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Original Article

The Risk of Bag-Carrying Related to Musculoskeletal Pain in Medical Students

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Abstract

Background : Musculoskeletal discomfort affects medical students' neck, shoulders, and back. Musculoskeletal pain may be linked to bag-carrying behaviors, which encompass the manner of carrying, duration of use, and weight of the bag. This study aims to determine the relationship between bag-carrying habits and musculoskeletal pain.
Methods : This is an observational analytic study with a cross-sectional approach. From 2022–2023, the research subjects were 70 Sriwijaya University medical students who met the inclusion and exclusion criteria. The sampling method employed a simple random sampling technique. We analyzed the obtained data using the Chi-square test in SPSS software.
Results : The majority of the subject was 20 years old and female. Most patients with musculoskeletal pain experience mild complaints in the lower neck (47.14%), right shoulder (41.43%), and back (41.43%). All of the *p-values* are ≥0.05, including how to carry a bag, bag weight, and the duration of using a bag with neck, shoulder, and back pain among medical students of Sriwijaya University.
Conclusion : There is no significant relationship between bag-carrying habits, which include how to carry a bag, bag weight, and the duration of using a bag, with neck, shoulder, and back pain among medical students of Sriwijaya University.

Keywords : bag-carrying, musculoskeletal disorders, medical students

INTRODUCTION

Medical students often carry thick and heavy books as part of their learning requirements.[1] Technology advancements have replaced the physical burden of books with digital loads, substituting bulky books with electronic files, and filling students' bags with modern devices like laptops, iPads, and similar gadgets.[2] The appropriate use of bags is essential to facilitate the transportation of numerous learning materials, bags must be used appropriately. Various bags are available for carrying items according to needs and purposes.[3,4]

Backpacks are commonly chosen because they can carry heavier loads and distribute the weight across most of the user's body. However, some individuals, especially women, opt for shoulder bags for aesthetic reasons due to their diverse designs. These bags can increase pressure on muscles, ligaments, joints, and bones, leading to musculoskeletal pain.[5] In 2018, a study on female Oxford students from various faculties found a highly significant correlation between musculoskeletal pain and time spent carrying bags.[6] Research on medical students at the University of Sumatera Utara indicated that students carrying bags on both shoulders were more likely to experience neck pain than those using a single-shoulder bag.[7] Several studies conclude that the neck, shoulders, and lower back experience the most common musculoskeletal pain.[6,7]

Musculoskeletal pain is a prevalent issue among medical students.[7,8] A study on the prevalence of Musculoskeletal Disorders (MSDs) among medical students in Saudi Arabia found that 59.8% of medical students experienced pain in at least one location in the past year. The most frequently reported musculoskeletal regions were the neck (36.7%), followed by the lower back (33.3%) and shoulders (22.3%) in the past year and week, but reports in the last week were less common.[9] This is somewhat different from previous research reporting musculoskeletal pain incidents in medical students at a university, with the majority in the lower back (38.2%), followed by the neck (27.2%), and lastly, the shoulders (19.7%).[10]

The above description suggests that musculoskeletal pain in medical students may be associated with the habit of carrying bags, including the carrying method, the duration of use, and the weight of the bag. This research aims to identify the distribution of bag-carrying methods, bag weight, and duration of bag use among students in the Medical Education Programme at the Faculty of Medicine, University of Sriwijaya and analyse its relationship with musculoskeletal pain. The limited availability of data on musculoskeletal pain experienced by medical students at the Faculty of Medicine of Sriwijaya University has piqued the researchers' interest in studying the relationship between bag-carrying habits and musculoskeletal pain among medical students at Sriwijaya University.

METHODS

This study is an observational analytic study with a cross-sectional approach. The research subjects were 70 medical students of Sriwijaya University for the period of 2022–2023 who met the inclusion and exclusion criteria. The sampling method used a simple random sampling technique. The musculoskeletal pain collected by Numeric Rating Scale Pain (NRS) and Nordic Body Map by questionnaire and was analyzed using the Chi-square test with SPSS software. This research also has been confirmed by ethical clearance No 186-2023 declared by Ethics Committee from Faculty of Medicine Sriwijaya University, Palembang, Indonesia.

RESULTS

The respondents' ages were varied, with nearly half being 21 years old (48.57%), 24.29% being 20 years old, and the

TABLE 1
Distribution of Research Subjects Based on Bag Usage Habits

		n	%
Habits of bag-carrying	One side of shoulder	39	55.71
	Both shoulders	31	44.29
Bag weight	>10% BW	4	5.71
	<10% BW	66	94.29
Duration of bag carrying	>30 minutes	24	34.29
	15–30 minutes	14	20.00
	10–15 minutes	26	37.14
	<10 menit	6	8.57

TABLE 2
Frequency Distribution of Students Based on Musculoskeletal Pain

Pain Location	Pain Category								N
	No Pain		Mild		Moderate		Severe		
	n	%	n	%	n	%	n	%	
Upper neck	38	54.29	23	32.86	8	11.43	1	1,43	70
Lower Neck	26	37.14	33	47.14	10	14.29	1	1,43	70
Left Shoulder	32	45.71	24	34.29	12	17.14	2	2,86	70
Right Shoulder	21	30.00	29	41.43	20	28.57	0	0,00	70
Left Upper-arm	57	81.43	11	15.71	2	2.86	0	0,00	70
Upper Back	28	40.00	29	41.43	11	15.71	2	2,86	70
Right Upper Arm	49	70.00	17	24.29	4	5.71	0	0,00	70
Waist	29	41.43	27	38.57	13	18.57	1	1,43	70
Lower Back	46	65.71	18	25.71	6	8.57	0	0,00	70
Buttocks	58	82.86	10	14.29	2	2.86	0	0,00	70
Left Elbow	67	95.71	3	4.29	0	0.00	0	0.00	70
Right Elbow	65	92.86	5	7.14	0	0.00	0	0.00	70
Left Lower Arm	64	91.43	5	7.14	1	1.43	0	0,00	70
Right Lower Arm	60	85.71	9	12.86	1	1.43	0	0,00	70
Left Wrist hand	64	91.43	5	7.14	1	1.43	0	0,00	70
Right Wrist Hand	59	85.51	9	13.04	1	1.43	0	0,00	69
Left Hand	64	91.43	5	7.14	1	1.43	0	0,00	70
Right Hand	60	85.71	8	11.43	2	2.86	0	0,00	70
Left Thigh	65	92.86	5	7.14	0	0.00	0	0.00	70
Right Thigh	62	88.57	8	11.43	0	0.00	0	0.00	70
Left Knee	67	95.71	3	4.29	0	0.00	0	0.00	70
Right Knee	65	92.86	5	7.14	0	0.00	0	0.00	70
Left Calves	58	82.86	9	12.86	3	4.29	0	0,00	70
Right Calves	59	84.29	8	11.43	3	4.29	0	0,00	70
Left Ankle	64	91.43	5	7.14	1	1.43	0	0,00	70
Right Ankle	59	84.29	9	12.86	2	2.86	0	0,00	70
Left Foot	63	90.00	6	8.57	1	1.43	0	0,00	70
Right Foot	63	90.00	5	7.14	2	2.86	0	0,00	70

lowest proportion being 23 years old (1.43% of the total respondents). More than half of the respondents were female (65.71%), while 24 individuals were male, or 34.29% of the total number of respondents.

According to the student distribution based on bag use patterns, most research subjects (55.71%) carry their bags on one shoulder. The majority of respondents (94.29%) carry bags that are less than 10% BB, and the duration of bag use is primarily between 10–15 minutes (37.14%) (Table 1). Based on the frequency distribution of students with musculoskeletal pain shown in the table below, the three places where the research subjects most often felt mild pain were the lower neck (47.14%), the right shoulder (41.43%), and the back (41.43%), which

TABLE 3
Relationship Between Bag-Carrying Habits and Neck Pain

Category		Neck Pain				N	*PR*	*p-value*
		Pain		No Pain				
		n	%	n	%			
Bag-carrying habits	One side of shoulder	27	69.2	12	30.8	39	1.129	0.487
	Both shoulders	19	61.3	12	38.7	31		
Bag weight	>10% BW	3	75	1	25	4	1.150	1.000
	<10% BW	43	65.2	23	34.8	66		
Bag Usage Duration	>30 minutes	15	62.5	9	37.5	24	1.000	1.000
	15–30 minutes	10	71.4	4	28.6	14		
	10–15 minutes	16	61.5	10	38.5	26		
	<10 menit	5	83.3	1	16.7	6		
Total						70		

TABLE 4
Relationship Between Bag-Carrying Habits and Shoulder Pain

Category		Shoulder Pain				N	*PR*	*p-value*
		Pain		No Pain				
		n	%	n	%			
Bag-carrying habits	One side of shoulder	31	79.5	8	20,5	39	1.368	0.052
	Both shoulders	18	58.1	13	41,9	31		
Bag weight	>10% BW	2	50	2	50	4	0.702	0.578
	<10% BW	47	71.2	19	28,8	66		
Bag Usage Duration	>30 minutes	20	83.3	4	16,7	24	1.033	0.834
	15–30 minutes	7	50	7	50	14		
	10–15 minutes	16	61.5	10	38,5	26		
	<10 menit	6	100	0	0	6		

had the same percentage as the right shoulder (Table 2).

The research subjects most frequently experienced the right location when viewed in the context of the moderate pain category. The left shoulder had a proportion of 17.41%, followed by the waist (18.57%) and the shoulder (28.57%). The Nordic Body Map Questionnaire identifies only five locations in the severe pain category: the left shoulder (2.86%), back (2.86%), abdomen (1.43%), upper neck (1.43%), and lower neck (1.43%).

The right shoulder exhibited a higher pain level than the left shoulder, as indicated by the proportion of no pain. The same assessment also revealed a higher incidence of discomfort in the lower neck compared to the upper neck. According to the Nordic Body Map, the left elbow and left knee are the least painful body regions, with a combined percentage of 95.71%.

This study used the Chi-square test to conduct statistical tests on a sample size of 70. If the chi-square test did not meet the requirements, the *p-value* was determined using Fisher's exact test results. More than 50% of the subjects who carry bags with one shoulder (69.2%) or both shoulders (61.3%) experience neck discomfort when viewed from the carrying bag perspective (Table 3). In the Chi-square test results, the *p-value* for the variable of how to transport a bag is 0.487. This suggests that no significant relationship exists between how students carry their bags and their neck pain at PSPD FK Unsri. In addition, the Chi-square test results for the bag weight variable did not indicate a

TABLE 5
Relationship Between Bag-Carrying Habits and Back Pain

Category		Back Pain				N	*PR*	*p-value*
		Pain		No Pain				
		n	%	n	%			
Bag-carrying habits	One side of shoulder	21	53.8	18	46.2	39	0.926	0.724
	Both shoulders	18	58.1	13	41.9	31		
Bag weight	>10% BW	3	75	1	25	4	1.376	0.624
	<10% BW	36	54.5	30	45.5	66		
Bag Usage Duration	>30 minutes	15	62.5	9	37.5	24	1.348	0.172
	15–30 minutes	9	64.3	5	35.7	14		
	10–15 minutes	10	38.5	16	61.5	26		
	<10 menit	5	83.3	1	16.7	6		

significant relationship with neck discomfort in PSPD FK Unsri students, with a *p-value* of 1.000. Musculoskeletal pain was experienced by over half of the research subjects who carried bags exceeding 10% of their body weight (75%), while 65.2% of the total group who carried bags below 10% experienced neck pain.

Based on the duration of bag use, the research subject who carried the bag for less than 10 minutes had the highest percentage of neck pain (83.3%). However, considering the number of students who experienced neck pain, the group that carried bags for 10–15 minutes (61.5%), comprising as many as 16 individuals, was the most affected. The relationship between the duration of bag use and neck pain was insignificant, as indicated by a *p value* of 1.000. Table 4 illustrates an analysis of the relationship between bag use habits and shoulder pain. The analysis results differ slightly from those of the study on neck pain. In the bag-carrying category, the group experiencing shoulder pain was more likely to carry the bag on one shoulder (79.5%). While in the category of bag weight, the group that carried a bag weight <10% of body weight (71.2%) showed a greater percentage than the other groups.

Based on the duration of bag use, the group that experienced shoulder pain with the highest percentage was the research subject who carried the bag for <10 minutes (100%). Meanwhile, when viewed from the number of students who experience shoulder pain, the most was the group who carrier bags with a duration of >30 minutes (83.3%), as many as 20 people. The relationship between the way of carrying a bag (p=0.052), the weight of the bag (p=0.578), and the duration of bag use (p=0.834) with shoulder pain is not significant based on the analysis results in Table 4.

Table 5 shows the results of the analysis of the relationship between bag use habits and back pain. Different results can be seen in the category of how to carry a bag, where the group with the highest percentage of pain is the group that carried the bag with both shoulders (58.1%). In addition, in the category of bag weight, the highest percentage is the group that carried a bag weight of more than 10% BW. However, in the category of duration of bag use, the highest percentage remained in the less than 10 minutes group (83.3%). Based on the *p-value* results, no significant relationship was found between the three variables of bag use habits and back pain experienced by the research subjects.

DISCUSSION

The research subjects in this study included all active PSPD students for the 2022–2023 period which included the Class of 2020, 2021, and 2022. Research sampling was carried out using a simple random sampling technique where respondents were randomly selected at each data collection time. The questionnaire was filled out voluntarily by students willing to become research samples.

The data collection results indicated that 73 students were willing to participate as research subjects in the study. Of this total number, it was found that three people failed to complete the questionnaire. Based on this, the final number of research samples in data processing amounted to 70 people. The majority of research subjects are female; this is also in line with the research on FK USU students in 2019.[7]

Based on the results of the distribution of research subjects according to bag usage habits, most students carry bags on one shoulder. When conducting the study, it was known that female respondents used more bags with one shoulder. These results show the same thing as the results of research on FK students at the University of

North Sumatra.[7] The study showed that female respondents were more likely to use bags with one shoulder, while men were more likely to use backpacks carried over both shoulders.[7] This is supported by a study that women prefer shoulder bags for appearance.[4] Most of the subjects in this study carried a burden of less than 10% of their body weight in their bags. The same phenomenon was demonstrated in a study of medical students in North Sumatra, where 149 out of 170 respondents carried less than 10% BW in their daily packs.[7]

The duration of bag use among respondents ranged from 10 to 15 minutes, influenced by their mode of transportation. Students living in boarding houses near campus tended to walk, resulting in longer bag-carrying times, whereas students commuting by vehicle reported shorter durations. Interestingly, the most common pain locations reported were the lower neck, right shoulder, and back. This pattern differs from earlier studies, such as research on musculoskeletal pain among medical students that identified the lower back as the most affected area (38.2%), followed by the neck (27.2%) and shoulders (19.7%).[1] Similarly, a study in Saudi Arabia reported the neck as the most frequent pain site, followed by the lower back and shoulders. This variation may be influenced by differences in lifestyle, posture, or cultural habits related to bag use and daily activities.

This study aimed to investigate the relationship between bag use habits and musculoskeletal pain. The findings revealed no significant association between how students carried their bags, bag weight, or duration of use with neck, shoulder, or back pain. These results are consistent with prior research among FK USU students, which also found no significant relationship between bag use patterns and musculoskeletal complaints. Similar conclusions were reported in other studies, which suggested that factors such as bag weight and carrying duration may not directly contribute to pain unless combined with other ergonomic or individual risk factors.[6]

The absence of a significant relationship in this study could be due to the relatively light bag weights and short carrying durations among participants. It is also possible that students adjusted their posture or load distribution to minimize discomfort, mitigating the potential impact of bag use on musculoskeletal pain. Additionally, other factors not assessed in this study, such as physical activity levels, pre-existing musculoskeletal conditions, or seating ergonomics during the study, may play a more prominent role in the development of pain.

CONCLUSION

The majority of medical students at Sriwijaya University carry packs with a weight of less than 10% BW on one shoulder for 10–15 minutes. The relationship between musculoskeletal discomfort and the habit of using bags among medical students at Sriwijaya University was not statistically significant.

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