

Work-Related Musculoskeletal Disorders Among Hospital Midwives in Chenzhou, Hunan Province, China and Associations with Job Stress and Working Conditions

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Background: Midwives have a high risk of work-related musculoskeletal disorders (WMSDs), which are the leading cause of pain and disability. However, the association between job stress and WMSDs among midwives has not been studied. The aim of this project was to specifically describe relationships between the job stress and WMSDs among a sample of hospital midwives in Chenzhou, Hunan Province, China.

Methods: We conducted a cross-sectional study among a sample of 769 eligible midwives in the city of Chenzhou in Hunan Province, China from May 2018 to January 2019. All participants completed a questionnaire regarding the presence and severity of different pain symptoms and job stress assessed by the Korean occupational stress scale.

Results: A total of 597 participants responded (77.6%), and 491 (82.2%) reported that they had experienced WMSDs at some time over a 12-month period. The most common pain site was low back (72.7%), followed by the neck (52.8%) and shoulders (42.7%). We revealed that various aspects of job stress were associated with WMSDs in the current study, namely "Owing to my workload, I always feel time pressure" (OR, 2.05; 95% CI: 1.28–3.28), "My job has become increasingly overbearing" (OR, 2.34; 95% CI: 1.46–3.77), "My work requires long lasting concentration" (OR, 3.50; 95% CI: 2.13–5.74), "I have to do various jobs simultaneously", (OR, 3.15; 95% CI: 1.93–5.14), "My work requires creativity" (OR, 2.15; 95% CI: 1.31–3.54), "My work requires a high level of skill or knowledge" (OR, 2.83; 95% CI: 1.67–4.80), "My supervisor is helpful in getting the job done" (OR, 0.53; 95% CI: 0.33–0.84), "I have someone who understands my difficulties at work" (OR, 0.53; 95% CI: 0.34–0.85), "Undesirable changes (ie, downsizing) will come to my job" (OR, 3.28; 95% CI: 2.01–5.77), "My company provides me with sufficient organizational support" (OR, 0.47; 95% CI: 0.29–0.74), "Departments cooperate each other without conflicts" (OR, 0.50; 95% CI: 0.32–0.80), "I am provided with the opportunity to develop my capacity" (OR, 0.57; 95% CI: 0.36–0.91) and "My company climate is authoritative and hierarchical" (OR: 3.21; 95% CI: 1.97–5.23).

Conclusion: Overall, this study suggests that job stress has an important influence on WMSDs among a sample of hospital midwives in Chenzhou, Hunan Province, China. Given the multifaceted nature of identified risk, a comprehensive approach to reduce this risk is clearly required and a job stress management program will be essential.

Keywords: midwife, work-related musculoskeletal disorders, job stress

Background

Musculoskeletal disorders (MSDs) are a leading cause of disease burden globally, producing discomfort, damage or persistent pain in body structures.¹ MSDs can be work-related. The Global Burden of Disease (GBD) has reported that MSDs were the second most common work-related problems worldwide.^{2,3} WMSDs are defined as MSDs caused or worsened by occupational risk factors significantly, though not exclusively.^{4–6}

Studies have shown that health-care workers are susceptible to work-related musculoskeletal disorders (WMSDs). Midwives are considered the group of the high-risk occupations for WMSDs.⁷ This is expected given that the nature of midwives' job that requires prolonged standing, awkward positions, high attention and concentration, stooping, and repetitive actions.^{7,8} In addition, it is also important to bear in mind that midwifery workforce shortage may have contributed to WMSDs. It should be noted that there is a global shortage of midwives,⁹ which may pose a desperate burden on work load for the rest of the workforce to bridge gaps in personnel and resulting in increased musculoskeletal symptoms. The prevalence of WMSDs among midwives has been documented in different studies and varies across countries.⁸ In a cross-sectional study investigating 637 midwives in the United Kingdom reported very high prevalence of musculoskeletal symptoms (91%) in the last 12 months.¹⁰ Long MH et al found that a substantial proportion of Australian midwives are troubled by low back and neck discomfort, demonstrating annual prevalence rates of 40.8% for neck and nearly 30% for low back.¹¹ In a study of Polish midwives, 67% of the participants had pain in any segment of the spine.¹²

As a result of WMSDs, midwives may prevented from carrying out normal activities, absent from work, leave the profession and need to be seen by the physician, which may create adverse effects on quality of life and patient safety.^{13–15} Furthermore, midwives with WMSDs also should take the negative effect of this impairment on their mental state into account. A previous study conducted in the Northeast United States reported that the prevalence of the comorbidity of MSDs and depression was 14.5% in a sample of nurses,¹⁶ and this may be true of midwives as well due to the fact that midwives are members of a unique profession sharing characteristics with nursing.

Given the severe consequences of WMSDs, the relevant factors of WMSDs have been extensively studied to minimize such injuries. Factors associated with WMSDs include not only individual characteristics (eg age, sex, leisure-time exercise, BMI), but also physical risk factors that arise from a worker's tasks (eg physical demands, handling loads, repetitive movements or vibration).^{17–20} Numerous previous studies have focused on occupational psychosocial risk factors (eg high psychosocial demands, low job control or inadequate social support, too much overtime) as potential causes of WMSDs.^{3,21,22} Besides, several studies have demonstrated a relationship between occupational injury and job stress.^{23,24} There is evidence that excessive job stress lead to an overall increase in the risk for occupational injuries due to the fact that it affects a worker's ability to escape from risks, decreases risk recognition, and causes excessive fatigue.^{25–28} A recent study suggests that intrinsic stress is a main contributor for developing WMSDs for the midwifery profession.¹⁰ Lang et al found that stress could be a predictor of severe somatic symptoms of WMSDs.²⁹ However, to date no study address the association between job stress and WMSDs in hospital midwives has yet been published. Hence, the impact of a broader range of job stress on midwives' musculoskeletal health deserves research attention. The purpose of this study was to determine the status of WMSDs among a sample of hospital midwives in Chenzhou, Hunan Province, China and to investigate the existence of association between job stress and WMSDs after adjusting for confounding variables. We hypothesized that there is also an association between job stress and WMSDs.

Methods

Participants

A purposive convenience sampling method was used to recruit participate. First, with the help of Health Commission of Chenzhou, we contacted the nursing administration and human resources departments of 54 hospitals to host this study. The chief nursing officer in each hospital welcomed the research study and expressed interest in applying the findings of the study. A nurse representative from nursing administration served as the main contact and liaison between the hospital and the research team. The liaison from Nursing Administration was responsible for facilitating the Institutional Review Board (IRB) approval process, distributing recruitment

flyers, recruiting midwives, and providing a list of all potential participants in study hospital. Midwives were eligible if they met the following criteria: (a) full-time registered midwives, (b) worked in midwifery profession for at least 12 months. Midwives on leave during the survey period or refusing to participate were excluded. Overall, 769 midwives met the initial eligibility criteria. Research assistant then contact those possible participants via phone for further screening to confirm inclusion/exclusion criteria. A total of 687 midwives were eligible to participate after the phone-based screening. The study was approved by the Ethics Committee of the XiangNan University.

Data Collection

We collected data from a cross-sectional survey from May 2018 to January 2019. Structured questionnaire packages, including a recruiting notice, an informed consent form, and an anonymous questionnaire, were distributed by the research team at regularly scheduled staff meetings of each study hospital, which all midwives at the hospital were required to attend. The study objectives, detailed instructions and potential benefits and risks were explained to the participants in person. All participants provided written informed consent. Every individual participating midwife was expected to take his or her own time to complete the questionnaire anonymously and return it to the designated survey collection boxes in a sealed envelope in each hospital within 1 week. The liaison from Nursing Administration in each hospital then sent the collection boxes to researchers by mail.

Survey Instrument

The survey instrument was a structured, self-administered questionnaire, which mainly required checkbox-style answers, and Likert-type scales. The questionnaire included three sections (ie, WMSDs in the previous 12-month period, Job stress and socio-demographic data).

WMSDs were measured based on the Nordic Musculoskeletal Questionnaire (NMQ), which is a valid and reliable assessment tool.³⁰ Participants were asked to rate the severity of pain in nine body regions: neck, shoulders, upper back, elbows, wrists/hands, lower back, hips/thighs, knees, ankles/feet in the previous 12-month period. In order to highlight each part of the body for clarity, participants were provided with anatomic diagrams. The intensity of the symptoms was rated on a 5-point (1=none; 2=mild; 3=moderate; 4=severe; and 5=extreme). WMSDs

was defined as “yes” for participants who reported moderate, severe, or extreme pain (≥ 3 on a 1–5 scale) in any region.³¹ The impact of such symptoms was explored with the question of “Has the trouble prevented you from carrying out normal activities (eg job, housework, hobbies) during the last 12 months?” Participants could choose between (1) yes (2) no. In addition, midwives were asked whether they had seen a physician for this condition during the last 12 months. Participants could choose between (1) yes (2) no. Besides, participants were asked if they had trouble in each body regions during the past 7 days. Participants could choose between (1) yes (2) no. The trouble was defined as prevented from carrying out normal activities or had seen a physician because of the pain in each region.

Job stress was assessed with the short form of the Korean occupational stress scale (KOSS-SF), which is commonly used to record the job stress.²⁴ The KOSS-SF is comprised of 7 subscales and 24 items, which inquires about job demands (4 items), job control (4 items), interpersonal conflict (3 items), job insecurity (2 items), organizational system (4 items), lack of reward (3 items) and workplace environment (4 items). Each item is rated on a 4-point Likert-type scale (strongly agree, agree, disagree, strongly disagree). The KOSS-SF scale was translated into Chinese and then back-translated to validate the translation by a bilingual professional. Then, experts evaluated the Chinese version for accuracy, clarity, and readability. The Cronbach’s α score for each subscale ranged between 0.51 and 0.82, indicating a high internal consistency.²³ The Cronbach’s α coefficient for subscales of job stress for this study ranged from 0.54 to 0.79.

We collected information about the midwives’ demographic and socioeconomic characteristics on hospital size, age, gender, marital status, Body Mass Index (BMI), highest educational level, practice years in midwifery, frequency of exercise (times/week), weekly working hours. Hospital size was separated into either (1) ≤ 399 beds, (2) ≥ 400 beds. Marital status was categorised as single, never married, married or domestic partnership, widowed, divorced, separated. BMI was categorised as underweight, normal weight, overweight and obese.³² Possible responses to the question about highest educational level were (1) secondary diploma, (2) associate degree, (3) bachelor’s degree/higher. When it terms to practice years in midwifery, participants could choose between: (1) ≤ 3 years, (2) 4–10 years, (3) >10 years. Possible responses to the question about frequency of exercise was either <3 times/week or ≥ 3 times/week. Participants could choose between (1) ≤ 40 hours, (2) >40 hours regarding the question about weekly working hours.

Statistical Analysis

We collapsed job stress items into dichotomous (agree/disagree) responses in order to simplify analysis and interpretation of the results. Respondents' general characteristics and WMSDs were described by percentage. Age showed no normal distribution, median and interquartile range was employed.

To assess the prevalence of WMSDs in different participants, the chi-squared test (hospital size, marital status, BMI), fisher's exact test (gender) and the Mann-Whitney *U*-test (age) were used. The analysis of the prevalence of WMSDs was based on the general characteristics data. The relationship of job stress and WMSDs were compared by chi-squared test.

In order to determine the association between general characteristics, job stress, and the occurrence of WMSD, we applied Univariate and multivariate logistic regression analysis. Univariate logistic regression analysis was performed with each job stress subtype as an independent variable (Model I). Multivariate logistic regression analysis was performed with hospital size, age, marital status, Body Mass Index (BMI), highest educational level, practice years in midwifery, weekly working hours as adjusted factors (Model II). *P* values below 0.05 were considered statistically significant throughout the analysis. All analyses were conducted with SPSS 21.0 (SPSS Inc., Chicago IL).

Table 1 Differences Between WMSDs and Non-WMSDs in Relation to Population Characteristics

Characteristics		n (%)	Non-WMSDs n (%)	WMSDs n (%)	p-value
Number of Participants		597(100.00)	106 (17.8)	491 (82.8)	
Hospital size	≤399 beds	248(41.54)	33 (13.3)	215 (86.7)	0.016
	≥400 beds	349(58.46)	73(20.9)	276 (79.1)	
Gender	Female	596(99.83)	106(17.8)	490 (82.8)	1.000*
	Male	1(0.17)	0(0.0)	1 (100.0)	
Age (year)		24.0(23.0,34.0)	25.0(20.8,27.0)	24.0(23.0,35.0)	0.001 [#]
Marital status	Single, never married	163(27.30)	30 (18.4)	133 (83.3)	0.039
	Married or domestic partnership	420(70.35)	70 (16.7)	350 (81.6)	
	Widowed, divorced, separated	14(2.35)	6 (42.9)	8 (57.1)	
Body Mass Index (BMI)	Underweight	51(8.54)	13(25.5)	38(74.5)	<0.001
	Normal Weight	391(65.49)	85(21.7)	306(78.3)	
	Overweight	101(16.92)	6(5.9)	95(94.1)	
	Obese	54(9.05)	2(3.7)	52(96.3)	
Highest educational level	Secondary diploma ^a	55(9.21)	4(7.3)	51(92.7)	0.003
	Associate degree ^b	296(49.58)	44(14.9)	252(85.1)	
	Baccalaureate degree/higher ^c	246(41.21)	58(23.6)	188(76.4)	
Practice years in midwifery	≤ 3 years	262(43.89)	55(21.0)	207(79.0)	0.028
	4–10 years	199(33.33)	37(18.6)	162(81.4)	
	>10 years	136(22.78)	14(10.3)	122(89.7)	
Frequency of exercise (times/week)	<3	471(78.89)	87(18.5)	384(81.5)	0.376
	≥3	126(21.11)	19(15.1)	107(84.9)	
Weekly working hours	≤40 hours	537(89.95)	89(16.6)	448(83.4)	0.024
	>40 hours	60(10.05)	17(28.3)	43(71.7)	

Notes: ^aRefers to the 3-year secondary diploma programs recruiting junior high school graduates aged 15–16 years old. ^bRefers to the 3-year advanced diploma programs recruiting senior high school graduates aged 18–19 years old. ^cRefers to a mixture of medical and surgical units, in which service is provided for acutely ill patients with a wide variety of medical issues or who are recovering from surgery. *Fisher's Exact Test. [#]Mann-Whitney *U*-Test.

Results

A total of 687 questionnaires were distributed and 608 (88.5%) were retrieved. Eleven incompletely answered the questionnaires leaving 597 (86.9%) for analysis. Table 1 contains a summary of the demographic characteristics of these midwives. The majority were female (only one male), with a mean age of 28.36 (SD=7.00) years. Mean BMI was 23.14 (SD=3.90). Regarding the weekly working hours, 89.3% of the participants reported that their weekly working hours were ≥ 40 hours. About 58.5% of them worked in hospitals with ≥ 400 beds hospital.

Among the participants, 491 (82.2%) reported that they had experienced WMSDs at some time over a 12-month period. There were significant differences between WMSDs versus non-WMSDs personnel with respect to hospital size, age, marital status, Body Mass Index (BMI), highest educational level, practice years in midwifery, weekly working hours (Table 1).

The Ratio and Severity WMSDs

According to participants' answers on The NMQ, the most common pain site was low back (72.7%), followed by the neck (52.8%) and shoulders (42.7%). Of those who reported low back symptoms during the last 12 months, 24.3% had been prevented from carrying out normal activities. Those who indicated that they experienced lower back discomfort were the higher group that had seen a physician during the last 12 months (12.1%), followed by neck (4.2%). Of the participants (29.6%) reported that they experienced discomfort of their lower back during the last seven days (Table 2).

The Relationship Between Items of Job Stress Scale and WMSDs

Affirmative responses to the job stress Scale and their relationship with WMSDs are reported in Table 3. A total of 485 (81.2%) participants agreed with the statement "My work requires a high level of skill or knowledge". Four hundred and thirty-four (72.7%) reported that undesirable changes (ie, downsizing) will come to their jobs and a total of 405 (67.8%) participants agree with the statement "My job has become increasingly overbearing". Four hundred and thirty-nine (73.5%) stated that their work requires long lasting concentration. However, only 186 (31.2%) reported that the organizational policy of their company is fair and reasonable, and finally, 228 (38.2%) participants agreed with the statement "My supervisor is helpful in getting the job done". WMSDs were associated with fourteen job stress questions.

Logistic Regression Analysis of WMSDs According to Job Stress Adjusted for the Psychosocial Component

Statistical analysis revealed various associations between WMSDs and job stress, as indicated in Table 4. By adjusting the general characteristics such as hospital size, age, marital status, Body Mass Index (BMI), highest educational level, practice years in midwifery, weekly working hours; we revealed that all items from job demands were associated with the occurrence of WMSDs (eg "Owing to my workload, I always feel time pressure" (OR, 2.05; 95% CI: 1.28–3.28), "My job has become increasingly overbearing" (OR, 2.34; 95% CI: 1.46–3.77), "My work requires

Table 2 Pain Location and Impact on Daily Activities and Health Care Seeking

Body Part	WMSDs n (%)	During the Last 12 Months Have You Been Prevented from Carrying Out Normal Activities(eg Job, Housework, Hobbies) Because of This Trouble in: n (%)	During the Last 12 Months Have You Seen a Physician for This Condition: n (%)	During the Past 7 Days Have Had Trouble in: n (%)
Neck	315(52.8)	39(6.5)	25(4.2)	45(7.5)
Shoulders	255(42.7)	25(4.2)	17(2.8)	43(7.2)
Upper back	216(36.2)	11(1.8)	6(1.0)	20(3.4)
Elbows	89(14.9)	9(1.5)	3(0.5)	12(2.0)
Wrist/hands	162(27.1)	7(1.2)	2(0.3)	11(1.8)
Lower back	434(72.7)	145(24.3)	72(12.1)	177(29.6)
Hips/thighs	167(28.0)	11(1.8)	3(0.5)	12(2.0)
Knees	153(25.6)	5(0.8)	4(0.7)	7(1.2)
Ankles/feet	117(19.6)	4(0.7)	1(0.2)	7(1.2)

Table 3 Presence of WMSDs and Non-WMSDs in Relation to Job Stress Variables

Job Stress Scale	^a Agree or not Agree	n (%)	Non-WMSDs n (%)	WMSDs n (%)	p-value
Job demands					
1. Owing to my workload, I always feel time pressure.	Agree Not agree	392(65.7) 205(34.3)	58 (14.8) 48 (23.4)	334 (85.2) 157 (76.6)	0.009
2. My job has become increasingly overbearing.	Agree Not agree	405(67.8) 192(32.2)	58 (14.3) 48 (25.0)	347 (85.7) 144 (75.0)	0.001
3. My work requires long lasting concentration.	Agree Not agree	439(73.5) 158(26.5)	60 (13.7) 46 (29.1)	379 (86.3) 112 (70.9)	<0.001
4. I have to do various jobs simultaneously.	Agree Not agree	430(72.0) 167(28.0)	60 (14.0) 46 (27.5)	370 (86.0) 121 (72.5)	<0.001
Job control					
5. My work requires creativity.	Agree Not agree	291(48.7) 306(51.3)	38 (13.1) 68 (22.2)	253(86.9) 238 (77.8)	0.003
6. My work requires a high level of skill or knowledge.	Agree Not agree	485 (81.2) 112 (18.8)	73 (15.1) 33 (29.5)	412 (84.9) 79 (70.5)	<0.001
7. I can make my own decisions in my job and have influence over the work.	Agree Not agree	284 (47.6) 313(52.4)	40 (14.1) 66 (21.1)	244 (85.9) 247 (78.9)	0.025
8. I can control my pace of work and time schedule.	Agree Not agree	536(89.8) 61(10.2)	91 (17.0) 15 (24.6)	445 (83.0) 46 (75.4)	0.140
Interpersonal conflict					
9. My supervisor is helpful in getting the job done.	Agree Not agree	228 (38.2) 369 (61.8)	54 (23.7) 52 (14.1)	174 (76.3) 317 (85.9)	0.003
10. My coworker is helpful in getting the job done.	Agree Not agree	473 (79.2) 124 (20.8)	81 (17.1) 25 (20.2)	392 (82.9) 99 (79.8)	0.431
11. I have someone who understands my difficulties at work.	Agree Not agree	231 (38.7) 366 (61.3)	54 (23.4) 52 (14.2)	177 (76.6) 314 (85.8)	0.004
Job insecurity					
12. My future is uncertain because the current situation of my company is unstable	Agree Not agree	295 (49.4) 302 (50.6)	48 (16.3) 58 (19.2)	247 (83.7) 244 (80.8)	0.348
13. Undesirable changes (ie, downsizing) will come to my job.	Agree Not agree	434 (72.7) 163 (27.3)	60 (13.8) 46(28.2)	374 (86.2) 117 (71.8)	<0.001
Organisational system					
14. The organisational policy of my company is fair and reasonable.	Agree Not agree	186 (31.2) 411 (68.8)	37 (19.9) 69 (16.8)	149(80.1) 342 (83.2)	0.358
15. My company provides me with sufficient organizational support.	Agree Not agree	227(38.0) 370(68.0)	56(24.7) 50 (13.5)	171 (75.3) 320 (86.5)	0.001
16. Departments cooperate each other without conflicts.	Agree Not agree	223 (37.4) 374 (62.6)	54 (24.2) 52 (13.9)	169 (75.8) 322 (86.1)	0.001
17. I have opportunities and channels to talk about my ideas.	Agree Not agree	288 (48.2) 309 (51.8)	47(16.3) 59 (19.1)	241 (83.7) 250(80.9)	0.375

(Continued)

Table 3 (Continued).

Job Stress Scale	^a Agree or not Agree	n (%)	Non-WMSDs n (%)	WMSDs n (%)	p-value
Lack of reward					
18. My salary is not commensurate with my effort and work performance.	Agree Not agree	217 (36.3) 380 (63.7)	46 (21.2) 60 (15.8)	171 (78.8) 320 (84.2)	0.096
19. I believe that I will be given more rewards from my company if I work hard.	Agree Not agree	201 (33.7) 396 (66.3)	44 (21.9) 62 (15.7)	157 (78.1) 334 (84.3)	0.060
20. I am provided with the opportunity to develop my capacity.	Agree Not agree	242 (40.5) 355 (59.5)	55(22.7) 51 (14.4)	187 (77.3) 304 (85.6)	0.009
Workplace environment					
21. Dining out after work makes me uncomfortable	Agree Not agree	374 (62.6) 223 (37.4)	59 (15.8) 47 (21.1)	315 (84.2) 176 (78.9)	0.101
22. I am asked to do my work with irrational principles or inconsistency.	Agree Not agree	182 (30.5) 415 (69.5)	36(19.8) 70 (16.9)	146 (80.2) 345 (83.1)	0.391
23. My company climate is authoritative and hierarchical.	Agree Not agree	425(71.2) 172 (28.8)	59 (13.9) 47(27.3)	366 (86.1) 125 (72.7)	<0.001
24. I am at a disadvantage because I am a woman.	Agree Not agree	278(46.6) 319(53.4)	46 (16.5) 60 (18.8)	232(83.5) 259 (81.2)	0.471

Notes: ^aMidwives who reported that they either "agreed" or "strongly agreed" with each item is defined as "Agree", otherwise it is defined as "Not agree".

long lasting concentration" (OR, 3.50; 95% CI: 2.13–5.74), "I have to do various jobs simultaneously" (OR, 3.15; 95% CI: 1.93–5.14)). Meanwhile, midwives who thought that their work requires creativity were more likely to have suffered WMSDs in the previous year (OR, 2.15; 95% CI: 1.31–3.54), as well as midwives who thought that their work requires a high level of skill or knowledge (OR, 2.83; 95% CI: 1.67–4.80). In contrary, "My supervisor is helpful in getting the job done" (OR, 0.53; 95% CI: 0.33–0.84) and "I have someone who understands my difficulties at work" (OR, 0.53; 95% CI: 0.34–0.85) were less likely to have suffered WMSDs in the last 12 months. Furthermore, "Undesirable changes (ie, downsizing) will come to my job" (OR, 3.28; 95% CI: 2.01–5.77), "My company provides me with sufficient organizational support" (OR, 0.47; 95% CI: 0.29–0.74), "Departments cooperate each other without conflicts" (OR, 0.50; 95% CI: 0.32–0.80), "I am provided with the opportunity to develop my capacity" (OR, 0.57; 95% CI: 0.36–0.91) and "My company climate is authoritative and hierarchical" (OR: 3.21; 95% CI: 1.97–5.23) were also related to the occurrence of WMSDs over a 12-month period.

Discussion

Based on the results, the prevalence of WMSDs over a 12-month period in our sample was found to be high. The present study showed that 82.2% participants reported that they had experienced WMSDs at some time over a 12-month period. Moreover, the prevalence of lower back pain was the highest of all the parts of the body among hospital midwives, at 72.7%. This result is consistent with the result of a recent study that reported 92% of the participants reported MSDs, most commonly in the low back (71%), neck (45%) and shoulders (45%).¹⁰ WMSD prevalence rates are not very different when compared with other health-care professionals, for example, Atheer F. et al found the 12-month prevalence of WMSDs among clinical laboratory workers was 82% and to be most commonly in the low back (61%).³³ One possible explanation is that hospital midwives have similar risk exposures at work with such occupations. According to this finding, of those who reported low back symptoms during the last 12 months, 24.3% had been prevented from carrying out normal activities and 12.1% had seen a physician. It is therefore very likely that the WMSDs could have critical implications for the safety and health of hospital midwives themselves and their patients, considering the fact that hospital midwives are caring two loads (mother and baby). Midwives' emotional well-being

Table 4 Logistic Regression Analysis of WMSDs and Non-WMSDs and Job Stress Factors

Job Stress		Unadjusted OR* (95% CI)	Adjusted OR [@] (95% CI)
Job demands			
1. Owing to my workload, I always feel time pressure.	Agree	1.76(1.15,2.70)	2.05(1.28,3.28)
2. My job has become increasingly overbearing.	Agree	1.99(1.30,3.06)	2.34(1.46,3.77)
3. My work requires long lasting concentration.	Agree	2.59(1.67,4.02)	3.50(2.13,5.74)
4. I have to do various jobs simultaneously.	Agree	2.34(1.52,3.62)	3.15(1.93,5.14)
Job control			
5. My work requires creativity.	Agree	1.90(1.23,2.94)	2.15(1.31,3.54)
6. My work requires a high level of skill or knowledge.	Agree	2.36(1.46,3.80)	2.83(1.67,4.80)
7. I can make my own decisions in my job and have influence over the work.	Agree	1.63(1.06,2.51)	1.47(0.88,2.46)
8. I can control my pace of work and time schedule.	Agree	1.60(0.85,2.98)	1.51(0.77,2.98)
Interpersonal conflict			
9. My supervisor is helpful in getting the job done.	Agree	0.53(0.35,0.81)	0.53(0.33,0.84)
10. My coworker is helpful in getting the job done.	Agree	1.22(0.74,2.01)	1.08(0.63,1.86)
11. I have someone who understands my difficulties at work.	Agree	0.54(0.36,0.83)	0.53(0.34,0.85)
Job insecurity			
12. My future is uncertain because the current situation of my company is unstable	Agree	1.22(0.80,1.86)	1.20(0.74,1.92)
13. Undesirable changes (ie, downsizing) will come to my job.	Agree	2.45(1.58,3.79)	3.28(2.01,5.37)
Organizational system			
14. The organizational policy of my company is fair and reasonable.	Agree	0.81(0.52,1.27)	0.69(0.42,1.12)
15. My company provides me with sufficient organizational support.	Agree	0.48(0.31,0.73)	0.47(0.29,0.74)
16. Departments cooperate each other without conflicts.	Agree	0.51(0.33,0.77)	0.50(0.32,0.80)
17. I have opportunities and channels to talk about my ideas.	Agree	1.21(0.79,1.85)	1.20(0.75,1.92)
Lack of reward			
18. My salary is not commensurate with my effort and work performance.	Agree	0.70(0.46,1.07)	0.67(0.42,1.05)
19. I believe that I will be given more rewards from my company if I work hard.	Agree	0.66(0.43,1.02)	0.65(0.41,1.03)
20. I am provided with the opportunity to develop my capacity.	Agree	0.57(0.37,0.87)	0.57(0.36,0.91)
Workplace environment			
21. Dining out after work makes me uncomfortable	Agree	1.43(0.93,2.18)	1.53(0.97,2.42)
22. I am asked to do my work with irrational principles or inconsistency.	Agree	0.82(0.52,1.29)	0.70(0.43,1.14)
23. My company climate is authoritative and hierarchical.	Agree	2.33(1.51,3.60)	3.21(1.97,5.23)
24. I am at a disadvantage because I am a woman.	Agree	1.17(0.77,1.78)	1.17(0.74,1.86)

Notes: *Model I: Odds ratio (OR). Confidence interval (CI). @Model II: adjusted by hospital size, age, marital status, Body Mass Index (BMI), highest educational level, practice years in midwifery, weekly working hours.

is essential to ensure a high quality of woman-centered midwifery care.³⁴ Therefore, efforts to prevent injuries are of great importance, particularly in light of the midwifery shortage. Our findings may highlight the need to control this problem as well as its consequences on the physical and psychological health and wellbeing of the midwifery staff.

Results from our current study offer an interesting insight into the association between job stress and WMSDs among hospital midwives. This finding could be explained by the fact that muscle strain would be intensified if job-related psychological burdens become heavier due to work stress, which can increase the awareness of

musculoskeletal symptoms or weaken the capability to manage the symptoms.^{35,36}

We found that all items from job demands were associated with the occurrence of WMSDs. Midwives who always feel time pressure owing to their workload were more likely to have suffered WMSDs in the previous 12 months. Midwives who thought that her/his job has become increasingly overbearing reported a higher prevalence of WMSDs in the last 12 months. In addition, midwives who thought that their work requires long lasting concentration were also more likely to have suffered WMSDs in the last 12 months, as well as midwives who thought that they have to do various jobs simultaneously. It suggests that midwives experience a greater risk of WMSDs corresponding to higher job demands. There is a wealth of literature showing the association between high quantitative workloads and high cognitive demands and occupational injury.^{37–39} Our current study supports these findings to some extent.

Meanwhile, midwives who thought that their work requires creativity were more likely to have suffered WMSDs in the previous year as well as midwives who thought that their work requires a high level of skill or knowledge. This finding supports previous study indicating that workers had a higher risk of occupational injury when they had less job control.²⁵ However, Nowai L et al demonstrated that an association could not be found between insufficient job control and WMSDs.²³

On the other hand, midwives whose supervisor is helpful in getting the job done were nearly half as likely to have suffered WMSDs in the last 12 months; as well as midwives who have someone understand their difficulties at work. A study of the nursing workforce showed that low encouragement and help from management was associated with an decreased risk of occupational injury.⁴⁰ Our results are in agreement with it, although the nature of the job was different.

Our results suggested that midwives who thought that undesirable changes (ie, downsizing) will come to her/his job were more likely to have suffered WMSDs in the last 12 months. This finding is similar to the study result of Probst TM et al, who clearly indicated that workers in insecure jobs underwent more occupational injuries compared with those in secure jobs.⁴¹ It is worrying that due to the increase in birth levels with more women being pregnant at older ages and overweight/obesity, midwives facing more undesirable changes and in more insecure jobs.

The current study suggests that midwives who were provided with sufficient organizational support were less likely to have suffered WMSDs over a 12-month period. This report is

almost similar to one of a previous report in Hunan Province, China.⁴² To our knowledge, sufficient organizational support, like having strong support for safety programs, emphasis on environmental control, frequent safety related feedback or training, regular and open communication had profound impacts on occupational injury.⁴³ In recent years, the impact of organizational system on health care worker's occupational injuries has been increasingly studied.⁴⁴ To the best of our knowledge, improving organizational system offers numerous benefits.⁴⁵ According to this finding, these midwives whose departments cooperating each other without conflicts were less likely to have suffered WMSDs in the previous year. A study of Finish hospital personnel showed that low interpersonal conflicts was associated with an decreased risk of occupational injury.²³

It should also be noted that inadequate opportunity to develop their capacities is potential antecedent for the development of WMSDs.⁴⁶ Hospital midwives who provided with the opportunity to develop their capacities were less likely to have suffered WMSDs in the previous year. This seems to be consistent other research on midwives, for example Bazazan et al found an association between job satisfaction and MSD.⁴⁷ One possible explanation is that satisfaction at work can be influenced by opportunities for advancement, reward, professionalism and so on.^{48,49}

Finally, the probability of WMSDs among the midwives whose company climate is authoritative and hierarchical was increased. Musculoskeletal discomfort was previously reported to be statistically associated with poor lower company climate.⁵⁰ Such findings offer an interesting insight into the association between company climate and occupational injuries. A plethora of studies have proved that poor safety climate plays a important role in occupational injuries among healthcare workers.^{42,51} Our current study supports these findings to some extent. Reducing WMSDs among midwives can be achieved by optimizing the climate.⁴²

Limitations

Some limitations of this study must nevertheless be considered. First, there was possibility that the result was biased by using self-reported questionnaires without any clinical examination to confirm the presence of symptoms and exclude overestimated self-reported musculoskeletal complaints. Second, the sample size was limited to only one city in Hunan Province, China, thereby the results cannot be generalized. Finally, definitive conclusion about causal relationship between job stress and WMSDs cannot be drawn with a cross-sectional design, which allowed the interference of

uncontrolled factors. Future analyses of longitudinal data would be desirable to verify the study findings.

Implications

The prevalence of, and factors associated with, WMSDs among health-care workers are well-demonstrated in the literature. Some previous studies have investigated the association between job stress and occupational injuries. However, little is known about association between job stress and WMSDs in midwives. Despite the limitations mentioned above, this study has shed light on the relationship between job stress and WMSDs among this population. This study has important implications for future research in related fields. First, given the fact that the sample size was limited to only one city in Hunan Province, China, the results of this study may not be generalized, further studies with efforts to conduct in wider areas of China are encouraged to further validate the results obtained from this study. Beyond that, further research is needed to explore how to develop strategies to manage or mitigate job stress at work in this occupational group. Lastly, there was possibility that the result was biased by using self-reported questionnaires and missing some potential confounders.

Conclusions

In summary, our study revealed that there was an association between increased job stress and WMSDs among hospital midwives. This research underscores the need for midwives and managers to reinforce risk awareness and highlights the job stress factors that should be ameliorated to prevent WMSDs among midwives. The results are crucial to promote risk-awareness and actions for risk management. Given the multifaceted nature of identified risk, a comprehensive approach to reduce WMSDs is clearly required and a job stress management program will be essential. In an effort to achieve that goal, intervention strategies should focus on decreasing work demand, improving job control, interpersonal conflicts, Job insecurity and optimizing the organisational system, reward as well as workplace environment.

Abbreviations

WMSDs, work-related musculoskeletal disorders; MSDs, musculoskeletal disorders; GBD, The Global Burden of Disease; NMQ, Nordic Musculoskeletal Questionnaire; BMI, body mass index.

Data Sharing Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of the XiangNan University (ref. 39/2018) in accordance with the Declaration of Helsinki. Written consent was obtained from all participation at the time of data collection.

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Disclosure

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