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PREVALENCE AND GENDER DIFFERENCES IN MUSCULOSKELETAL DISORDERS AMONG SECONDARY SCHOOL STUDENTS IN SABAH, MALAYSIA: A CROSS-SECTIONAL STUDY

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Abstract: The transition from childhood to adolescence, defined by the World Health Organization as ages 10 to 19, marks a critical phase of physical, cognitive, and emotional development. Adolescents, especially those in secondary school, undergo significant changes in their bodies, often leading to musculoskeletal disorders (MSDs). These disorders are prevalent globally and have a substantial impact on individual's daily lives, including their education and recreational activities. This study, conducted in Sabah, Malaysia, aimed to determine the prevalence of MSDs among secondary school students and examine gender differences in MSD prevalence rates. A total of 449 students participated, with data collected using the Standardized Nordic Questionnaire (SNQ). Results revealed a high prevalence of MSDs, with 69.7% of students experiencing discomfort in the previous six months. Gender disparities were observed, particularly in the upper back and thigh regions, where females reported higher rates of MSDs compared to males. The findings highlight the need for comprehensive ergonomic programs tailored to school children, especially in regions like Sabah. Such programs could help reduce the risk of MSDs and raise awareness among students, families, and policymakers. Additionally, the study underscores the importance of further research to explore predictors associated with MSDs and develop targeted intervention strategies. By addressing MSDs early on, we can improve the health and well-being of school children and promote a conducive learning environment.

Keywords: Musculoskeletal Disorders, Adolescents, Secondary School Student, Prevalence, Gender Differences, Malaysia

INTRODUCTION

The classification of secondary school students as adolescents is based on their age falling within the range defined by the World Health Organization (WHO) as adolescence, which spans from 10 to 19 years. This time is recognized by the WHO as a transitional phase between childhood and maturity in Encyclopedia Britannica (Csikszentmihalyi, 2023). This stage is marked by the progression of physical, cognitive, and emotional maturation, during which individuals, influenced by their respective cultural backgrounds, strive to attain diverse objectives. This phase of human development encompasses physical transformations such as alterations in body composition, the onset of puberty, and the evolution of one's personality.

An asymmetry in growth patterns throughout puberty is observed, wherein bones exhibit a quicker rate of growth compared to muscles and tendons. This phenomenon is particularly pronounced in the context of spinal development. Adolescents attending secondary school often experience a period of adjustment to their changing bodies, characterized by reflection and heightened sensitivity. As a result, they commonly exhibit a rounded back posture, which can potentially contribute to the development of musculoskeletal disorders.

Musculoskeletal problems are a prevalent health concern across many age groups and genders worldwide (World Health Organization: WHO, 2022). Musculoskeletal diseases (MSDs) have garnered increased attention in both developed and developing nations due to their high frequency and the subsequent societal burden they impose (He et al., 2023). Hatefi et al., (2019) conducted a study that revealed that musculoskeletal problems are the predominant source of pain among students and adolescents. According to Malik et al. (2018), musculoskeletal problems are a prevalent source of disability globally. According to Atia et al. (2023), musculoskeletal problems affecting the neck, upper back, lower back, and thoracic region were found to be more prevalent among younger individuals.

Apart from the working population, MSDs are also experienced by school students (Hendi et al., 2021) and they are becoming increasingly common (Pranjić & Azabagic, 2019). According to the findings of Aktürk et al. (2018),

teenagers have encountered musculoskeletal disorders (MSDs) at least once in their lifetime. The prevalence of musculoskeletal disorders (MSDs) was found to be substantial, as 64.8% of the student population reported experiencing musculoskeletal pain or discomfort (Hendi et al., 2019). Additionally, 15% of adolescents have reported experiencing chronic musculoskeletal disorders on a weekly basis (Azabagić et al., 2016). According to Henschke et al. (2014), the annual incidence of musculoskeletal problems in children and adolescents in Australia is estimated to be 880,000 cases. According to statistical data provided by public health care in Australia, it has been observed that a proportion of 5.8 per 100 children under the age of 18 are diagnosed with musculoskeletal disorders. In Indonesia, it has been shown that a significant proportion of high school students, specifically 36.04 percent, experience musculoskeletal disorders (MSDs) (Wiguna & Adiatmika, 2019).

Musculoskeletal disorders encompass a range of conditions affecting the musculoskeletal system, including the muscles, tendons, joints, vertebrae, and nerves (National Academies Press (US), 2020). Individuals commonly experience various symptoms associated with MSDs ("Selected Health Conditions and Likelihood of Improvement with Treatment," 2020). According to Villa-Forte (2024), these symptoms encompass discomfort in the neck and back, pain in the shoulder accompanied by stiffness or reduced flexibility, sensations akin to being pricked in the hands and feet, as well as pain, swelling, and stiffness in the elbows or ankles.

Furthermore, according to Reynolds (2021), individuals may also encounter restricted mobility, stiffness, and diminished strength in the fingers, along with tingling sensations, coldness, rigidity, or a sensation of heat in the feet and heels. Limits associated with musculoskeletal disorders (MSDs) encompass the hindrance of engaging in various activities, such as those related to education and recreation. These limits can lead to school absenteeism and a reduction or cessation of physical activities among school-aged children (Shamsoddini et al., 2010). Previous research has indicated that gender disparities exist in pain perception (El-Metwally et al., 2007; Osborne & Davis, 2022). Additionally, in a study conducted by Kedra and Czaprowski (2013), it was shown that girls had a higher propensity for experiencing pain compared to boys when it came to carrying a school bag.

With most studies on MSDs that have been undertaken in developed countries; it is argued that the prevalence MSDs in developing countries such as Malaysia may not be like those reported in the developed countries (Mohd Azuan, et al., 2010). However, there are only a handful of studies in the literature that have been carried out to investigate the prevalence of MSDs among school children in Malaysia (Mohd Azuan et al., 2010).

Research Objective

Given this, the present study aimed to determine the prevalence of MSDs among secondary school children in Sabah, and (b) to examine gender differences on the prevalence rates of MSDs among school children at Sabah based on the body region. With this kind of study, it is hoped that the information gathered from the study could assist in promoting awareness among school children on the issue of MSDs.

METHODOLOGY

The present study was done in the state of Sabah, focusing on adolescents enrolled in secondary schools. The research received approval from both the Ministry of Education Malaysia and the Education Department of Sabah State. The researcher was selected as a participant through the utilization of a convenience sampling method. A total of 449 participants, consisting of 207 males and 242 females, were involved in the present study. The present study utilized a cross-sectional research design, employing questionnaires as the primary method for data collecting. The gender variable is considered the independent variable in this study, whereas the musculoskeletal disorder variable is regarded as the dependent variable.

The primary instrument employed in this research was the Standardized Nordic Questionnaire (SNQ), which had been appropriately translated into Malay. This tool was utilized to collect data pertaining to symptoms of musculoskeletal disorders (MSDs) across several anatomical regions among students in Sabah. The questionnaire underwent a process of validation to assess its validity and reliability. Prior to commencing data collecting, the researchers sought authorization from the Ministry of Education and obtained consent from the Department of Education of Sabah.

Subsequently, the researchers-initiated contact with each educational institution through telephone, when they sought consent from the respective school principals. Once the school made the decision to proceed, an appointment day and time were established for the execution of the study. During the data collection phase, the researchers initially disseminated a package of three components: (a) an information page, (b) informed consent documentation, and (c) a questionnaire. The participants were thereafter provided with an overview of the research and informed that their involvement in the study was optional. The participants then provided their approval to participate in the study.

The Human Ethics Committee at the University of Malaysia Sabah granted ethical consent for the project. The data analysis was conducted with IBM SPSS Statistics version 28 software. Descriptive statistics were computed and examined to determine the prevalence rate of MSD symptoms over a six-month period. This calculation was derived from the data obtained using the SNQ, with a focus on different body areas. The research aims involved the utilization of descriptive and inferential statistics, specifically employing a chi-square test to examine gender disparities in musculoskeletal disorders (MSDs) among secondary school students in Sabah.

RESULTS

The purpose of this study was to determine the prevalence and incidence of musculoskeletal disorders (MSDs) among secondary school students in Sabah, Malaysia. The study aimed to test the hypothesis that female students would exhibit a higher incidence of MSDs compared to their male counterparts. A descriptive statistical analysis was conducted on the participants (N = 449), revealing that the mean age was 14.78. The findings indicate that the six-month prevalence of musculoskeletal disorders (MSD) among school students in Sabah was 69.7% (95% confidence interval: 65.5%–73.5%). Both male and female students reported a similar level of discomfort, with 69.6% of males and 69.8% of females experiencing discomfort within the preceding six months.

Table 1: The prevalence rate of MSDs among school students in Sabah

Prevalence of Musculoskeletal Disorder	Male (n = 207)	Female (n = 242)	Total (n = 449)	Gender Differences (p)
No	63 (30.4%)	73 (30.2%)	136 (30.3%)	p = 0.951
Yes	144 (69.6%)	169 (69.8%)	313 (69.7%)	
Total	207 (46.1%)	242 (53.9%)	449 (100%)	

*Significant $p< 0.05$, X^2 = Chi Square Test

Table 2 displays the prevalence of musculoskeletal disorders (MSDs) categorized by body regions. Among the participants, the highest occurrence of MSDs was reported for knee pain/disorder, with a frequency of 53.0%. This was followed by neck pain/disorder (50.3%), elbow pain/disorder (48.1%), shoulder pain/disorder (40.8%), upper back pain/disorder (35.2%), thigh pain/disorder (33.9%), foot pain/disorder (30.5%), hand pain/disorder (29.2%), and finally, low back pain/disorder (28.7%).

Table 2: The Frequency of Occurrences MSDs among School Students at Sabah Based on The Body Region

Body Region	**Frequency (%)**
Knee	53.0%
Neck	50.3%
Elbow	48.1%
Shoulder	40.8%
Upper Back	35.2%
Thigh	33.9%
Foot	30.5%
Hand	29.2%
Low Back	28.7%

With regards to MSDs, the prevalence rate of musculoskeletal disorders by body region for the previous 6 months was shown in Table 2. There are only two parts of the body that have significant differences seen in the prevalence rate of MSDs between male and female students, which were the upper back (χ^2 =0.02, $p<0.05$) and thighs (χ^2 = 0.08, $p<0.05$). The prevalence of MSDs among secondary school students in Sabah during the previous 6 months for the upper extremities was 48.6% (95% CI: 43.7% -53.5%) and for the thigh part was 50.8% (95% CI: 46.3% -55.7%).

Table 3: The Prevalence rates musculoskeletal disorder among school children at Sabah based on body region and gender

Musculoskeletal Disorder		Male (%)	Female (%)	Gender Differences (p)
Neck				
	No	111 (53%)	112 (46.3%)	0.12
	Yes	96 (46.4%)	130 (50.3%)	
Shoulder				
	No	88 (42.5%)	91 (37.6%)	0.29
	Yes	119 (57.5%)	151 (62.4%)	
Elbow				
	No	111 (53.6%)	122 (50.4%)	0.49
	Yes	96 (46.4%)	120 (49.6%)	
Hand				
	No	106 (51.2%)	113 (46.7%)	0.34
	Yes	101 (48.8)	129 (53.3%)	
Upper Back				
	No	118 (57%)	113 (46.7%)	**0.02****
	Yes	89 (43%)	129 (53.3%)	
Lower Back				
	No	121 (58.5%)	127 (52.5%)	0.20
	Yes	86 (41.5%)	115 (47.5%)	
Thigh				
	No	111 (53.6)	110 (45.5%)	**0.08****
	Yes	96 (46.4)	132 (54.5%)	
Knee				
	No	103 (49.8%)	108 (44.6%)	0.27
	Yes	108 (50.2%)	134 (55.4%)	
Foot				
	No	93 (44.9%)	107 (44.2%)	0.88
	Yes	114 (55.1%)	135 (55.8%)	

*Significant $p< 0.05$, χ^2

DISCUSSION

The primary objective of this research was to determine the prevalence of MSDs among secondary school students in Sabah for 6 months. In the previous six months, the prevalence of MSDs was 69.7% (95%CI: 65.5%-73.5%) with 69.6% of males and 69.8% of females school students reporting

pain which was equal to previous studies conducted outside Malaysia which is at secondary school in Shaquira governorate, Egypt with (Atia et al., 2023). The prevalence rate of 69.7% was comparable to other studies such as Shamsoddini, Hollisaz & Hafezi (2010) in Iran but 20% higher than the prevalence rate among secondary school students in India which was 40.2 % (Ebrahim et al, 2020). The findings clearly showed that MSDs are experienced by school students.

The second objective of this study was to investigate the gender disparities among secondary school students in Sabah regarding musculoskeletal disorders (MSDs). There were no notable disparities based on gender in this study result. However, this study discovered variations in the prevalence rates of musculoskeletal disorders among schoolchildren in Sabah, specifically in relation to gender and body region. As the result, the finding also shows that there are gender differences in body region especially upper body. The females reported experiencing higher MSDs than their male in upper body.

The findings in this research reported that two body regions show a significant difference seen in the prevalence rate of MSDs between male and female students, namely in the upper back and thighs. The prevalence of MSDs among secondary school students in Sabah in the previous 6 months was for upper extremities 48.6% (95% CI: 43.7% -53.5%) and thigh was 50.8% (95% CI: 46.3% -55.7%). This result of the study in line with previous studies from Overstreet et al. (2023) which stated that musculoskeletal disorders exhibit a high prevalence and significantly impact females in terms of both frequency and severity in upper body when compared to males. It may be because female body was higher awareness to pain as stated from Breithecker et al, (2004) which reported that females have higher body awareness and lesser pain threshold and are therefore more likely to complain than male. In addition, females might have a higher prevalence rate than males due to their differences in muscle strength (Mohd Azuan, et al., 2010). Other research indicated that gender greatly affects the risk level of muscle complaints and the occurrence of MSDs (Lestari et al., 2020).

The likelihood of developing muscle problems is significantly influenced by gender. This study aligns with the research conducted by Shan in Shanghai, which demonstrated that gender is a significant factor associated with the

occurrence of muscle pain complaints (Shan et al., 2013). According to a study conducted by Kok et al., (2018), there is a positive association between the female gender and elevated prevalence of musculoskeletal disorders in the upper body region. This phenomenon occurs due to physiological differences, whereby the muscular capacity of females is comparatively lower than males. Epidemiological studies have indicated that females exhibit a higher susceptibility to the development of musculoskeletal diseases in the upper back region (Overstreet et al., 2023), specifically the neck-shoulder area, when engaging in low-intensity and repeated tasks. Previous studies have consistently found that work-related musculoskeletal disorders (MSDs) are more prevalent among females compared to males (Schneider et al., 2010).

Specifically, these MSDs tend to affect the upper back, including the neck, shoulder, and arm regions (Srinivasan et al., 2016). The occurrence of upper back pain, namely at the neck and shoulder region, in youngsters is regarded as a potential risk factor for health complications during maturity. Hence, the identification and comprehension of pain, as well as its prompt intervention, are imperative to mitigate subsequent consequences (Gheysvandi et al., 2019). This finding fulfills the objective of the study which is to examine gender differences on the prevalence rates of MSDs among secondary school students at Sabah considering the frequency of MSD based on the body region

CONCLUSION

The current study is one of only a few studies aimed to determine the prevalence and gender differences among secondary school students with MSDs in Sabah, Malaysia. These overall results seemed to indicate a greater prevalence among secondary school students in Sabah. Like other research, this present research also has limitations, one of which is that all variables were measured using survey and self-report methods, implying that the findings may have led to a generally negative perception of the student situation.

Other than that, the recommendations' part for future studies is based on the contributions and limitations identified in this study. First of all, this study proves that MSDs existed and is experienced by both male and female school students in Malaysia. However, since only a few studies have investigated this issue, it is imperative to conduct more studies on not only the prevalence rate of MSDs but also the predictors associated with MSDs among school students

be it in primary or secondary schools. Nevertheless, the findings suggest the need for MSDs intervention programs and guidelines for the school students to improve their health and well-being.

Given this, all these findings could suggest the importance of introducing comprehensive ergonomic programs for school children, especially in Sabah. An understanding of this program is valuable and will assist those students also the school and parents in the planning, designing, and implementing preventive intervention programs to reduce the risk of MSDs. This study also raises awareness to other parties involved either among small communities such as families or in policy-making networks such as the Ministry of Education Malaysia on MSDs issues for the student. These findings also indicate the need for culturally sensitive interventions to minimize MSDs among school students.

Informed Consent Statement
The informed consent form was included on the first page of the questionnaire. Participants who agreed to the informed consent proceeded to complete the questionnaire.

Conflict of Interest
No conflict of interest.

Ethics Statement
None.

Author Contributions
Nurkhaidaratul was responsible for data collection and article writing, while Ismail Maakip and Peter Voo handled the checking and editing of the article.

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Data Availability Statement
None

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