

Gender Differences in Pain Perception and Management among Postoperative Patients in Tertiary Hospitals in Osun State, Nigeria: A Mixed-Methods Study

Tolulope M. Adeosun*

Department of Medicosurgical Nursing, Faculty of Nursing Sciences, College of Medicine and Health Sciences, Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria

Elizabeth F. Ojo

Faculty of Nursing Sciences, College of Medicine and Health Sciences, Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria

Agatha O. Ogunkorode

Department of Medicosurgical Nursing, Faculty of Nursing Sciences, College of Medicine and Health Sciences, Afe Babalola University, Ado-Ekiti, Ekiti State, Nigeria

Ruth A. Ajayi

College of Nursing Sciences,
OAUTHC, Ile-Ife, Osun State, Nigeria

doi: <https://doi.org/10.37745/ejbmsr.2013/vol14n44864>

Published October 25, 2026

Citation: Adeosun T.M., Ojo E.F., Ogunkorode A.O., Ajayi R.A. (2026) Gender Differences in Pain Perception and Management among Postoperative Patients in Tertiary Hospitals in Osun State, Nigeria: A Mixed-Methods Study, *European Journal of Biology and Medical Science Research*, 14(4),48-64

Abstract: *Understanding gender differences in postoperative pain may improve nursing care. The study investigated gender differences in pain perception and management among postoperative patients in tertiary hospitals in Osun State, Nigeria. A Sequential mixed-methods design was used. A survey of 310 patients (125 male, 185 female) across three tertiary hospitals measured pain using the Numeric Pain Rating Scale at 6, 12, 24, and 48 hours, as well as pain management satisfaction. Ten patients (6 male, 4 female) completed phenomenological interviews. Analysis used repeated-measures ANOVA, Mann-Whitney U test, and thematic analysis. Results showed that females reported higher pain than males during the first 24 hours ($p < 0.001$). Satisfaction did not differ by gender ($p = 0.445$). Female patients communicated pain non-verbally; anxiety and religious framing shaped coping; non-pharmacological strategies were underused. Nurses should do scheduled pain assessments, recognise gendered communication, and teach non-pharmacological strategies.*

Keywords: postoperative pain, gender differences, pain perception, pain management

INTRODUCTION

Postoperative pain is one of the most common concerns following surgery and remains an important part of nursing care. Pain is a complex, multidimensional phenomenon that functions both as a subjective experience and as a clinical sign of illness, and postoperative pain in particular is a typical, predictable consequence of surgery that, if inadequately managed, can delay recovery, increase morbidity, and raise the risk of chronic post-surgical pain (Goldberg & McGee, 2021). Between 20% and 80% of surgical patients' experience inadequately managed postoperative pain (Negash et al., 2022; Niguse et al., 2023), and sex and gender have been identified as complex, contested factors influencing how this pain is perceived, expressed, and treated. Adult women have consistently been reported to have lower pain thresholds and tolerance than men, and to report higher pain intensity after surgery, although some evidence on analgesic requirements is mixed and appears to depend on the population and outcome studied (Casale et al., 2021; Keogh, 2022). Effective pain management is important because poorly controlled pain can interfere with movement, sleep, emotional well-being, and recovery.

Differences between men and women in pain experience stem from an interacting set of biological, psychological, and sociocultural factors, not biology alone (Fillingim, 2023). Hormonal and neuroanatomical differences, differential engagement in pain catastrophizing, and gender-role socialization that encourages stoicism in men and permits more open expression in women have all been proposed as contributing mechanisms (Gazerani et al., 2021; Keogh & Boerner, 2024; Stieger et al., 2025). The International Pharmaceutical Federation has coined the term "gender pain gap" to describe the resulting disparities in pain experience and treatment access across genders (International Pharmaceutical Federation [FIP], 2024), and the International Association for the Study of Pain (IASP) devoted its 2024 Global Year campaign to sex and gender disparities in pain, calling explicitly for more evidence from under-represented regions (Keogh & Nimmaanrat, 2024).

Evidence on gender differences in postoperative pain from Nigeria and the wider African region remains limited (Gao et al., 2023), even though postoperative pain control in the region is frequently documented as suboptimal (Mohamed Bayoumi, 2021). Clarifying whether, and how, gender shapes pain intensity, satisfaction with management, and coping in this setting is a necessary step toward developing gender-sensitive, evidence-based nursing care. This study therefore investigated gender differences in pain perception and management among postoperative patients in tertiary hospitals in Osun State, Nigeria, guided by five objectives:

1. To assess gender differences in pain perception using the Brief Pain Inventory–Short Form (BPI-SF) and the Numeric Pain Rating Scale (NPRS);
2. To determine male and female reports of pain management satisfaction;
3. To explore biopsychosocial factors influencing pain perception;
4. To investigate male and female descriptions of lived pain experience; and
5. To identify coping strategies for postoperative pain.

The quantitative hypotheses were;

H1: There is no significant difference between male and female patients' perception of postoperative pain; and

H2: There is no significant difference between male and female patients in satisfaction with postoperative pain management

METHODS

Study Design

A sequential mixed-methods design (Creswell & Creswell, 2023) was used, in which a cross-sectional quantitative survey, while the qualitative component used a phenomenological approach to explore patients' lived experience, communication patterns, and coping. The quantitative and qualitative data were collected sequentially, analyzed separately, and integrated during interpretation through a joint display.

Setting

The study was conducted in three tertiary hospitals in Osun State, southwestern Nigeria: the Ife Hospital Unit (IHU) and Wesley Guild Hospital (WGH), both components of the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), and the University of Osun State Teaching Hospital (UNIOSUNTH), Osogbo. All three hospitals provide multidisciplinary surgical services, including general, orthopaedic, obstetric and gynecological, and urological surgery, and receive patients from Osun State and surrounding areas.

Population and Sample

This study used multi-stage sampling to select the quantitative sample. In the first stage, three tertiary hospitals were purposively selected because of patient influx and population diversity. The second stage involved selecting surgical units using stratified purposive sampling to ensure representation of varying pain trajectories across units. The third stage used criterion-plus-maximum-variation sampling to select participants with direct experience of postoperative pain within 48 hours.

The target population was adult patients (≥ 18 years) after major surgery with no history of analgesic allergy and who were medically competent to consent. Patients who were unable to communicate adequately or provide informed consent were excluded. A total of 621 major surgical procedures were recorded during the three-month period used for the study. Using Cochran's modified formula for finite populations, a sample of 310 patients was calculated and allocated proportionally across the hospitals (195 at IHU, 67 at UNIOSUNTH, and 48 at WGH). For the qualitative component, 30 postoperative patients who could articulate their pain experience were purposively approached for individual interviews, with a target sample of 20.

Instruments for Data Collection

Pain intensity was assessed using the NPRS, an 11-point scale ranging from 0 (no pain) to 10 (worst possible pain). Item 8 was adapted from the 15-item Brief Pain Inventory (BPI-SF) and was used to assess patients' satisfaction as a percentage from 10% (no satisfaction) to 100% (complete satisfaction). Information relating to analgesic use was obtained from patients' medical records. Both instruments have been widely validated in surgical populations. The NPRS has shown good test-retest reliability ($r = 0.79-0.95$), and the BPI-SF has also shown acceptable internal consistency among

postoperative patients (Cronbach's $\alpha = 0.80$) (Baamer et al., 2022; Wang et al., 2024; El Mostafa et al., 2025).

The semi-structured interview guide, containing 31 questions, was used for the qualitative interviews. The questions explored participants' postoperative pain experience, communication, coping strategies, and experiences of pain management. Three research experts reviewed the guide: the two principal investigators' supervisors and the data analyst. In addition, the guide was pilot-tested among 10 postoperative patients from a non-participating hospital before use. They were asked whether the questions were clear, simple to answer, and not too sensitive.

Data Collection

Data collection proceeded in two connected phases. In Phase 1(quantitative), four trained research assistants administered the NPRS and BPI-SF at 6, 12, 24, and 48 hours after surgery, alongside chart review of analgesic consumption.

In Phase 2, of the 30 patients approached, 13 consented to audio-recording and were interviewed. Approximately 17 declined to be audio-recorded, mostly female patients, citing postoperative pain and discomfort. Three of the 13 recordings were not audible enough to transcribe accurately and were excluded. Ten interviews were therefore transcribed and analyzed (6 male, 4 female). The principal investigator (PI) and a trained research assistant conducted face-to-face individual interviews lasting 10–20 minutes. Interviews were conducted only once. They were kept short because participants were recovering from surgery and experiencing pain and fatigue; most were conducted in Yoruba, per participants' preference. In addition to audio recording, the interviewer made handwritten field notes on the interview guide during the interviews. Interviews were translated and transcribed verbatim for analysis. Transcripts were not returned to participants for comment or correction, because most were discharged shortly after the interviews and were recovering from surgery.

Data Analysis

Quantitative data were analysed using SPSS version 26. Continuous variables were summarized using means and standard deviations. Repeated-measures ANOVA, with Greenhouse-Geisser correction where Mauchly's test indicated a violation of sphericity, was used to examine changes in pain intensity over time and differences in pain between male and female participants.

For satisfaction with pain management, the Mann-Whitney U test compared male and female participants because the satisfaction measure was treated as an ordinal variable and did not meet the assumptions for a parametric comparison. A p-value < .05 was considered statistically significant.

An expert analyst coded qualitative data in ATLAS.ti and analyzed them thematically. Thirty patients were approached; 13 were interviewed and recorded, of whom 10 had transcribable recordings and were included in the analysis. Transcripts were coded in ATLAS.ti, yielding codes that were grouped into 9 themes and 30 subthemes (Table 4; full coding tree in Supplementary File 1). The quantitative and qualitative findings were subsequently compared and integrated using a joint display to identify areas of convergence, complementarity, and difference.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committees of Afe Babalola University, the Obafemi Awolowo University Teaching Hospital Complex, and the University of Osun State University Teaching Hospital.

[UTH/REC/2026/04/08/1506;ABUUAD/ADHREC/21/2026/837] All participants provided written informed consent and were informed that the research was for academic purposes only, and that they had the right to withdraw at any time without consequences. Unique codes were used instead of participants' names, and identifying information was not included in the analysis. The results were approved for dissemination to Afe Babalola University, the three tertiary hospital settings, and the public after publication.

RESULTS**Sample Characteristics**

Of the 310 participants, 185 (59.7%) were female, and 125 (40.3%) were male, with a mean age of 40.55 years (SD = 14.78; range 18–80). Most were married (66.8%) and Yoruba (74.5%); the most common educational attainment was the Senior Secondary Certificate Examination (37.4%). 25.5% had a Higher National Diploma, 24.2% had a Bachelor of Science, 5.2% attained only primary education, 3.2% attained a Diploma, and 2.3% had no Education. 1.9% attained a National Certificate in Education, and only 0.3% had a Master of Science. General surgery accounted for the largest share of procedures (44.8%), followed by obstetric/gynecological (21.6%) and orthopaedic surgery (13.2%). Other types of surgery included Eye/ENT/Neuro/maxillofacial (6.1%), Cardiothoracic (2.6%), Urology (7.1%), and Plastic (4.5%) (Table 1). The 10 qualitative interview participants (6 male, 4 female, aged 21–75 years) had undergone a range of procedures, including spine fusion, external bone fixation, and limb amputation.

Table 1. Sociodemographic and Surgical Characteristics of Participants (N = 310)

Characteristic	n	%
Gender — Male	125	40.3
Gender — Female	185	59.7
Marital status — Married	207	66.8
Marital status — Single	74	23.9
Marital status — Widowed	16	5.2
Marital status — Divorced	13	4.2
Ethnicity — Yoruba	231	74.5
Ethnicity — Igbo	57	18.4
Ethnicity — Hausa	22	7.1
Education — SSCE	116	37.4
Education — HND	79	25.5
Education — BSc	75	24.2
Type of surgery — General surgery	139	44.8
Type of surgery — Orthopaedic	41	13.2
Type of surgery — Urology	22	7.1
Type of surgery — Eye/ENT/Neuro/Maxillofacial	19	6.1
Type of surgery — Plastic	14	4.5
Type of surgery — Cardiothoracic	8	2.6

Note. Mean age = 40.55 years (SD = 14.78), range 18–80 years. Only categories with $n \geq 20$ are shown for education; percentages for remaining categories are reported in the text.

Objective 1: Gender Differences in Pain Perception

This objective was addressed principally through Theme 2 (Pain Experience & Perception) and the focused gender comparison of reported peak pain scores. Descriptively, pain intensity declined progressively across all four time points, from a peak mean of 7.92 (SD = 1.75) at 6 hours to 3.05 (SD = 1.64) at 48 hours. At every time point up to 24 hours, female participants reported higher mean pain scores (8.35, 6.46, and 5.47) than males (7.30, 5.92, and 4.99); by 48 hours, the difference had essentially disappeared (Table 2).

Table 2. Mean Postoperative Pain Scores by Gender and Time (N = 310)

Time	Male, M (SD)	Female, M (SD)	Total, M (SD)
6 hours	7.30 (1.89)	8.35 (1.52)	7.92 (1.75)
12 hours	5.92 (1.64)	6.46 (1.67)	6.24 (1.68)
24 hours	4.99 (1.61)	5.47 (1.65)	5.28 (1.64)
48 hours	3.10 (1.67)	3.02 (1.62)	3.05 (1.64)

Note. Pain measured on the 0–10 Numeric Pain Rating Scale. n = 125 males, 185 females at each time point.

A repeated-measures ANOVA with Greenhouse-Geisser correction (Mauchly's $W = 0.63$, $\chi^2(5) = 141.37$, $p < .001$) confirmed a highly significant main effect of time, $F(2.36, 909.15)$, $p < .001$, partial $\eta^2 = .75$; and a significant Time $\times$ Gender interaction, $F(2.36, 12.362)$, $p < .001$, partial $\eta^2 = .039$ indicating that male and female pain trajectories declined at different rates (Table 3). Hypothesis 1 was therefore rejected.

Table 3. Summary of Hypothesis Tests

Hypothesis	Test	Statistic	p	df	Interpretation
H1: No gender difference in pain perception	Repeated-measures ANOVA (Time)	$F(909.145)$ $\eta^2 = .75$	.000	2.36	Rejected
	Repeated-measures ANOVA (Gender)	$F(72.913)$ $\eta^2 = .001$	10.383	1	-
Time $\times$ Gender interaction	Repeated-measures ANOVA	$F(12.362)$ $\eta^2 = .039$	< .001	2.360	-
H2: No gender difference in satisfaction (confirmatory)	Mann-Whitney U	U = 10,986.50	.445		Not rejected
	Independent t test	$t(1.031) = 1.03$	.304 (2-tailed)	308	Not rejected

Note. Greenhouse-Geisser correction applied throughout ($\epsilon = 0.79$ – 0.83) following significant Mauchly's test of sphericity ($p < .001$).

The qualitative interviews showed a broadly similar declining trajectory but a far smaller gender gap: mean peak pain scores were nearly identical between male ($\approx 8.3/10$) and female ($\approx 8.4/10$) participants. In this small sample, age and surgery invasiveness appeared to co-occur visibly with gender. The two youngest participants (aged 21 and 23 years), who had undergone spine fusion and external bone fixation, reported the highest peak scores (10/10), while the oldest participant (75 years) reported one of the lowest (7/10).

P1 (Male): "My pain was 9 out of 10 right after the surgery."

P6 (Female): "It's a full 10 out of 10, sharp."

P7 (Male): "It was intense right after, a 10 out of 10, but now it's just a little pain."

Objective 2: Pain Management Satisfaction

This objective was addressed through Theme 9 (Satisfaction & Recommendations), alongside Theme 5 (Nursing Care & Responsiveness), and item 8 on the BPI-SF. Satisfaction with pain treatment was generally high among both genders: 31.9% of participants reported 80% satisfaction, and a further 24.9% reported 90% or 100% satisfaction. Neither the Mann-Whitney U test ($U = 10,986.50$, mean rank male = 160.11, mean rank female = 152.39, $p = .445$) nor a confirmatory independent-samples t test ($t(308) = 1.03$, $p = .304$) found a statistically significant gender difference in satisfaction (Table 3); Hypothesis 2 was not rejected.

Qualitative interviews corroborated this null result. Seven of ten participants expressed clear satisfaction (typically $\geq 8/10$) regardless of gender, but also revealed a mechanism not visible in the descriptive statistics. Only one participant (P6, female) commented directly on gender and care, stating that she was not treated differently because she was a woman. Other minor themes, raised by one or two participants, included prior surgical history, the nurse-patient relationship, and emotional distress.

P8 (Male): "I'm very satisfied. I'd say a 9 out of 10."

P3 (Female): "I'm highly satisfied with the pain management and with the nurses."

P6 (Female): "I don't think I said anything. The nurses just saw me crying and knew."

Objective 3: Bio-psychosocial Factors

This objective was addressed primarily through Theme 8 (Psychosocial & Contextual Factors) and Theme 3 (Preoperative & Postoperative Education) see Table 4, triangulated with the demographic analysis. No validated psychosocial or anxiety scale was administered quantitatively, so this objective relied primarily on the qualitative data. Eight of ten interviewees described preoperative fear or anxiety, most explicitly among female participants facing a first surgery. Six of ten participants drew on religious or cultural framing to cope with pain. Medication knowledge did not clearly depend on formal education: a university-educated female participant could name her medication, while a Master's-degree-holding participant could not. This finding appeared to depend more on whether a nurse had explained it.

P3 (Female): "I was really afraid, because it was my first time."

P10 (Female): "I believed God is helping me through it."

Objective 4: Lived Pain Experience and Communication

This objective had no direct quantitative counterpart; theme 4 (Pain Communication), see Table 4 provided the clearest gender-patterned difference in the dataset. Qualitatively, seven of ten participants described directly and verbally reporting pain to nurses; of the three who did not, two were female. All three participants who described communicating pain non-verbally, such as through hand signals, crying, or being carried, were female, and three of the four participants who described initial hesitation about reporting pain were also female.

P5 (Male): "I asked, and they gave me medication."

P4 (Female): "Sometimes I don't talk; I just use hand signals."

P10 (Female): "At first I wasn't comfortable telling them, but it's a bit easier now."

Objective 5: Coping Strategies

This objective was addressed through Theme 6 (Pain Management Strategies) and the recommendations sub-theme of Theme 9 (Table 4). All 310 quantitative participants received a pharmacological analgesic regimen, most commonly a combination of opioids and non-opioids (40.0%), followed by a combination of all three drug classes (24.2%).

Qualitatively, eight of ten participants described medication as their only coping method, a pattern holding for both sexes; only two participants (one male, one female) described self-improvised, non-pharmacological strategies, and participants of both genders spontaneously requested that providers offer non-medication pain-relief options.

P2 (Male): "It's only medication, nothing else."

P9 (Male): "I put a cloth under my hand myself; that helps."

P6 (Female): "I sleep on my side with a pillow behind my back."

P6 (Female): "Doctors and nurses should find ways to relieve pain apart from medication."

Table 4: Themes, Subthemes, Frequency and Quotations

Theme	Sub-Theme	Freq (10)	Illustrative Quotations (Participant ID)
1. Demographics and Surgical Characteristics	Participant identification	10	P1: "I'm married, and I finished secondary school." P6: "I'm 21, single, Igbo, and I've been through university."
	Type of surgery	7	P9: "They had to amputate my hand." P10: "It was my goitre — that's what the surgery was for."
	Surgical history	1	P2: "I've had surgery before, after an accident."
2. Pain Experience & Perception	Pain intensity/score	6	P1: "My pain was 9 out of 10 right after the surgery." P6: "It's a full

Theme	Sub-Theme	Freq (10)	Illustrative Quotations (Participant ID)
			<i>10 out of 10, sharp.” P8: “About a 7 out of 10.”</i>
	Pain trajectory	8	<i>P1: “By twelve hours it had eased off, and by the next day it was completely gone.” P10: “It was intense right after, a 10 out of 10 — but now it's just a little pain.”</i>
	Pain characteristics	6	<i>P4: “It's sharp.” P1: “It's mild now, mostly in my leg and when they change the dressing.”</i>
	Aggravating/relieving factors	3	<i>P6: “Lying down makes it worse, so I sleep on my side with a pillow behind my back.” P10: “I think it's the plastered side that keeps pulling at me.”</i>
3. Pre and Post Operative Education	Doctor's preoperative explanation	6	<i>P10: “The doctors told me they might accidentally cut a vein in my neck — if that happened, I'd be sent to ICU, otherwise straight back to the ward.” P8: “Yes, the doctors explained what to expect beforehand.”</i>
	Nurses' preoperative teaching	3	<i>P2: “The nurses explained that the injection would stop me feeling anything during the surgery.” P10: “The nurses told me I would feel pain.”</i>
	Postoperative education gap	7	<i>P2: “Nobody taught me what to expect once I was back on the ward.” P5: “Nobody — not the doctors, not the nurses — told me beforehand what the pain would be like afterward.”</i>
4. Pain Communication	Verbal pain reporting	7	<i>P4: “I report it to the nurses.” P5: “I asked, and they gave me medication.”</i>
	Non-verbal communication	3	<i>P4: “Sometimes I don't talk — I just use hand signals.” P6: “I don't think I said anything — the nurses just saw me crying and knew.”</i>
	Comfort/concerns reporting pain	4	<i>P10: “At first I wasn't comfortable telling them, but it's a bit easier</i>

Theme	Sub-Theme	Freq (10)	Illustrative Quotations (Participant ID)
			<i>now.” P6: “I do have some worry about telling them — but when I do report it, they attend to me quickly.”</i>
	Encouraged reporting pain	5	<i>P2: “I feel very free to tell them when I'm in pain.” P9: “They encourage me to ask for help when I'm in pain.”</i>
5. Nursing care and Responsiveness	Responsive nursing care	7	<i>P2: “They come very fast.” P3: “They respond very well, and very fast.”</i>
	Proactive vs reactive monitoring	7	<i>P9: “They're there day and night, I don't even have to call.” P4: “They barely come check on me unless I call.”</i>
	Nurse-patient relationship	2	<i>P2: “They've been nice and good to me.”</i>
6. Pain Management Strategies	Pharmacological management	8	<i>P2: “It's only medication, nothing else.” P10: “They haven't used anything besides medication.”</i>
	Non-pharmacological/self-directed methods	2	<i>P9: “I put a cloth under my hand myself — that helps.” P6: “I sleep on my side with a pillow behind my back.”</i>
	Medication duration/effectiveness	7	<i>P8: “It lasts about four or five hours.” P6: “About eight hours.”</i>
	Medication safety/side effects	7	<i>P6: “They had to stop it and switch me to a tablet instead — it didn't agree with me.” P3: “It just makes me sleep sometimes, and I wake up without pain.”</i>
	Medication knowledge	8	<i>P6: “I know I'm on painkillers and antibiotics.” P4: “I don't know what they're giving me.”</i>
7. Patient Participation in care & Gender-Related Experience	Active vs passive participation	6	<i>P6: “Yes, I'm involved.” P2: “I just take whatever they give me.”</i>
	Gender-related experience	1	<i>P6: “No, they don't treat me differently because I'm a woman.”</i>
8. Psychological and contextual factors	Preoperative fear/anxiety	8	<i>P3: “I was really afraid, because it was my first time.” P10: “I was very scared before the surgery.”</i>

Theme	Sub-Theme	Freq (10)	Illustrative Quotations (Participant ID)
	Emotional coping/distress	2	P1: <i>"It makes me sad, always."</i> P3: <i>"It troubles me, honestly."</i>
	Sociocultural/religious beliefs	6	P2: <i>"I'm a Christian; I don't have any particular cultural beliefs about it."</i> P10: <i>"I believe God is helping me through it."</i>
	Pain history	4	P3: <i>"I've felt pain like this before, during childbirth."</i> P10: <i>"I've felt this kind of pain before too, during childbirth."</i>
9. Satisfaction & Recommendations	Satisfaction with care	7	P8: <i>"I'm very satisfied — I'd say a 9 out of 10."</i> P3: <i>"I'm highly satisfied, with the pain management and with the nurses."</i>
	Recommendations for improvement	6	P5: <i>"The world has moved on with technology — they should find new ways to bring down patients' pain."</i> P6: <i>"Doctors and nurses should find ways to relieve pain apart from medication."</i>

Triangulation

Integration of the two strands (Table 5) showed convergence for Objectives 2 and 5, partial convergence for Objective 1 (consistent direction of effect, but a qualitative sample too small to reproduce the magnitude of the quantitative gender effect), and a complementary, qualitative-dominant relationship for Objectives 3 and 4, for which no comparable quantitative measure existed. Across all five objectives, gender was significantly associated with postoperative pain intensity, although the observed effect was modest.

Objective	Quantitative Finding (N=310)	Qualitative Finding (N=10)	Integration
1. Gender differences in pain perception	Repeated-measures ANOVA: significant main effect of gender on pain intensity across 6-48h, $F(1,308)=10.38$, $p=.001$, partial $\eta^2=.033$; significant time $\times$ gender interaction, $F=12.36$, $p<.001$. Females scored higher at 6h (8.35 vs 7.30), 12h, and 24h; scores converged by 48h (3.02 vs 3.10).	Mean peak pain scores nearly identical by gender ($M\approx 8.3$ male, $M\approx 8.4$ female); both sexes clustered at 7-10/10 shortly after surgery, with age/surgery type more visibly associated with variation than gender.	Partial convergence

2. Satisfaction with pain management	Mann-Whitney U test: no significant gender difference in satisfaction with pain management ($U=10986.5$, $p=.445$).	7/10 participants expressed clear satisfaction ($\approx 8/10$) regardless of gender; the one negative case of nursing responsiveness occurred in a female participant who also communicated pain non-verbally.	Convergence + qualitative expansion
3. Bio-psychosocial factors influencing pain perception	No dedicated psychosocial/anxiety scale administered; sociodemographic profile only (e.g., 37.4% SSCE-level education, 66.8% married).	8/10 participants addressed preoperative fear/anxiety; 6/10 referenced religious/cultural framing; medication knowledge tracked with nurse explanation more than with education level.	Complementarity (qual-dominant)
4. Male and female descriptions of lived pain experience	Not measured quantitatively (BPI-SF captures intensity only, not communication mode).	All 3 participants describing non-verbal pain communication were female; verbal reporting was the dominant mode described by male participants.	Qualitative-only (no quantitative equivalent)
5. Coping strategies for postoperative pain	100% of participants received a pharmacological regimen; combination of opioids + non-opioids most common (40%); no non-pharmacological coping measure administered.	8/10 participants used medication as their only coping method; only 2 described self-improvised, untaught non-pharmacological strategies; both sexes requested non-drug options.	Convergence + qualitative expansion

DISCUSSION

This study found that gender was significantly, though modestly, associated with postoperative pain intensity, with female patients reporting higher pain during the first 24 hours before scores became similar to those of male patients by 48 hours. At the qualitative phase, women disproportionately declined recording due to pain; results also showed that female patients more often communicated pain non-verbally. This finding is consistent with a substantial body of literature reporting that female patients score higher on numeric pain scales during early postoperative recovery, attributed in part to sex differences in central pain modulation and to elevated preoperative anxiety and pain catastrophizing among women (Allen & Zumwalt, 2024; Casale et al., 2021; Morgan et al., 2024). The small effect size (partial $\eta^2 = .03$) aligns with clinical practice guidance that grades female gender as only a moderate-strength risk factor for acute postoperative pain, behind stronger predictors such as young age and elevated body mass index (Chen et al., 2025).

The near-identical peak pain scores reported in the qualitative subsample should not be read as contradicting the quantitative finding. Rather, it illustrates that a statistically real but modest population-level effect will not reliably surface in a ten-person sample in which other factors, here, plausibly age and surgical invasiveness, vary alongside gender (Keogh, 2022). This aligns with the

broader argument that the relationship between sex, gender, and pain depends heavily on context, population, and the specific outcome measured, rather than reflecting a fixed biological difference (Fillingim, 2023; Keogh, 2022).

Satisfaction with pain management did not differ significantly by gender, a finding that converged across both study strands and echoes prior work showing that satisfaction with postoperative analgesia does not track neatly onto pain intensity or sex (Niguse et al., 2023). This gender-equivalent satisfaction should, however, be interpreted cautiously alongside broader evidence that postoperative pain control in African clinical settings frequently remains suboptimal even where reported satisfaction is high (Gao et al., 2023), and alongside a systematic review concluding that female patients remain more likely than male patients to receive suboptimal pain relief even when aggregate satisfaction appears comparable across groups (Thurston et al., 2022). The qualitative finding that the one instance of reactive, rather than proactive, nursing monitoring occurred in a female patient who communicated pain non-verbally offers a plausible, patient-level mechanism for this pattern: communication style, more than gender or satisfaction per se, may be the more proximate driver of variation in perceived care quality (Keogh & Boerner, 2024; Ryan et al., 2024).

Gender Role Theory, one of two frameworks guiding this study, proposes that socialized norms impose a higher “response cost” on men who express pain, encouraging stoicism and underreporting, while women face comparatively less social penalty for candid pain expression (Keogh & Boerner, 2024). The qualitative finding that non-verbal pain communication in this sample was reported exclusively by female participants, while verbal, direct reporting predominated among males, offers a concrete, context-specific instantiation of this mechanism, one for which the quantitative BPI-SF, which measures intensity rather than communication mode, could not itself provide evidence. Read together with the quantitative finding of higher early pain intensity among women, this suggests that female patients in this setting both experienced more intense pain in the immediate postoperative period and expressed that pain through a wider range of communicative channels, including non-verbal ones, than male patients did.

The Biopsychosocial Model of Pain, the study’s second framework, similarly received support: preoperative anxiety, religious and cultural framing, and provider communication behavior all appeared, qualitatively, to interact with biological sex in shaping how pain was experienced and managed (Gornitzky & Diab, 2021). Because no validated psychosocial instrument was included in the quantitative survey, this objective was necessarily qualitative-dominant, and the finding that medication knowledge tracked more closely with nurse explanation than with formal education nuances prior evidence linking educational attainment to psychological pain beliefs (Tuna et al., 2024), suggesting that provider communication may operate somewhat independently of patients’ own educational attainment in this context.

The most consistent, cross-cutting finding across all five objectives was that postoperative pain management in this setting remained overwhelmingly pharmacological: every quantitative participant received an analgesic regimen, and eight of ten interviewees described medication as their only coping method. This mirrors documented deficits in structured, non-pharmacological pain management training among nurses in Nigerian tertiary hospitals (Mohamed Bayoumi et al., 2021) and is consistent with international guidance recommending multimodal, individualized analgesia that combines

pharmacological and non-pharmacological approaches (Chen et al., 2025; Fuller et al., 2023). The gender-neutral request, volunteered spontaneously by patients of both sexes, for non-medication pain-relief options represents a concrete, modifiable target for nursing quality improvement.

Limitations

This study was limited to three tertiary hospitals within a single Nigerian state, which may constrain generalizability to other regions and hospital tiers. Although, the interview guide underwent expert review, the single item adapted from the BPI-SF to assess satisfaction was not independently validated or pilot-tested. Therefore, the measurement properties of this adapted item have not been established, and the satisfaction findings should be interpreted with appropriate caution. The qualitative sample of 10 was limited by recording problems and refusals, and was too small to reproduce the magnitude of the modest quantitative gender effect; individual variation in age and surgery type was more visible than gender in this subsample. No validated psychosocial or anxiety scale was administered quantitatively, limiting population-level testing of the biopsychosocial objective. Pain and satisfaction data relied on self-report, which is susceptible to recall and social-desirability bias, a risk potentially compounded by the gendered communication patterns identified in this study. Data collection was limited to the first 48 postoperative hours and cannot speak to longer-term or chronic post-surgical pain. Gender was operationalized as a binary category, excluding non-binary and gender-diverse patients, and the cross-sectional design of the quantitative strand permits inferences of association, not causation.

Implications for Practice

For practice, these findings suggest that nurses should not treat high overall satisfaction as evidence of adequate pain control, and should instead conduct scheduled, standardized pain reassessment throughout the first 48 postoperative hours rather than relying on patients to volunteer their pain status. Nurses should be sensitized to the tendency of some female patients to communicate pain non-verbally and of male patients to underreport pain due to socialized stoicism, and should complement pharmacological analgesia with structured, taught non-pharmacological strategies, such as positioning guidance, relaxation techniques, and preoperative pain education, for patients of both sexes. Nursing curricula should incorporate explicit content on sex and gender differences in pain within a biopsychosocial framework, and future research should incorporate validated anxiety or health-literacy measures and larger qualitative samples to test these patterns at population scale.

CONCLUSIONS

Gender was significantly, though modestly, associated with postoperative pain intensity in this Nigerian tertiary-hospital sample, with female patients reporting higher pain during the first 24 hours before scores converged with those of male patients by 48 hours; satisfaction with pain management and analgesic provision, by contrast, did not differ significantly by gender. The qualitative findings indicate that disparities in postoperative pain care in this setting are expressed more clearly in how pain is felt and communicated than in the aggregate adequacy of treatment.

Future Research

Future studies should incorporate validated anxiety, health-literacy, or health-belief scales into the quantitative instrument to allow the psychosocial factors identified qualitatively in this study to be

tested and quantified at population scale. A replication of this study with a larger qualitative sample size would allow the population-level gender effect on pain intensity identified quantitatively to be examined in greater depth at the level of individual patient narratives.

REFERENCES

- Allen, J., & Zumwalt, M. (2024). Biological sex differences in pain response and functional outcomes after orthopaedic surgery procedures: A scoping review. *Current Orthopaedic Practice*, 35(5), 189–196. <https://doi.org/10.1097/bco.0000000000001269>
- Baamer, R. M., Iqbal, A., Lobo, D. N., Knaggs, R. D., Levy, N. A., & Toh, L. S. (2022). Utility of unidimensional and functional pain assessment tools in adult postoperative patients: A systematic review. *British Journal of Anaesthesia*, 128(5), 874–888. <https://doi.org/10.1016/j.bja.2021.11.032>
- Casale, R., Atzeni, F., Bazzichi, L., Beretta, G., Costantini, E., Sacerdote, P., & Tassorelli, C. (2021). Pain in women: A perspective review on a relevant clinical issue that deserves prioritization. *Pain and Therapy*, 10(1), 287–314. <https://doi.org/10.1007/s40122-021-00244-1>
- Chen, X., Chu, Q., Peng, Y., Chen, Y., Kaye, A. D., Liu, H., Yang, J., Wang, T., & Yu, W. (2025). Clinical practice guidelines for postoperative pain management in adults (2024 edition). *Journal of Anesthesia and Translational Medicine*, 4(3), 161–185. <https://doi.org/10.1016/j.jatmed.2025.09.001>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods Approaches* (6th ed.). SAGE.
- El Mostafa, A., Mesfioui, A., Mohamed, B., Elharas, K., Younes, Y., Ouissaden, A., Aderbaz, S., & Alilou, M. (2025). Postoperative pain evaluation: Validity and applications of the Brief Pain Inventory (BPI). *Bangladesh Journal of Medical Science*, 24(2). <https://doi.org/10.3329/bjms.v24i2.81542>
- Fillingim, R. B. (2023). Sex, gender, and pain. In *Principles of gender-specific medicine: Sex and gender-specific biology in the postgenomic era* (4th ed., pp. 769–792). Academic Press.
- Fuller, A. M., Bharde, S., & Sikandar, S. (2023). The mechanisms and management of persistent postsurgical pain. *Frontiers in Pain Research*, 4, Article 1154597. <https://doi.org/10.3389/fpain.2023.1154597>
- Gao, L., Mu, H., Lin, Y., Wen, Q., & Gao, P. (2023). Review of the current situation of postoperative pain and causes of inadequate pain management in Africa. *Journal of Pain Research*, 16, 1767–1778. <https://doi.org/10.2147/JPR.S405574>
- Gazerani, P., Aloisi, A. M., & Ueda, H. (2021). Editorial: Differences in pain biology, perception, and coping strategies: Towards sex and gender specific treatments. *Frontiers in Neuroscience*, 15, Article 697285. <https://doi.org/10.3389/fnins.2021.697285>
- Goldberg, D. S., & McGee, S. J. (2021). Pain as a global public health priority. *BMC Public Health*, 11, Article 770.
- Gornitzky, A., & Diab, M. (2021). Coping skills in children: An introduction to the biopsychosocial model of pain control as a tool to improve postoperative outcomes. *Journal of the Pediatric Orthopaedic Society of North America*, 3(1), Article 211. <https://doi.org/10.55275/JPOSNA-2021-211>

- International Pharmaceutical Federation. (2024). Gender-based disparities in the management of pain in pharmacy: “The gender pain gap”: A literature review. International Pharmaceutical Federation.
- Keogh, C. (2022). Sex and gender differences in pain: past, present, and future. *Pain*, 163(Suppl 1), S108–S116. <https://doi.org/10.1097/j.pain.0000000000002738>
- Keogh, E., & Boerner, K. E. (2024). Gender role expectations and biological mechanisms underlying pain disparities. *Frontiers in Pain Research*, 5, Article 1342110. <https://doi.org/10.3389/fpain.2024.1342110>
- Keogh, E., & Nimmaanrat, S. (2024). IASP 2024 Global Year on sex and gender disparities in pain. International Association for the Study of Pain. <https://www.iasp-pain.org/advocacy/global-year/sex-and-gender-disparities-in-pain/>
- Mohamed Bayoumi, M. M., Khonji, L. M. A., & Gabr, W. F. M. (2021). Are nurses utilizing the non-pharmacological pain management techniques in surgical wards? *PLOS ONE*, 16(10), Article e0258668. <https://doi.org/10.1371/journal.pone.0258668>
- Morgan, J., Magwood, K., Smith, J., Jenkins, M. R., McGregor, A. J., & Quesnelle, K. M. (2024). Sex and gender differences in pain perception and management in clinical settings. *All Life*, 17(1), Article 2367421. <https://doi.org/10.1080/26895293.2024.2367421>
- Ryan, E., Hannigan, A., Grol-Prokopczyk, H., May, P., & Purtill, H. (2024). Sociodemographic disparities and potential biases in persistent pain estimates: Findings from 5 waves of the Irish Longitudinal Study on Ageing (TILDA). *European Journal of Pain*, 28(5), 754–768. <https://doi.org/10.1002/ejp.2215>
- Negash, T. T., Belete, K. G., Tilaye, W., Ayele, T. T., & Oumer, K. E. (2022). Knowledge, attitudes, and practices of health professionals towards postoperative pain management at a referral hospital in Ethiopia. *Annals of Medicine and Surgery*, 73, Article 103167. <https://doi.org/10.1016/j.amsu.2021.103167>
- Niguse, M. A., Solomon, W. A., Atey, E., & Mebrahtu, A. (2023). Patients’ satisfaction with post-operative pain management in Ayder Comprehensive Specialized Hospital, Ethiopia: A cross-sectional study. *Pan African Medical Journal*, 45, Article 94. <https://doi.org/10.11604/pamj.2023.45.94.22563>
- Stieger, A., Asadauskas, A., Luedi, M. M., & Anderegg, L. (2025). Women’s pain management across the lifespan: A narrative review of hormonal, physiological, and psychosocial perspectives. *Journal of Clinical Medicine*, 14(10), Article 3427. <https://doi.org/10.3390/jcm14103427>
- Thurston, K. L., Zhang, S. J., & Wilbanks, B. A. (2022). A systematic review of race, sex, and socioeconomic status differences in postoperative pain and pain management. *Journal of PeriAnesthesia Nursing*, 38(3), 504-515. <https://doi.org/10.1016/j.jopan.2022.09.004>
- Tuna, T. P., Tuna, H. I., Molu, B., & Keskin, A. Y. (2024). Factors affecting postoperative pain beliefs among surgical patients in Türkiye: A cross-sectional study. *Pain Management Nursing*, 25(3), e265–e270. <https://doi.org/10.1016/j.pmn.2024.02.010>
- Wang, S., Yao, S., Wei, J., Shang, L., Xu, C., & Ma, J. (2024). Psychometric properties of the Brief Pain Inventory among patients with osteoarthritis undergoing total knee arthroplasty surgery. *The Journal of Arthroplasty*, 39(3), 672–676. <https://doi.org/10.1016/j.arth.2023.08.072>
- Daryoush, J. R., Rogers, M. J., Hubbard, J. C., Arbon, J., Zhang, C., Presson, A. P., Garcia, B. N., & Kazmers, N. H. (2025). Establishing the Patient-Acceptable Symptom State for the Numeric Rating Scale-Pain Score in a Postoperative Non-Shoulder Hand and Upper-Extremity

European Journal of Biology and Medical Science Research, 14(4),48-64, 2026

Print ISSN: ISSN 2053-406X,

Online ISSN: ISSN 2053-4078

Website: <https://www.eajournals.org/>

Publication of the European Centre for Research Training and Development -UK

Population. The Journal of Hand Surgery, 50(1), 10–18.

<https://doi.org/10.1016/j.jhsa.2024.07.020>