Clinical and Experimental Obstetrics & Gynecology

Clin. Exp. Obstet. Gynecol. **2025**; 52(2): 25833
https://doi.org/10.31083/CEOG25833

Original Research

Prevalence and Risk Factors for Neck and Upper Limb Musculoskeletal Disabilities Among Postpartum Women

Maha F. Algabbani[1], Abeer A. Alazmi[2], Samiah Alqabbani[3,*], Muneera M. Almurdi[1], Samiha M. I. Abdelkader[1], Maram Alruwaili[1], Saad A. Alhammad[1], Lolwah AlRashed AlHumaid[1], Asma Alrushud[1], Afrah Almuwais[3], Afaf A. M. Shaheen[1,4]

[1]Department of Rehabilitation Health Sciences, College of Applied Medical Sciences, King Saud University, 11433 Riyadh, Saudi Arabia
[2]Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University, 11433 Riyadh, Saudi Arabia
[3]Department of Rehabilitation Sciences, College of Health and Rehabilitation Sciences, Princess Nourah Bint Abdulrahman University, 84428 Riyadh, Saudi Arabia
[4]Department of Basic Sciences, Faculty of Physical Therapy, Cairo University, 12613 Cairo, Egypt
*Correspondence: sfalqabbani@pnu.edu.sa (Samiah Alqabbani)
Academic Editor: Hiroshi Matsushita
Submitted: 25 July 2024 Revised: 29 November 2024 Accepted: 11 December 2024 Published: 5 February 2025

Abstract

Background: Postpartum women often experience musculoskeletal pain due to physiological and biomechanical changes during pregnancy and childbirth, which can result in disability. This study assessed the prevalence of neck and upper limb pain and disability in postpartum women, as well as the factors associated with these conditions. **Methods**: A descriptive cross-sectional study was conducted to collect data from postpartum women through an online self-administered questionnaire. The questionnaire included items on the demographic variables, the Nordic Musculoskeletal Symptoms Questionnaire, the Neck Disability Index, the Disabilities of the Arm, Shoulder, and Hand scale, as well as the Pain Intensity Numeric Rating Scale. **Results**: Among a sample of 400 postpartum women aged 20–50 years, 82.5% reported experiencing pain in at least one part of their upper body. Neck pain was the most prevalent (65.5%), followed by pain in the shoulders (63.3%), arms (58.3%), and hands (57.0%). Cesarean section delivery and moderate-to-severe pain intensity were identified as significant risk factors for developing mild disability among women who reporting neck pain. Upper limb pain and being aged 41–50 years were significant risk factors for mild disabilities among postpartum women. **Conclusions**: Disability was prevalent among the sample of postpartum women, highlighting the importance of healthcare providers in addressing this issue.

Keywords: disability; musculoskeletal pain; postpartum care; Nordic Musculoskeletal Symptoms Questionnaire; Neck Disability Index; Disabilities of the Arm, Shoulder, and Hand scale; Pain Intensity Numeric Rating Scale

1. Introduction

Musculoskeletal pain (MSP) refers to discomfort or pain that occurs in the muscles, bones, tendons, ligaments, and other structures that support the body's movement [1]. It is one of the most common conditions that imposes burdens on health systems globally [2,3]. Postpartum women frequently experience MSP [4]. Physical and hormonal changes during pregnancy and childbirth can lead to various musculoskeletal problems, affecting the overall well-being and quality of life of new mothers [5]. Physical and mental disorders associated with the postpartum period can have effects for up to 12 months after the delivery of a child [6]. This pain can lead to various degrees of disability, as it impairs normal physical or mental functions, resulting in limitations of an individual's activities and participation in their environment [2,3].

Several studies have shown that MSP is a prevalent issue among postpartum women; a significant number of women experience neck and upper limb pain during the postpartum period, with a prevalence ranging between 22% and 61% [4,7–11]. Risk factors have been identified for the prediction of neck and upper extremity pain, including an individual's socio-demographic characteristics (e.g., older women and women with a high body mass index [BMI] experience more pain) and maternal characteristics (e.g., women who undergo Cesarian sections [C-sections] experience more pain than women who undergo vaginal deliveries) [9]. Darwish and Al-Zuhair attributed the higher prevalence of MSP among females in Saudi Arabia to the higher number of children per mother compared to mothers in many other countries [12]. In addition, factors such as the sustained posture imposed by the neck and upper extremities while taking care of the newborn may increase the prevalence and impact of MSP [13].

MSP is associated with disabilities, which may interfere with mothers' overall well-being and ability to care for themselves and their newborns. Despite the high prevalence of postpartum pain among women, it is unclear how much disability is actually caused by this condition. However, MSP may interfere with a mother's ability to care for herself and her baby. Understanding the factors that impact MSP is crucial in providing appropriate support and care

during this period. Healthcare providers should be aware of postpartum MSP and disability to prevent and/or reduce its consequences. Therefore, the aims of this study were as follows: (1) to assess the prevalence of neck and upper limb pain and disability and (2) to investigate the factors associated with disability among postpartum women.

2. Materials and Methods

2.1 Study Design

An online self-administered questionnaire was used in this descriptive cross-sectional study.

2.2 Setting

Three hospitals were involved in the recruitment of participants (King Fahd Medical City, Prince Muhammad bin Abdulaziz Hospital, and Al-Yamamah Hospital), along with 48 healthcare centers in the Riyadh Second Health Cluster in Saudi Arabia. The questionnaires were distributed and collected between October and December 2022.

2.3 Participants

The participants were postpartum mothers aged 20–50 years, six weeks to one year after giving birth. Mothers with orthopedic or neurological conditions, those with severe complications after giving birth (such as hemorrhage, infection, or uterine perforation), and those who gave birth to preterm infants or infants with congenital anomalies were excluded from the study.

2.4 Sample Size

The minimum required sample size was calculated according to the following formula: $n = Z^2\ P\ (1 - P)/d^2$, where n represents the sample size, Z represents the level of confidence (90%), P represents the expected prevalence (50%), and d represents the margin of error (5%) [14]. To account for attrition and incomplete data, the recommended sample size was increased by 20%. For this study, a sample of at least 328 postpartum mothers was required. A convenience sampling method was used.

2.5 Study Procedures

Before the distribution of the online questionnaire, it was tested for usability and technical functionality by 10 postpartum mothers. For the actual study, the mobile telephone numbers of potential participants were collected from their medical records and used to send an invitation text and link to the open-access online questionnaire. Furthermore, hospitals and health care centers placed invitation barcodes to the questionnaire in their waiting areas. The participants were required to enter the last four digits of their mobile telephone numbers when submitting a completed questionnaire to reduce the possibility of duplicate entries.

2.6 Instrument

A self-administered questionnaire was built using Google Forms. The questionnaire consisted of three sections. The first section included seven questions related to sociodemographic characteristics (age group, height, weight, BMI, educational level, work status, and number of children), five questions related to maternal characteristics (mode of delivery, complications after delivery, pregnancy with more than one child, and a preterm baby or baby with a congenital anomaly), and two health-related questions (the presence of orthopedic or neurological disorders in the mother). The second section included a body map based on the Nordic Musculoskeletal Symptoms Questionnaire, which is used by a respondent to locate pain in the upper-quarter sites of the body (neck, shoulder, arm, and hand) [15]. The third section included three previously validated outcome measures related to pain and disability: (1) the Arabic shortened version of the Disabilities of the Arm, Shoulder, and Hand scale (Arabic Q-DASH) [16]; (2) the Arabic version of the Neck Disability Index (NDI-Ar) [17]; and (3) the Pain Intensity Numeric Rating Scale (PI-NRS) [18].

The NDI-Ar is a validated instrument for assessing the effects of neck pain on a patient's functional activities [17]. It consists of 10 items that cover the following: pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. The assessment of each item is based on one question, rated from 0 (no disability) to 5 (fully disabled). A total score out of 100% is calculated by multiplying the sum of the 10 items by 2, where a higher percentage indicates a high disability [17,19]. There are four defined levels of disability: normal (0–20), mild dysfunction (21–40), moderate dysfunction (41–60), severe dysfunction (61–80), and complete or extreme dysfunction (80–100) [20].

The Arabic Q-DASH questionnaire is a validated instrument that consists of 11 items that ask the respondent about difficulty with a variety of upper extremity activities, pain severity, and a problem's impact on social activities, work, and sleep. There are five response options for each item on the Q-DASH, ranging from 0 (no difficulty to perform or no symptoms) to 5 (unable to perform). A raw score is calculated by summing the responses to at least 10 out of 11 items; the raw score is then converted to a 0–100 scale using the following formula: $[(\textit{sum of responses}/n) - 1] \times 25$, where n is the number of completed responses. The ranges of these scores can be categorized as normal or near normal (0–20), mild (20–50), moderate (50–80), and severe (80–100) [16,21].

The PI-NRS allows a respondent to report 11 levels of pain intensity: 0 represents no pain, and 10 represents the worst possible pain. The pain intensity of the PI-NRS scores can be classified according to three levels: mild (0–5), moderate (6–7), and severe (8–10) [18,22].

The purpose of the study, the approximate length to complete the online questionnaire, and the contact number of the main investigator were attached to the survey. The participants' information was kept private, and their names and any information that could identify them were not disclosed.

Permission to use the Arabic version of the NDI was obtained from the translator who created it. The other previously published outcome measures were provided online by their creators for use by the researchers, and specific permission was not needed for this study.

2.7 Statistical Analysis

The online questionnaire data were transferred electronically into an Excel spreadsheet, which was then imported into the statistical analysis program. IBM SPSS Statistics for Windows (Version 29; Armonk, NY, USA) was used for the analysis. The Shapiro–Wilk test was used to examine the normality of the continuous variables (height, weight, NDI-Ar scores, and Arabic Q-DASH scores). Descriptive statistics in terms of means and standard deviations (or medians and first/third interquartiles [IQ] when the data were skewed) were used for continuous variables. Frequencies and percentages were used to describe the categorical variables (participants' characteristics, pain intensity categories, and disability level categories).

The relationships between the independent and dependent variables (levels of disability as ordinal variables) were examined using cross-tabulation analysis. Kendall's τ coefficient (τ_b) was used to measure the strength and direction of association that existed between the disability level categories and ordinal data (age group, BMI classification, pain intensity category, educational level, and number of children). Unsigned correlation coefficient values were interpreted as follows: no correlation (<0.1), weak correlation (0.1–0.3), moderate correlation (0.4–0.6), strong correlation (0.7–0.8), and very strong correlation (>0.8).

With the categorical variables (work status, mode of delivery, and type of feeding), Pearson's Chi-square test (χ^2) was used, and the effect size was measured by the phi coefficient (φ). The phi coefficient can be interpreted as follows: very weak (<0.5), weak (≥0.05 and <0.10), moderate (≥0.10 and <0.15), strong (≥0.15 and <0.25), and very strong (>0.25) [23]. If associations were present, the odds ratios (ORs) were calculated with a 95% confidence interval (CI).

A logistic regression model was used to detect risk factors and to generate ORs of disability among the postpartum women. Variables that showed significant correlations were included in the logistic regression. Variables were excluded from the model when their likelihood ratio test was not significant ($p > 0.05$). A correlation matrix (>0.7) was used to identify potential multicollinearity among the predictor variables. Based on the p-values from the omnibus test of model coefficients, the model fit was assessed ($p < 0.05$). Using Nagelkerke's R square, a value less than 0.2 was considered an indicator of a weak relationship between the predictors and the outcome; a moderate relationship was indicated by a value between 0.2 and 0.4, and a strong relationship was indicated by a value above 0.4 [24].

3. Results

A total of 400 questionnaires were received from participants; all the questionnaires were complete, and all the participants met the inclusion criteria. There was no normal distribution for any continuous variable. The participants' ages ranged from 20 to 50 years (210; 52.5% were aged between 31 and 40 years). The medians and first/third quartiles (in parentheses) of the characteristics of the sample were as follows: height was 160 cm (156 cm, 165 cm), weight was 70 kg (60 kg, 78 kg), and BMI was 26.57 kg/m^2 (23.94 kg/m^2, 29.67 kg/m^2). The number of children each participant had ranged from one to six. The participant characteristics are reported in Table 1.

3.1 Prevalence of MSP

A total of 330 (82.5%) postpartum mothers reported pain in at least one location on their upper body (neck, shoulder, arm, or hand). The highest prevalence of pain was reported in the neck (262, 65.5%), followed by the shoulder (253, 63.3%), arm (233, 58.3%), and hand (228, 57.0%). 280 mothers reported pain in at least one part of the upper limb. The medians and first/third quartiles (in parentheses) for pain intensity for the upper body areas were as follows: neck was 5 (3, 7), shoulder was 4 (3, 6), arm was 4 (2, 6), and hand was 4 (2, 6). The most frequent level of pain reported for each body area by the participants was mild (see Table 2).

Moreover, within the sample, areas of pain intensity were often significantly correlated. There were significant strong positive correlations of neck pain with shoulder pain (0.55, $p < 0.001$), arm pain (0.58, $p < 0.001$), and wrist/hand (0.59, $p < 0.001$). There was also a very strong positive correlation of shoulder pain intensity with arm pain (0.75, $p < 0.001$) and wrist/hand pain (0.64, $p < 0.001$) and of arm pain with wrist/hand pain (0.78, $p < 0.001$).

3.2 Prevalence of Disability

According to the NDI-Ar, the median and first/third quartiles (in parentheses) for participants with neck pain was 20 (8.89, 24.83), with 135 (51.5%) having no disability, 120 (45.0%) having a mild disability, and only 7 (2.7%) having moderate disability. No one in the sample reported severe or complete disability. In the Arabic Q-DASH, the median and first/third quartiles (in parentheses) of participants with shoulder, arm, or hand pain was 22.73 (6.81, 34.9). In addition, 111 (39.6%) had no disability, and the majority of participants (58.2%) were categorized as having mild disabilities, only six (2.1%) participants had moderate disability, and no one had severe disability.

Table 1. Participant's characteristics (N = 400).

Participant characteristics		Frequency	Percentage
Age group (yrs.)	20–30	133	33.3%
	31–40	210	52.5%
	41–50	57	14.3%
BMI classification	Healthy	144	36.0%
	Overweight/obese	256	64.0%
Education level	High school or lower	156	39.0%
	Bachelor's degree or higher	244	61.0%
Work status	Working	180	45.0%
	Not working	220	55.0%
Number of children	1–3	189	47.3%
	4–6	211	52.8%
Mode of delivery	Spontaneous vaginal delivery	224	56.0%
	Cesarean section	176	44.0%
Type of feeding	Exclusive breastfeeding	50	12.5%
	Non-exclusive breastfeeding	350	87.5%

BMI, body mass index; yrs., years.

Table 2. Prevalence of musculoskeletal pain (MSP) by neck and upper limb category (N = 400).

MSP	Pain intensity categories			
	No pain	Mild	Moderate	Severe
Neck	138 (34.5%)	170 (42.5%)	35 (8.8%)	57 (14.3%)
Shoulders	147 (36.8%)	165 (41.3%)	52 (13.0%)	36 (9.0%)
Arm	167 (41.8%)	174 (43.5%)	52 (13.0%)	7 (1.8%)
Hand	172 (43.0%)	167 (41.8%)	54 (13.5%)	7 (1.8%)

Prevalence presented as frequency with percentage of total in parentheses; MSP, musculoskeletal pain.

3.3 Correlations of Disability Level with Participants' Characteristics and Pain Intensity

The correlations of disability levels with participant characteristics and pain intensity are shown in Table 3. There was a significant moderate negative correlation between disability measured by the NDI-Ar and age (τ_b = –0.29, $p < 0.001$), BMI classification (τ_b = –0.31, $p < 0.001$), and number of children (τ_b = –0.16, $p = 0.01$). Older mothers, those with higher BMI values, and those with more children reported lower disability levels. There was a positive strong correlation of disability with education level ($\tau_b = 0.16, p = 0.01$); mothers with bachelor's degrees or higher reported experiencing more disability than mothers with lower education levels. In addition, disability level was related with mode of delivery (χ^2 = 19.10, degrees of freedom [df] = 1, $p < 0.001$) and demonstrated a very strong effect ($\varphi = 0.28$). A majority of mothers who indicated vaginal delivery (63.0%) reported no disabilities (OR = 1.5, 95% CI [1.24, 1.85]). In contrast, a smaller proportion of mothers who indicated a C-section delivery (34.4%) reported no disability (OR = 0.47, 95% CI [0.33, 0.67]). No significant relationships were observed between either disability measure and work status or type of feeding (all tests, $p > 0.05$).

A moderate positive correlation was found between disability level measured by the Arabic Q-DASH and age (τ_b = 0.13, $p = 0.01$); older mothers had a lower level of disability. No correlations were found with the other factors ($p > 0.05$). There were significant positive correlations between pain intensity and disability. Neck pain intensity had a significant positive strong correlation with NDI-Ar scores (τ_b = 0.33, $p < 0.001$). Disability as measured by the Arabic Q-DASH had a significant moderate correlation with shoulder pain ($\tau_b = 0.26, p < 0.001$) and a significant strong correlation with both arm pain ($\tau_b = 0.32, p < 0.001$) and wrist/hand pain (τ_b = 0.34, $p < 0.001$).

3.4 Regression Analyses

There were no participants who reported a level of disability higher than moderate; moreover, only a few reported moderate disabilities on the NDI-Ar and Arabic Q-DASH (ratings of 7 and 6, respectively). Therefore, moderate disability was excluded from the regression analyses. The independent variables that showed a significant correlation with disability were entered in the binary logistic regression analyses, with disability as the dependent variable: no disability (value = 0) and mild disability (value = 1). Table 4 shows the results of the binary logistic regression analyses.

Table 3. Correlation indicators (and corresponding significance tests) of disability measures with participants' characteristics.

	NDI-Ar (N_a = 262)			Arabic Q-DASH (N_b = 280)		
Kendall's tau test	τ_b	SE	p	τ_b	SE	p
Age group	–0.29	0.06	<0.001*	0.13	0.06	0.01*
BMI classification	–0.31	0.06	<0.001*	–0.08	0.06	0.21
Education level	0.16	0.06	0.01*	0.08	0.06	0.18
Number of children	–0.16	0.06	0.01*	0.09	0.06	0.14
Neck pain intensity	0.33	0.05	<0.0001	—	—	—
Shoulder pain intensity	—	—	—	0.26	0.05	<0.001
Arm pain intensity	—	—	—	0.32	0.05	<0.001
Wrist/hand pain intensity	—	—	—	0.34	0.04	<0.001
Chi-square test	χ^2	df	p	χ^2	df	p
Work status	2.99	2	0.22	1.14	2	0.57
Mode of delivery	19.10	1	<0.001*	3.41	2	0.18
Type of feeding	1.35	2	0.51	0.37	2	0.55

N_a, number of participants with neck pain; N_b, number of participants with pain in upper limb; NDI-Ar, Arabic version of the Neck Disability Index; Arabic Q-DASH, The Arabic shortened version of the Disabilities of the Arm, Shoulder, and Hand questionnaire; τ_b, Kendall's τ coefficient; SE, standard error; χ^2, Pearson's Chi-squared; df, degrees of freedom; p, p-value. * Significant at the 0.05 level.

3.5 Disability Scored by the NDI-Ar

All the demographic and neck pain severity independent variables were significant according to the likelihood ratio test ($p < 0.05$), except for educational level and number of children; these two variables were excluded from the model. The model fitting results indicated a significant relationship between neck disability as scored by the NDI-Ar and the independent variables ($\chi^2 = 109.98$; $p < 0.001$). The Nagelkerke R^2 value (0.47) indicated a very good model fit. The model correctly classified 78.8% of the disability outcomes in the sample data.

Table 4 shows that when the mode of delivery was C-section, the probability of developing a mild disability was greater (5.72 times) than when the mode of delivery was spontaneous vaginal delivery. In addition, the postpartum women who complained of moderate neck pain intensity and severe neck pain intensity were more likely to become disabled (2.30 times and 9.10 times, respectively) than those who complained of mild pain. Disability was less likely to be predicted for postpartum women in the 31–40 and 41–50 age groups and those in the overweight/obese BMI category; these groups had OR values of less than 1.

3.6 Disability Scored by Arabic Q-DASH

The variables representing age group and pain intensity in shoulder, arm, and wrist/hand were entered in the logistic regression. However, the variables for arm and wrist/hand pain intensity had non-significant likelihood ratio test results ($p < 0.05$), so they were excluded from the model. The model fitting indicated a significant relationship between upper limb disability as scored by Arabic Q-DASH and the independent variables ($\chi^2 = 44.12$; $p < 0.001$). The Nagelkerke R^2 value (0.22) indicated a very good model fit. The model correctly classified 64.0 % of the disability outcomes in the sample data.

Table 4 shows that the postpartum women in the 31–40 are less likely to have disability (OR= 0.30) and 41–50 age groups had greater probabilities (5.97 times) of developing mild disabilities than those in the younger 20–30 age group. Shoulder pain intensity was more likely to predict disability; the moderate and severe intensity groups had OR values 2.17 and 1.40, respectively.

4. Discussion

In this study, the postpartum mothers reported pain in at least one area of their upper body, with neck pain being the most common location, followed by pain in the shoulder, arm, and wrist/hand. It was found that 45% of those with pain had mild disabilities as measured by the NDI-Ar, and 58.2% had mild disabilities as measured by Arabic Q-DASH. Pain intensity appeared to be a predictor of disability development. Women who had a C-section delivery and experienced moderate to severe neck pain were more likely to develop mild disabilities. Being part of the 31–50 age group was a significant risk factor for mild disabilities among postpartum women with upper limb pain.

Consistent with the findings of the current study, in 2022, Asif *et al.* [11] reported that 52% of mothers within 12 months of childbirth experienced neck pain. Satoh *et al.* [25] reported that 46.8% and 40.0% of mothers reported hand/wrist pain at two and six months after birth, respectively. In addition, as reported in 2015 by Koyasu *et al.* [10], approximately 71.5% of two-month postpartum mothers experienced neck or shoulder pain. In 2019, Jothi Prasanna and Tamizhmani [7] found that MSP prevalence among mothers was distributed as follows: neck (61%),

Table 4. Binary logistic regression models for correlates of neck disability.

NDI-Ar categories[1] (N = 255)								
Characteristic		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower bound	Upper bound
Age group (yrs.)	20–30 (reference category)	—	—	—	—	—	—	—
	31–40	–2.06	0.37	30.96	<0.001	0.13	0.06	0.26
	41–50	–1.34	0.52	6.74	0.01	0.26	0.10	0.72
BMI classification	Healthy (reference category)	—	—	—	—	—	—	—
	Overweight/obese	–0.97	0.36	7.32	0.01	0.38	0.19	0.77
Mode of delivery	Vaginal (reference category)	—	—	—	—	—	—	—
	Caesarean section	1.75	0.37	22.81	<0.001	5.72	2.80	11.71
Neck pain severity	Mild (reference category)	—	—	—	—	—	—	—
	Moderate	0.84	0.47	3.20	0.07	2.30	0.92	5.773
	Severe	2.21	0.45	24.22	<0.001	9.10	3.78	21.95
Arabic Q-DASH categories[1] (N = 247)								
Characteristic		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower bound	Upper bound
Age group (yrs.)	20–30 (reference category)	—	—	—	—	—	—	—
	31–40	–1.21	0.35	11.62	<0.001	0.30	0.15	0.60
	41–50	1.79	0.79	5.08	0.03	5.97	1.26	28.21
Shoulder pain severity	Mild (reference category)	—	—	—	—	—	—	—
	Moderate	0.77	0.36	4.57	0.33	2.17	1.07	4.40
	Severe	0.33	0.51	0.42	0.52	1.40	0.51	3.80

NDI-Ar, the Arabic version of the Neck Disability Index; Arabic Q-DASH, the Arabic Shortened Version Disabilities of the Arm, Shoulder, and Hand questionnaire; CI, confidence interval; BMI, body mass index; B, beta; SE, standard error; *p*, *p*-value; [1]The targeted category was mild disability.

shoulders (59%), elbow (41%), and wrists/hands (22%). They also found that six-month postnatal mothers experienced greater neck, shoulder, and elbow discomfort than mothers in earlier months. In previous studies, a slight variation among postpartum mothers in neck and upper extremity pain rates and pain severity in relation to the duration following childbirth was noticed. However, all that former research supports the current study in its finding that a significant number of new mothers experience neck and/or upper limb pain.

In addition to the prevalence of MSP, it is also important to consider the intensity of the pain experienced by postpartum mothers. In this study, the majority of mothers described their pain as mild (42.5%), and only a few described it as moderate or severe (8% and 14%, respectively). This is contrary to the findings regarding Nigerian mothers, as reported in a recent study [26]. In that study, approximately 55% of Nigerian mothers reported neck pain, with around 35% describing the pain as moderate in intensity, and 35% describing it as mild. These findings suggest some variability in the prevalence and perceived intensity of neck pain among postpartum women across different populations [26]. However, in the previous study, only lactating mothers were included, and they used different pain assessment methods than in the current study, which may explain the contradictory results.

In this study, pain intensity was found to be significantly correlated with disability. Similarly, a previous study concluded that pain in the hand and wrist (after 2 or 6 months of delivery) was significantly associated with upper extremity-related disability [25]. Moreover, Asif and colleagues [11] concluded that neck pain was a primary contributor to disability among women during the postpartum period. According to previous literature, this is because pain can have a profound impact on musculoskeletal functional abilities [27].

A previous study of lactating women found that persistent pain can have a significant impact on daily activities

and well-being, affecting mobility, functionality, and mental and physical health [28]. However, the prevalence of disabilities and their associated factors among postpartum women has not been extensively studied.

According to a 2023 study conducted by Shafeeq *et al.* [28], significantly higher rates of disability among lactating mothers due to neck pain were found that are comparable to the findings of the present study. Shafeeq *et al.* [28] also found that 19.9% of lactating mothers were completely disabled, 35.5% were severely disabled, 33.3% were moderately disabled, and 10.6% were mildly disabled. These results indicate a higher degree of disability compared to the findings in our study. However, in their study, they included postpartum mothers with pre-existing spinal deformities, which could explain the differences in the studies in disability degree. It is important to note that the presence of spinal deformities can greatly impact the severity and functional limitations associated with neck pain, potentially leading to higher levels of disability.

Based on the Arabic Q-DASH scores, in the current study, we found that older women had higher disability scores. This is consistent with the recognition that musculoskeletal pain and disabilities increase with age because musculoskeletal systems undergo natural physiological changes over time [29]. We found that younger postpartum mothers were less likely to have neck disabilities than older mothers, which is inconsistent with Shafeeq *et al.*'s [28] finding that younger lactating mothers can develop severe disabilities while older lactating mothers do not, illustrating a relationship between age and pain-related disability. One possible explanation could be that younger postpartum mothers in the brevious study may have less experience and potentially less support, which can lead to difficulties in managing the demands of a newborn, such as breastfeeding and caring activities.

A previous study showed a positive correlation between BMI and the prevalence of musculoskeletal pain among postpartum women [30]. In contrast, in the current study, BMI had a negative correlation with the scores of the NDI-Ar and no correlation with Arabic Q-DASH scores. Postpartum mothers with higher BMI scores were less likely to develop disabilities according to the NDI-Ar scores. BMI is associated with changes in body composition and increased muscle mass, which can have an impact on neck muscle strength.

In the current study, disability measured using the NDI-Ar showed a positive correlation with higher educational levels. This may be attributed to the fact that mothers with higher educational attainment often hold professional or physically demanding jobs, which can exacerbate musculoskeletal issues. Additionally, women in high-demanding occupations are more susceptible to gender-specific influences on musculoskeletal pain, with ergonomics and occupational factors playing significant roles, as highlighted by Bento (2020) *et al.* [31]. While higher educational levels have previously been linked to better outcomes for shoulder disability [32], persistent musculoskeletal pain can still result in considerable functional impairments. For instance, Bergström *et al.* [33] reported a high incidence of sick leave due to persistent musculoskeletal pain, lasting up to 14 months postpartum [33].

To the best of our knowledge, no prior research has established a relationship between the number of children a woman has and her risk of developing a disability following childbirth. While the score of disability based on Arabic Q-DASH was not found to be associated with the number of children, the NDI-Ar scores were higher for mothers who had fewer children. A potential explanation is that mothers with fewer children may have less experience caring for newborns and infants, which often involves repetitive movements and postures that can place additional strain on the neck. Thus, the new mothers have not developed strength and flexibility in their neck muscles over time. As a result, they may experience more neck problems during and after childbirth.

Although no studies have linked C-section deliveries with disability (to the best of our knowledge), it has been reported that postpartum mothers are more likely to experience musculoskeletal pain [34,35]. C-section deliveries can cause women to adopt postures to cope with surgical wound pain while holding and caring for their newborns for extended periods of time. These posture changes can cause increased stress on the neck and shoulders, resulting in pain.

By gaining insights into the prevalence and risk factors associated with these disabilities, healthcare professionals can implement effective prevention strategies and early interventions to reduce their impact. This study provides a better understanding of these disabilities, enabling healthcare professionals to provide appropriate care and improve the quality of life for postpartum women. In addition, this knowledge can be used for the development of targeted interventions and rehabilitative programs to support postpartum women in managing their musculoskeletal disabilities.

This study has some limitations that should be considered when interpreting the results. The sample was limited to postpartum women in Riyad City, which may not be representative of the entire population of postpartum women in Saudi Arabia. As a result, the generalizability of the findings is limited, and the results cannot be applied to other regions without caution. Further research is needed to confirm whether similar patterns are found in those other regions. The use of convenience sampling is another limitation of the study, which involves selecting participants based on their availability and accessibility rather than through systematic random sampling.

Future research should focus on longitudinal studies to explore the long-term impact of musculoskeletal pain and disability on postpartum women's health and functioning. Additionally, investigating the effectiveness of different in-

terventions and preventive strategies in reducing the prevalence and severity of musculoskeletal pain in this population is warranted. More research is needed to examine other factors that can affect postpartum women's musculoskeletal pain and disabilities, including lifestyle habits and newborn feeding methods. Furthermore, it would likely be informative to compare postpartum women with women of the same age who have never given birth to gain a deeper understanding of how pain and disability affect the prior group.

5. Conclusions

The findings of this study highlight the high prevalence of neck and upper limb pain among postpartum mothers, as well as the disability associated with the pain. In addition, these results emphasize the importance of considering factors such as the severity of neck pain, C-section births, and maternal age, as these can be linked to disabilities that may have lasting health consequences. Identifying factors that contribute to disabilities provides valuable insights into the specific challenges faced by postpartum mothers and how they can be addressed. To identify mothers at risk of developing musculoskeletal pain and disability after childbirth, healthcare professionals should implement early screening and assessment protocols. By doing so, targeted physical therapy, pain management, and ergonomic modifications can be delivered promptly.

Availability of Data and Materials

The data that support the findings of this study are available upon request from the corresponding author. The data are not publicly available, as they contain information that could compromise the privacy of the research participants.

Author Contributions

MFA and AAA contributed to the design. MFA and AAMS supervised the work. AAA and LAA were responsible for data collection. MFA, SA, AAMS, SMIA and AfA handled the data analysis. MFA and AAA drafted the manuscript. SAA, MMA, AsA, LAA, SMIA and MA worked on the methodology. AsA, LAA, SMIA, AAMS, and SA reviewed and edited the writing. All the authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

In accordance with the Declaration of Helsinki of 1964, King Fahad Medical City's Institutional Review Board provided ethical approval (IRB Log Number: 22-427E), and all participants provided signed informed consent for inclusion before they engaged in any study activities.

Acknowledgment

The authors acknowledge the support provided through the Princess Nourah Bint Abdulrahman University Researchers Supporting Project (No. PNURSP2023R 285), Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] Graven-Nielsen T. Mechanisms and manifestations in musculoskeletal pain: from experimental to clinical pain settings. Pain. 2022; 163: S29–S45. https://doi.org/10.1097/j.pain.0000000000002690.

[2] Liu S, Wang B, Fan S, Wang Y, Zhan Y, Ye D. Global burden of musculoskeletal disorders and attributable factors in 204 countries and territories: a secondary analysis of the Global Burden of Disease 2019 study. BMJ Open. 2022; 12: e062183. https://doi.org/10.1136/bmjopen-2022-062183.

[3] Briggs AM, Woolf AD, Dreinhöfer K, Homb N, Hoy DG, Kopansky-Giles D, *et al*. Reducing the global burden of musculoskeletal conditions. Bulletin of the World Health Organization. 2018; 96: 366–368. https://doi.org/10.2471/BLT.17.204891.

[4] Chungade NS, Mahishale A, Dalal A, Angolkar M. Musculoskeletal pain syndrome in postpartum women. Nepal Journal of Obstetrics & Gynaecology. 2020; 15: 34–36.

[5] Fiat F, Merghes PE, Scurtu AD, Almajan Guta B, Dehelean CA, Varan N, *et al*. The Main Changes in Pregnancy-Therapeutic Approach to Musculoskeletal Pain. Medicina (Kaunas, Lithuania). 2022; 58: 1115. https://doi.org/10.3390/medicina58081115.

[6] Saurel-Cubizolles MJ, Romito P, Lelong N, Ancel PY. Women's health after childbirth: a longitudinal study in France and Italy. BJOG: an International Journal of Obstetrics and Gynaecology. 2000; 107: 1202–1209. https://doi.org/10.1111/j.1471-0528.2000.tb11608.x.

[7] Jothi Prasanna K, Tamizhmani T. Prevalence of Musculoskeletal Discomfort Among Breast feeding Mothers. International Journal of Current Advanced Research. 2019; 8: 17706–17709.

[8] Rani S, Habiba UE, Qazi WA, Tassadaq N. Association of breast feeding positioning with musculoskeletal pain in post partum mothers of Rawalpindi and Islamabad. JPMA. the Journal of the Pakistan Medical Association. 2019; 69: 564–566.

[9] Tan PY, Purushothaman VK, Muniandy Y, Pillai SGK. Prevalence and Factors Associated with Neckk and Low Back Pain among Breastfeeding Mothers in the Klang Valley. JUMMEC. 2022; 25: 129–134.

[10] Koyasu K, Kinkawa M, Ueyama N, Tanikawa Y, Adachi K, Matsuo H. The prevalence of primary neck and shoulder pain, and its related factors in Japanese postpartum women. Clinical and Experimental Obstetrics & Gynecology. 2015; 42: 5–10.

[11] Asif A, Amjad F, Dastgir H, Asif W, Adil A, Afzal M. Prevalence of Neck and Low Back Pain in Women During Post-Partum Period: Neck and Back Pain During Post-Partum. The Healer Journal of Physiotherapy and Rehabilitation Sciences. 2022; 2: 271–278.

[12] Darwish MA, Al-Zuhair SZ. Musculoskeletal Pain Disorders among Secondary School Saudi Female Teachers. Pain Research

and Treatment. 2013; 2013: 878570. https://doi.org/10.1155/2013/878570.
[13] Dandekar SA, Khatavkar M. Impact of breastfeeding positions on neck pain in postpartum mothers. IJCMPH. 2022; 9: 3791–3796.
[14] Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterology and Hepatology from Bed to Bench. 2013; 6: 14–17.
[15] Al Amer HS, Alharbi AA. Arabic version of the Extended Nordic Musculoskeletal Questionnaire, cross-cultural adaptation and psychometric testing. Journal of Orthopaedic Surgery and Research. 2023; 18: 672. https://doi.org/10.1186/s13018-023-04161-1.
[16] Salwa F, Khattab AS, Mohammed MM, Naser MA. Validity and reliability of the Arabic version of the quick-dash questionnaire for upper extremity disorders. The Medical Journal of Cairo University. 2020; 88: 2037–2043.
[17] Shaheen AAM, Omar MTA, Vernon H. Cross-cultural adaptation, reliability, and validity of the Arabic version of neck disability index in patients with neck pain. Spine. 2013; 38: E609–15. https://doi.org/10.1097/BRS.0b013e31828b2d09.
[18] Farrar JT, Young JP, Jr, LaMoreaux L, Werth JL, Poole MR. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain. 2001; 94: 149–158. https://doi.org/10.1016/S0304-3959(01)00349-9.
[19] MacDermid JC, Walton DM, Avery S, Blanchard A, Etruw E, McAlpine C, *et al*. Measurement properties of the neck disability index: a systematic review. The Journal of Orthopaedic and Sports Physical Therapy. 2009; 39: 400–417. https://doi.org/10.2519/jospt.2009.2930.
[20] Misterska E, Jankowski R, Glowacki M. Cross-cultural adaptation of the Neck Disability Index and Copenhagen Neck Functional Disability Scale for patients with neck pain due to degenerative and discopathic disorders. Psychometric properties of the Polish versions. BMC Musculoskeletal Disorders. 2011; 12: 84. https://doi.org/10.1186/1471-2474-12-84.
[21] Verma A, Verma S, Moses S, Mathur R, Patil L, Saraf S, *et al*. Study of upper limb peripheral nerve pathologies with special emphasis on quick dash score and selected electromyographic parameters. Journal of Evolution of Medical and Dental Sciences. 2018; 7: 499–503.
[22] Boonstra AM, Stewart RE, Köke AJA, Oosterwijk RFA, Swaan JL, Schreurs KMG, *et al*. Cut-Off Points for Mild, Moderate, and Severe Pain on the Numeric Rating Scale for Pain in Patients with Chronic Musculoskeletal Pain: Variability and Influence of Sex and Catastrophizing. Frontiers in Psychology. 2016; 7: 1466. https://doi.org/10.3389/fpsyg.2016.01466.
[23] Akoglu H. User's guide to correlation coefficients. Turkish Journal of Emergency Medicine. 2018; 18: 91–93. https://doi.org/10.1016/j.tjem.2018.08.001.
[24] Nagelkerke NJ. A note on a general definition of the coefficient of determination. Biometrika. 1991; 78: 691–692.
[25] Satoh T, Cadillo LRH, Ohashi K, Onishi T. Self-assessed hand and wrist pain and quality of life for postpartum mothers in Japan. British Journal of Midwifery. 2022; 30: 467–475.
[26] Ojukwu CP, Okpoko CG, Okemuo AJ, Ede SS, Ilo IJ. Breastfeeding-related neck pain: prevalence and correlates among Nigerian lactating mothers. International Health. 2023; 15: 383–388. https://doi.org/10.1093/inthealth/ihac050.
[27] Verdini E, Maestroni L, Clark M, Turner A, Huber J. Do people with musculoskeletal pain differ from healthy cohorts in terms of global measures of strength? A systematic review and meta-analysis. Clinical Rehabilitation. 2023; 37: 244–260. https://doi.org/10.1177/02692155221128724.
[28] Shafeeq S, Noreen A, Nasrullah Z, Masood A, Ul Hassan W, Ahmad S, *et al*. Association of Upper Crossed Syndrome with Neck Pain in Lactating Women. Pakistan Journal of Medical & Health Sciences. 2023; 17: 192.
[29] Bouziri H, Descatha A, Roquelaure Y, Dab W, Jean K. Can we distinguish the roles of demographic and temporal changes in the incidence and prevalence of musculoskeletal disorders? A systematic review. Scandinavian Journal of Work, Environment & Health. 2022; 48: 253–263. https://doi.org/10.5271/sjweh.4018.
[30] Wiezer M, Hage-Fransen MAH, Otto A, Wieffer-Platvoet MS, Slotman MH, Nijhuis-van der Sanden MWG, *et al*. Risk factors for pelvic girdle pain postpartum and pregnancy related low back pain postpartum; a systematic review and meta-analysis. Musculoskeletal Science & Practice. 2020; 48: 102154. https://doi.org/10.1016/j.msksp.2020.102154.
[31] Bento TPF, Genebra CVDS, Maciel NM, Cornelio GP, Simeão SFAP, Vitta AD. Low back pain and some associated factors: is there any difference between genders? Brazilian Journal of Physical Therapy. 2020; 24: 79–87. https://doi.org/10.1016/j.bjpt.2019.01.012.
[32] Engebretsen K, Grotle M, Bautz-Holter E, Ekeberg OM, Brox JI. Predictors of shoulder pain and disability index (SPADI) and work status after 1 year in patients with subacromial shoulder pain. BMC Musculoskeletal Disorders. 2010; 11: 218. https://doi.org/10.1186/1471-2474-11-218.
[33] Bergström C, Persson M, Mogren I. Sick leave and healthcare utilisation in women reporting pregnancy related low back pain and/or pelvic girdle pain at 14 months postpartum. Chiropractic & Manual Therapies. 2016; 24: 7. https://doi.org/10.1186/s12998-016-0088-9.
[34] Komatsu R, Ando K, Flood PD. Factors associated with persistent pain after childbirth: a narrative review. British Journal of Anaesthesia. 2020; 124: e117–e130. https://doi.org/10.1016/j.bja.2019.12.037.
[35] Rafiei M, Saei Ghare M, Akbari M, Kiani F, Sayehmiri F, Sayehmiri K, *et al*. Prevalence, causes, and complications of cesarean delivery in Iran: A systematic review and meta-analysis. International Journal of Reproductive Biomedicine. 2018; 16: 221–234.