
Baseline						
Mean	402	89	8.5	10	11.1	3.7
Median	404	91	6.5	8	8.0	3.1
SD	126	8	7.4	6	9.5	2.9
6 weeks Post						
Mean	411	82	14.7	20	13.7	4.0
Median	437	87	11.7	18	6.5	2.7
SD	102	16	12.5	8	2.6	4.1
Significance						
F (*p*)	1.5 (0.12)	0.9 (0.10)	2.1 (0.2)	2.0 (0.02)		

Table 2. Mean Comparisons of sleep efficiency and numbers of awakenings of actigraphy recordings at baseline and six weeks after hysterectomy (n = 26)

Table 3 displays Pearson product moment correlation coefficients of pain, depressed mood, and sleep disturbance symptoms and biopsychosocial variables before and six weeks after surgery. Age was negatively related to current and latent sleep quality, indicating that younger women had more sleep disturbance by self-report. Age was also negatively correlated with pain and depressed mood however the relationship was not statistically significant in this sample.

Preoperative sleep efficiency recorded in wrist actigrpahs was negatively correlated with perceptions of current sleep disturbance of GSDS (r = -0.51, p <0.01) and latent sleep disturbance (PSQI) in the past month (r = -0.64, p < 0.01). Preoperative perception of depressed mood was related with current and latent sleep disturbances (r = 0.60, r = 0.44, p < 0.01). Current sleep disturbance was correlated with the latent sleep disturbance (r = 0.78, p < 0.05). Postoperative sleep disturbance (PSQI) was also negatively related to age (r = -0.47, p <.002), and positively correlated with depressed mood (r = 0.65, p <.01). There were no statistically significant relationships between the pain and other covariables over time in this sample.

Time 1: Baseline	Pittsburg Pain1	Beck Depression1	Current Sleep GSDS1	Latent Sleep Quality PSQI1
Age	-0.45	-0.41	-0.63**	-0.66**
Education level	-0.26	0.10	0.22	0.04
Sleep efficiency	-0.37	-0.04	-0.51*	-0.64**
Pain	1	0.17	0.20	0.27
Depressed mood	0.17	1	0.60*	0.44*
Current sleep disturbance	0.20	0.60*	1	0.78**
Time 2: 6 weeks Post-op	Pittsburg Pain2	Beck Depression2	Current Sleep GSDS2	Latent Sleep Quality PSQI2
Age	-0.08	-0.34	-0.45	-0.47*
Education level	-0.48	0.14	0.18	0.24
Sleep efficiency	-0.32	-0.34	-0.39	-0.65**
Pain	1	0.40	0.13	0.17
Depressed Mood	0.40	1	0.65*	0.40
Current sleep disturbance	0.13	0.65*	1	0.57*

Note: * = Correlation is significant at the .05 level (2-tailed); and ** = Correlation is significant at the.01 level (2-tailed)

Table 3. Correlation coefficients between symptom outcome and biopsychosocial variables at baseline (Time 1) and Six Weeks (Time 2) after Surgery

5. Discussion

This study examines key symptoms of pain, depressed mood and disturbed sleep experienced by culturally diverse women who have undergone total abdominal hysterectomy (TAH) and laparoscopic assisted vaginal hysterectomy (LAVH); and evaluates their biopsychosocial variables in relation to the symptoms preoperatively and six weeks after surgery. Results indicate that women experience high levels of pain that interfere with their daily activities prior to surgery. Findings also suggest that women who undergo TAH perceive significantly higher pain scores than the women who receive LAVH postoperatively. Pain severity, however, is not correlated with any other variables.

The severity of depressed mood varies greatly in this sample. Women with TAH score higher on depressed mood than women with LAVH before and after surgery. In this study, women's

depressive symptoms improved after surgery, especially in women with LAVH. Although Caucasian women experienced worsen symptoms of depressed mood than Hispanic women at baseline, their scores reversed after surgery, with improved perception of depressed mood, while Hispanic women reported worsening mood. This outcome coincides with the study conducted by Gibson, Joffe, and Bromberger's [45] in that the researchers found women who had a hysterectomy with or without bilateral oophorectomy in midlife did not experience more negative mood symptoms in the years after surgery; however they reported that women's depressive and anxiety symptoms improved over the course of the menopausal transition. Similarly, in their review, Darwish, Atlantis, and Mohamed-Taysir [46] claimed that hysterectomy was associated with a decreased risk of clinically relevant depression and standardized depression outcomes. However Wang and colleagues [21] argued that their patients had obvious depression and anxiety symptoms before and after hysterectomy; and those who received psychological interventions decreased the depression scores significantly. Interestingly, Gómez-Campelo, Bragado-Álvarez, and Hernández-Lloreda [47] identified psychological distress of women that had undergone hysterectomy and mastectomy; and found both surgeries caused body image disturbance and depression for women. It appears that women might feel depressed when they have lost a part of their womanhood after hysterectomy, however understanding the need, risks, and benefits of surgery would help alleviate depressive feelings. Based on a current findings, hysterectomy alone does not have a physical basis for resulting in depression; therefore women can prevent this symptom by thoroughly understanding the surgical cases.

Women also report significant levels of subjective and objective sleep disturbances before and after surgery. Although the subjective sleep disturbance is significantly greater in Black and Hispanic women at baseline, there is no statistically significant ethnic difference in objective data measured by actigraphy recordings in this study.

Use of a wrist actigraph for measuring objective sleep data provides the changing pattern of sleep over time. Compared to the preoperative actigraphy data, women experience a progressive decrease in sleep efficiency and increase in day time sleep and numbers of awakenings during nights at six weeks after surgery. Sleep efficiency is negatively correlated with perceptions of current and latent sleep disturbance. This is a concern that healthcare providers should be aware as women might develop further risks and other complications if the sleep disturbance continues after surgery.

Preoperative and postoperative sleep disturbances are negatively related to age, indicating that younger women experience worse sleep disturbance; and positively correlated with depressed mood. It is worthy to note that certain correlations may exist between the physiological and psychological outcomes of hysterectomy. For instance, symptoms such as preoperative depressive moods may increase pain thresholds that may eventually cause poor sleep after hysterectomy. It is well known that signs of depressive mood may include insomnia and restlessness. Therefore, depressive mood may partially account for sleep disturbance after hysterectomy. Further research on the correlations between the physiological, psychological, demographic, and social factors would contribute in developing an integrated and comprehensive nursing care plan for women with hysterectomy.

6. Conclusion

This study examines symptoms of pain, depressed mood and sleep disturbance of women that have undergone abdominal and vaginal hysterectomy using subjective and objective measurements. Without complications, most women with a vaginal hysterectomy recover within a few weeks however those who undergo an abdominal hysterectomy may require six to eight weeks to recover and return to normal routines. Therefore, it is important for women to understand the possible risks involved with both types of surgery prior to having one.

The study provides important findings that women experience before and after hysterectomy and documents symptom severity and related biopsychosocial variables. Although the severity of pain and depressed mood decreased, women continue to experience poor sleep six weeks after surgery. With a small sample, results are difficult to generalize to the large population of women before and after hysterectomy. However, significant findings of the study allow for healthcare professionals in developing and implementing potential interventions that may benefit women considering the procedures.

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