

ANALYSIS OF INDIVIDUAL, PHYSICAL, AND PSYCHOSOCIAL RISK FACTORS ON WORK-RELATED SKELETAL MUSCLE DISORDERS IN WORKERS IN TOURISM SECTOR: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Based on observations and interviews conducted with workers in the tourism sector, there were subjective complaints of work-related skeletal muscle disorders experienced by workers. But it was still an inadequate explanation of the cause of work-related skeletal muscle disorders in workers. This study aimed to investigate the analysis of individual, physical, and psychosocial risk factors on work-related skeletal muscle disorders in workers at the tourism sector.

Subjects and Method: A systematic review was conducted by searching from PubMed, Science Direct, and Scopus databases. The inclusion criteria were the studies identifying the association of individual, physical, and psychosocial risk factors with work-related skeletal muscle disorders in workers of the tourism sector. The articles must be published full texts in English-language between 2005 and 2020. The quality, measure of association, and level of evidence of the selected studies were critically appraised. The data were reported according to PRISMA flow chart.

Results: Twelve articles, consisting of ten cross-sectional, one exploratory, and one cohort study designs, were obtained. The study subjects worked at hotels and restaurants. Nine articles showed high quality, and the other three articles showed low-quality. These articles reported an association between risk factors and work-related skeletal muscle disorders. The individual, physical, and psychosocial risk factors included gender, BMI, repetitive motion, excessive reaching, and the number of room cleaning per day.

Conclusion: Twelve articles with different quality show the association between risk factors and work-related skeletal muscle disorders. The risk factors include gender, BMI, repetitive motion, excessive reaching, and the number of room cleaning 4per day in workers of the tourism sector.

Keywords: work-related skeletal muscle disorders, risk factors, ergonomy, tourism

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BACKGROUND

Skeletal Muscle Disorders (WSMDS) are experienced by many workers from various sectors and impact workers and work organizations. Data from the Bureau of Labor Statistics (USA) showed that there were 307,640 cases of work-related skeletal muscle disorders (WSMDS) with an average of 34 cases for every 10,000 permanent workers. The recorded cases only showed incidents that resulted in workers being absent from work for one or more days. Based on a survey by the European Survey on Working Conditions (ESWC) in France in 2005, it was

found that the greatest prevalence of WSMDS was in the agriculture, construction, hotel, and restaurant sectors (European Agency, Safety, and Health at Work, 2010).

Several studies had been carried out related to WSMDS in the tourism industry, including restaurant and hotel workers. Chyuan et al. (2004) conducted a study on 905 restaurant workers; 784 (84%) reported feeling the presence of WSMDS in the last month with the highest prevalence found in the shoulder (58%), the highest mean score for pain intensity was found in the lower

back, only a few employees who did not report WSMDS (12%) (Chyuan et al., 2004).

Whereas Gawde (2018) conducted research related to WSMDS on 1,183 hotel workers in India found that 45% of workers had WSMDS, 27% back pain, leg pain (17%), joint pain (13%), and neck pain (7%). This study also suggested a relationship between work tenure, type of work, load lifted, and psychological well-being of WSMDS for hotel employees (Gawde, 2018). The risk factors that have been studied have a relationship with WSMDS in employment in the tourism industry, including sleep quality, age, work shift, work share, work intensity, and physical activity (Lee et al., 2013).

Research related to WSMDS conducted in tourism, in particular in Indonesia was still minimal. According to the Central Bureau of Statistics of the Republic of Indonesia, tourism is one of the sectors with an income of 19.29 billion US \$. It contributed to Indonesia's second-place foreign exchange. In their daily work, workers in the tourism sector such as restaurants, theme parks, nature tourism parks, hotels, and water parks certainly have ergonomic risk factors, both psychosocial (workload, work shifts, relations between employees, etc.), physical (static standing, awkward posture, overreaching, and carrying goods for visitors) and individual characteristics (age, sex, and smoking behaviours). This study aimed to systematically review the literature related to the causes of WSMDS in tourism workers.

SUBJECTS AND METHOD

1. Study Design

This study was a systematic review. Search systematically using the PubMed, ScienceDirect, and Scopus databases. The keywords used were WSMDS OR "work related musculoskeletal disorder" OR "work related musculoskeletal discomfort" AND hotel OR restaurant OR theme park OR water park AND attraction.

2. Population and Sample

Articles were searched considering PICO eligibility. The population in this study were workers in the tourism sector (hotels, restaurants, playgrounds, water parks, or attractions). The intervention was in the form of investigating the relationship between ergonomic risk factors (physical, psychosocial, and individual ergonomics). The outcome of this study was WSMDS.

3. Inclusion and Exclusion Criteria

The inclusion criteria in this study included: on the theme of WSMDS, research conducted in the tourism sector, publication year 2005 to 2020, using English, analyzing the relationship between risk factors (individual or physiological or psychosocial ergonomics) with WSMDS, and any research design. Criteria exclusions in this study were: not WSMDS, not tourism workers, articles not in English, articles did not explain the correlation between risk factors, and were irrelevant.

4. Data Analysis

There was a 5-point quality scale based on the need for epidemiological research, including (1) Having a clear description of WSMDS and one of the types of WSMDS; (2) Study population was described; (3) There were individual risk factors/ physical or psychosocial ergonomics in the study; (4) Risk factor data were obtained through validated instruments; and (5) Measurement results (OR, RR) were reported with 95% confidence intervals. Assessment of the level of evidence was determined based on the amount, quality, and output of the literature obtained. Evidence level category were: (1) Strong evidence: had consistently found findings in several (>1) high quality studies; (2) Moderate evidence: there were findings in 1 high quality study and one or more studies of low quality or in several studies of low quality; and (3) Insufficient evidence: only one existing study or the inconsistency of the findings

in several studies. The strength of the relationship between variables was obtained based on the method used by Hemingway and Marmot (1999) as follows: (1) Has no statistically significant positive relationship: $p > 0.050$ or odds ratio (OR) or relative risk (RR) < 1 or below 95% CI; (2) Moderate relationship: OR or RR > 1.00 to < 2.00 ; (3) Strong relationship: OR or RR > 2.00 .

RESULTS

The number of literatures that had been adjusted based on the discussion of risk factor relationships WSMDS from 3 databases of 12 literature consisting of 10 study designs cross-sectional, 1 exploratory study, and 1 study cohort. Based on the respondent's subject, there were 5 literature at hotels and 7 literature at restaurants, no respondent's subjects were found in the theme park, water park, and attractions (Table 1). Based on the quality analysis (Table 2), it was known that there were 9 high quality studies and 3 low quality studies. Risk factors in the results of this search will then be analyzed based on the level of quality, relationship, and level of evidence related to WSMDS.

Work repetitive, excessive reaching movement, and the number of bedrooms per day cleaning was a risk factor to the level of evidence and positively associated with WSMDS. Lifting goods was a risk factor with moderate evidence and is positively related to WSMDS. Meanwhile, there is not enough evidence and a positive relationship between physical workload and WSMDS.

There were several psychosocial risk factors for WSMDS that were identified through a systematic review. These factors included; effort reward, number of hours worked, sleep satisfaction, discrimination from management, part-time work positions, and work experience. Work experience and number of hours worked were factual or risk with moderate evidence and positively

related to WSMDS. Meanwhile, there was not enough evidence and a positive relationship between effort reward, number of hours worked, discrimination from management, and employment status with WSMDS.

DISCUSSION

The individual risk factors found a strong level of evidence (strong evidence) on gender and BMI. This result was in line with several studies which stated that the prevalence ratio of WSMDS in women was 50% greater than that of men, depending on the work performed by the workers themselves. (Cavallari et al., 2017). Women were more susceptible to WSMDS because women face increased body fluid retention and psychological conditions when hormone changes during pregnancy and menopause (Nunes, 2012). Other reasons that increased WSMDS levels in women can be attributed to physiological differences, lower muscle strength, anthropometry or hormonal problems (Nunes, 2012; Tarwaka and Bakri, 2004).

The BMI relationship in this study is in line with several studies which stated that overweight/ obesity had a positive relationship with WSMDS pain in labor shoulders (OR= 2.21) (Moreira-Silva et al., 2013). Research conducted by Onyemaechi et al. (2016) stated that increasing the lumbosacral angle can change the biomechanics of the spine, thereby increasing the incidence of low back pain. (Onyemaechi et al., 2016). At the level of individual risk factors found strong evidence (strong evidence) in the repetitive work, excessive reaching movement, and the number of bedrooms per day cleaning. Work that required repetition in the long term can cause muscle fatigue and if there is not enough recovery, it can lead to changes in muscle structure (WHO, 2003).

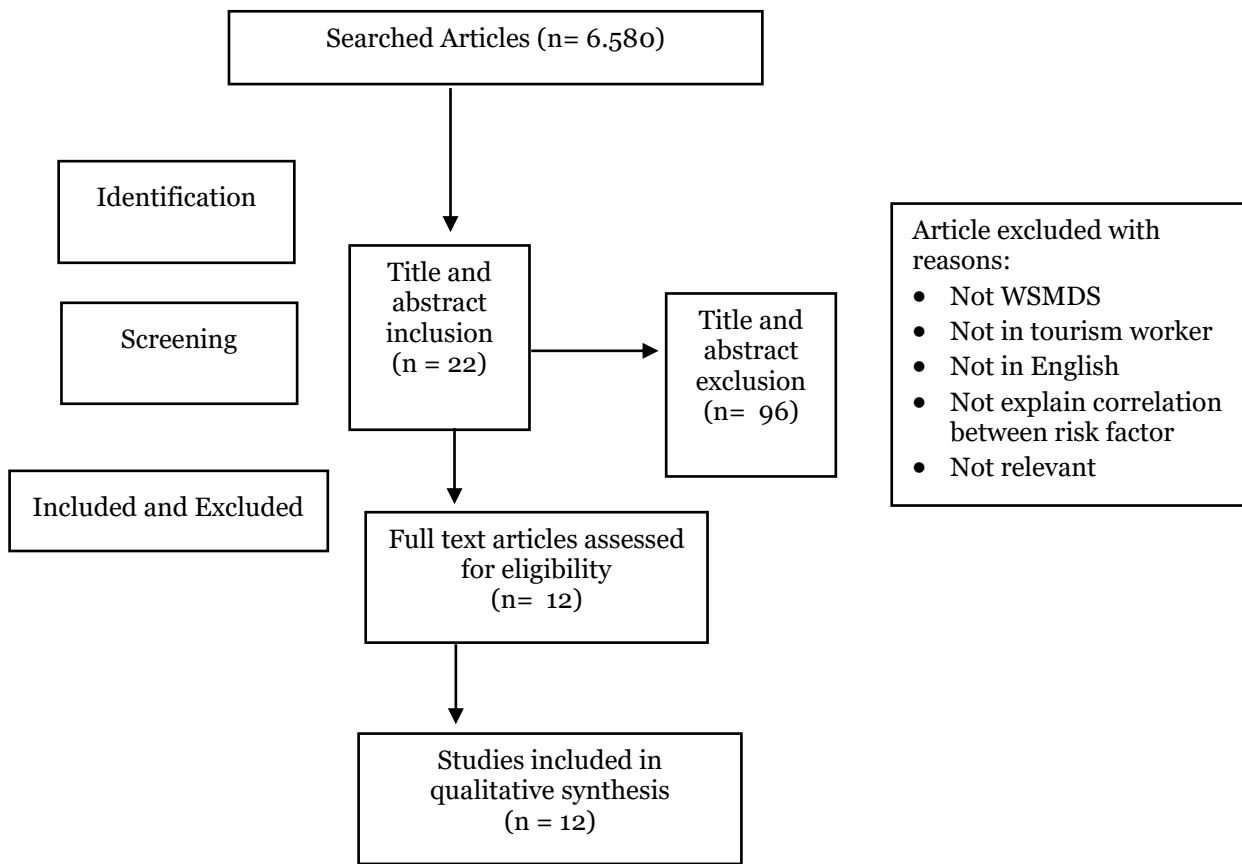


Figure 1. Search Articles Flowchart

Table 1. Summary sources of the relationship between risk factors and WSMDS

No.	Author (years)	Article Title	Journal	Study Population	Instrument	Risk Factor	Body Parts	OR / RR / PR / P-Value (95% CI)	
1	Liu et al. (2011)	Prevalence and risk factors of subjective musculoskeletal symptoms among cooks in Taiwan.	Journal of the Chinese Institute of Industrial Engineers	765 restaurant workers	Nordic Musculoskeletal Questionnaire , Chinese Labor Safety and Health Management Society, Supplementary questionnaire survey	Gender: Women	Upper back	OR: 1.55 (1.06 to 2.29)	
							Neck	OR: 1.70 (1.26 to 2.33)	
							Shoulder	OR: 1.70 (1.22 to 2.35)	
							Upper back	OR: 1.58 (1.16 to 2.16)	
						Frequency lifting	Lower back	OR: 1.75 (1.28 to 2.40)	
							Elbow	OR: 1.61 (1.19 to 2.19)	
							Finger/wrist	OR: 1.68 (1.24 to 2.28)	
							Thigh	OR: 1.50 (1.03 to 2.20)	
							Knee	OR: 1.53 (1.10 to 2.11)	
							Elbow	OR: 1.11 (1.03 to 1.20)	
2	Burgel et al. (2010)	Psychosocial work factors and shoulder pain in hotel room cleaners.	American Journal of Industrial Medicine	1,276 hotel workers	Job Strain, iso-strain, ERI	Number of work hours	Finger/wrist	OR: 1.09 (1.01 to 1.18)	
							Knee	OR: 1.12 (1.04 to 1.22)	
							Foot	OR: 1.99 (1.31 to 3.02)	
							Shoulder	OR: 1.52 (1.06 to 2.17)	
							Routine physical exercise	Knee	OR: 1.63 (1.12 to 2.36)
3	Krause et al. (2005)	Physical workload, work intensification, and prevalence of pain in low wage workers: Results from a participatory research project with hotel room cleaners in Las Vegas.	American Journal of Industrial Medicine,	1,276 hotel workers	Job Content Questionnaire , FGD	Effort Reward Imbalance	Shoulder	OR: 2.99 (1.95 to 4.59)	
							Number of rooms cleaned per day	body	OR: 1.34 (0.90 to 1.98)
								Neck	OR: 1.46
								body	OR: 4.6 (2.57 to 8.23)
	Physical workload index	Upper back	OR: 3.54 (1.94 to 6.47)						
		Lower back	OR: 3.74 (2.00 to 7.00)						

						Body	OR: 4.46 (2.44 to 8.15)
						Ergonomic problems index	Neck OR: 5.42 (2.95 to 9.97)
						Upper back	OR: 4.17 (2.25 to 7.74)
						Lower back	OR: 4.65 (2.47 to 8.76)
						Work intensification	Body OR: 2.16 (1.24 to 3.75)
						Part-time worker	Lower back OR: 3.22 (1.42 to 7.33)
4	Wami et al. (2019)	Work-related risk factors and the prevalence of low back pain among low wage workers: Results from a cross-sectional study.	BMC Public Health	422 hotel workers	Standardized Nordic Questionnaire	Over-stretching work	Lower back OR: 2.93 (1.53 to 5.60)
						Repetitive flexion of spine	Lower back OR: 1.97 (1.03 to 3.75)
						>30 bed places per day	Lower back OR: 3.19 (1.50 to 6.77)
						Men in kitchen	MSDS OR: 1.92 (1.03 to 3.79)
						Male workers with low sleep satisfaction	MSDS OR: 2.52 (1.57 to 4.04)
						Women aged 30-34	MSDS OR: 3.32 (1.56 to 7.04)
5	Lee et al. (2013)	The Relationship between Musculoskeletal Symptoms and Work-related Risk Factors in Hotel Workers.	Annals of Occupational and Environmental Medicine	1,320 hotel workers	Nordic Musculoskeletal Questionnaire	Women working shifts	MSDS OR: 1.60 (1.02 to 2.59)
						Women who work more intensive jobs	MSDS OR: 1.88 (1.17 to 3.02)
						Women with low sleep satisfaction	MSDS OR: 2.17 (1.34 to 3.50)
						Occupations that require repetitive movements	Neck OR: 1.98 (1.01 to 3.87)
6	Wami et al. (2019)	The impact of work-related risk factors on the development of neck and upper limb pain among low wage hotel housekeepers in Gondar town, Northwest Ethiopia: Institution-based cross-sectional study.	Environmental Health and Preventive Medicine	422 hotel workers	Standardized Nordic Questionnaire	Work requiring stretching or excessive stretching	Upper body OR: 6.44 (2.99 to 13.84)
							Neck OR: 3.72 (1.81 to 7.66)
							Upper body OR: 3.33 (1.48 to 7.51)

					Age 25-29	Upper body	OR: 3.39 (1.63 to 7.07)
7	Jahangiri et al. (2019)	Self-reported, work-related injuries and illnesses among restaurant workers in Shiraz city, South of Iran.	Annals of Global Health	300 restaurant workers	questionnaires	Age Work experience in years	MSDS MSDS p <0.001 p <0.001
8	Kim et al. (2013)	Perceived discrimination from management and musculoskeletal symptoms among New York City restaurant workers.	International Journal of Occupational and Environmental Health	502 restaurant workers	NIOSH HHE	Discrimination from management	Upper extremity Any body part Lower back PR: 4.90 (2.10 to 11.40) PR: 2.60 (1.60 to 4.10) PR: 1.40 (0.70 to 2.80)
9	Dempsey et al. (2006)	Cross-sectional investigation of task demands and musculoskeletal discomfort among restaurant wait staff.	Ergonomics	100 restaurant workers	Questionnaire Kuorinka and Focier (1995),	Lifting with a bad position	Lower back *
10	Chyuan et al. (2008)	Musculoskeletal disorders in hotel restaurant workers.	Occupational Medicine	328 restaurant workers	Physical fitness test, Discomfort level checklist (DLC), Fatigue Syndrome Checklist (FSC) from NIOSH/OSHA/CDC	Height Weight BMI Work time in month	Right knee Right knee Right knee Left knee Lower left knee Lower right leg Lower right foot Right arm WSMDS OR: 2.76 (1.31 to 5.80) OR: 4.65 (1.48 to 14.5) OR: 58.20 (3.09 to 1.09) OR: 1.01 (1.00 to 1.03) OR: 1.01 (1.00 to 1.024) OR: 1.01 (1.00 to 1.02) OR: 1.01 (1.00 to 1.03) OR: 1.03 (1.00 to 1.05) OR: 1.29 to 1.34
11	Shiue et al. (2008)	Musculoskeletal disorder among 52,261 Chinese restaurant cooks cohort: Result from the National Health Insurance Data.	Journal of Occupational Health,	52,261 restaurant workers	National Health Insurance of Taiwan	Work as a chef Non-chef workers aged 35-39 years	<i>Carpal Tunnel Syndrome</i> WSMDS OR 1.76 (1.50 to 2.10) OR 1.42 (1.39 to 1.46)
12	Laparriere	Work activity in food	Applied	64	Quebec Health and	Women	WSMDS **

et al. (2017)	service: The significance of customer relations, tipping practices and gender for preventing musculoskeletal disorders.	Ergonomics	restaurant workers	Social Survey, Nordic Questionnaires	Work hour	Wrist Lower part of body	**
					Frequency of carrying loads	Low back	**
						Foot	**

Table 2. Articles Quality Level Analysis

No	Author	Population	Instrument validated	Description WSMDS	One or a combination of risk factors for WSMDS	95% CI	Total Score	Quality level
1	Li-Wen Liu	1	1	1	1	1	5	High
2	Barbara J. Burgel	1	1	1	1	1	5	High
3	Niklas Krause	1	1	1	1	0	4	High
4	Sintayehu Daba Wami	1	1	1	1	1	5	High
5	Jin Woo Lee	1	1	1	1	1	5	High
6	Sintayehu Daba Wami	1	1	1	1	1	5	High
7	Mehdi Jahangiri	1	0	1	1	0	3	Low
8	Hyun Kim	1	1	1	1	1	5	High
9	Patrick G. Dempsey	1	0	0	1	0	2	Low
10	Jong-Yu Chyuan	1	1	0	1	1	4	High
11	Huei-Sheng Shiue	1	0	1	1	1	4	High
12	Eve Laparriere	1	1	0	1	0	3	Low

Score interpretation:
4-5= high quality literature
1-3= low quality literature

Excessive muscle stretching occurs because the exertion required exceeds the optimal muscle strength, if this is done frequently it can increase the risk of muscle complaints, and can even cause skeletal muscle injury (Tarwaka and Bakri, 2004). The amount of room cleaning per day is a risk factor for WSMDS due to the activities carried out in it. Allread et al. (2013) in Hedge (2017) stated that the majority of hotel room cleaning activities are at high risk (Hedge, 2017).

Psychosocial risk factors with moderate evidence for subjective complaints of WSMDS in tourism workers were work experience and working hours. This finding was in accordance with the research of Joseph et al. (2016) which explained that work experience is significantly related to WSMDS because as you get older and years of work, workers become physically weaker,

thus, increasing the likelihood of getting WSMDS (Joseph et al., 2016).

The risk factors for WSMDS had different relationships and levels of evidence. Based on a systematic literature review conducted from 12 literature, there were several risk factors that have a strong level of evidence related to WSMDS in tourism sector workers, including gender, BMI, repetitive movements, excessive reaching movements, and the number of rooms cleaning per day.

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