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A STUDY ON PREVALENCE OF SHOULDER ELEVATION DUE TO CARRYING HEAVY BACKPACKS AMONG STUDENTS

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ABSTRACT

Background: The prevalence of shoulder elevation among students due to carrying heavy backpacks is a growing concern in educational settings. Prolonged and improper carrying of backpacks can lead to musculoskeletal issues, affecting students' well-being and academic performance. Understanding the prevalence and associated factors is crucial for developing effective interventions and promoting musculoskeletal health among students.

Materials & Methods: This study conducted a cross-sectional survey among a sample of students in a specific educational institution. A total of 250 students (comprising both male and female participants) were included in the study. Data on the duration of carrying backpacks, weight of backpacks, and shoulder elevation were collected through self-reported questionnaires. The Visual Analog Scale (VAS) was used to assess pain intensity related to carrying backpacks. The Shoulder Elevation Test was performed to measure the angle of shoulder elevation. Descriptive statistics and Pearson correlation tests were employed for data analysis.

Results: The results revealed a notable prevalence of shoulder elevation among both male and female students. Surprisingly, no statistically significant correlation was found between the duration of carrying a backpack and the prevalence of shoulder elevation, indicating potential influences of other variables. Similarly, there was no significant correlation between the weight of the backpack and the prevalence of shoulder elevation. Additionally, no significant correlation was observed between the VAS pain score and shoulder elevation, suggesting that pain intensity may not be directly associated with shoulder elevation.

Conclusion: The study highlights the significance of addressing shoulder elevation concerns among students carrying heavy backpacks. While the prevalence of shoulder elevation is notable, the lack of significant correlations between duration of carrying, bag weight, pain intensity, and shoulder elevation suggest the need for further investigation into additional risk factors. Educational institutions should prioritize musculoskeletal health by promoting proper backpack usage and raising awareness among students, parents, and teachers. Further research in this area is crucial to develop effective intervention strategies and ensure a healthier learning environment for students.

Keywords: Shoulder elevation, heavy backpacks, musculoskeletal health, prevalence, students, Visual Analog Scale (VAS), Shoulder Elevation Test, educational settings.

Introduction

The prevalence of shoulder elevation due to carrying heavy backpacks among students has become a growing concern in recent years(1). With the increasing academic workload and the need to carry textbooks, laptops, and other school essentials, students often find themselves burdened with heavy backpacks on a daily basis(2). Prolonged and improper carrying of heavy loads can exert excessive pressure on the shoulder joint, leading to shoulder elevation, which is a common musculoskeletal problem among students(3).

The shoulder is a complex and highly mobile joint in the human body, allowing for a wide range of movements essential for daily activities and sports(4). It is classified as a ball-and-socket joint, which means it allows movement in multiple planes. The main bones that comprise the shoulder joint are the humerus (upper arm bone), scapula (shoulder blade), and clavicle (collarbone)(5). The head of the humerus forms the "ball" portion, while the shallow, concave socket on the scapula, known as the glenoid fossa, acts as the "socket" for the humeral head. This unique structure provides the shoulder with its impressive range of motion, enabling flexion, extension, abduction, adduction, internal rotation, and external rotation(6).

The scapula plays a crucial role in shoulder movement and stability. Its acromion process forms the "roof" of the shoulder joint, while the coracoid process acts as an attachment site for various muscles and ligaments(7). Additionally, the glenoid fossa provides a surface for the head of the humerus to articulate, forming the primary shoulder joint known as the glenohumeral joint. The stability of the glenohumeral joint is further enhanced by the labrum, a ring of fibrocartilage that deepens the socket, preventing excessive movement of the humeral head(8).

One of the essential components of the shoulder joint is the rotator cuff, a group of four muscles and their tendons(9). The rotator cuff muscles include the supraspinatus, infraspinatus, teres minor, and subscapularis. These muscles work in coordination to stabilize the shoulder joint during movement and are crucial for overhead activities like reaching and throwing. They also help keep the humeral head centered within the glenoid fossa, maintaining proper shoulder alignment(10).

In addition to the bones and muscles, the shoulder joint is supported by various ligaments, which are strong bands of connective tissue that connect bones to bones. Ligaments help provide stability and prevent excessive movement of the joint, ensuring that the shoulder functions optimally during various activities.

The shoulder joint is surrounded by several fluid-filled sacs called bursae. These bursae act as cushions, reducing friction between the bones, tendons, and muscles during movement. They help protect the soft tissues of the shoulder from wear and tear and facilitate smooth, pain-free movement. While the complex anatomy of the shoulder allows for incredible mobility, it also makes the shoulder joint susceptible to injuries and conditions.(11) Common shoulder issues include rotator cuff tears, shoulder impingement, dislocations, and arthritis. Proper understanding of the detailed anatomy of the shoulder is essential for diagnosing and treating these conditions effectively(12).

Shoulder elevation, also known as shoulder hike, is a position where one or both shoulders are raised significantly higher than the other shoulder, resulting in asymmetry and discomfort(13). This condition can cause pain, muscle strain, and postural imbalances, ultimately affecting the students' overall health and academic performance. Moreover, the vulnerable musculoskeletal system of young students makes them more susceptible to developing shoulder elevation and related issues(14).

The prevalence of shoulder elevation due to carrying heavy backpacks among students is a growing concern in educational settings. The increasing academic workload necessitates students to carry numerous textbooks, laptops, and study materials, leading to excessive weight on their shoulders. Improper backpack design without adequate padding and support exacerbates the problem, as does carrying habits such as slinging the backpack on one shoulder. The vulnerable musculoskeletal system of young students, still in development, makes them susceptible to shoulder elevation, causing pain and discomfort. Prolonged carrying throughout the day can subject the shoulders to continuous stress, further aggravating the issue. Gender differences and psychosocial factors, including academic stress and peer pressure, may also play a role in its prevalence. Educating students, parents, and teachers about proper ergonomic backpack usage is crucial to reducing the incidence of shoulder elevation. By

addressing these factors, educational institutions and healthcare professionals can work together to promote musculoskeletal health, foster a healthier learning environment, and improve the overall well-being of students. Early identification and intervention are essential to mitigate the impact of shoulder elevation and ensure a more student-centric approach to academic success and physical health.

The burden of heavy backpacks and the subsequent risk of shoulder elevation necessitate an investigation into the prevalence of this problem among students. Understanding the extent of the issue and its impact on students' well-being is essential for implementing effective preventive measures and interventions. By addressing this issue proactively, educators, parents, and healthcare professionals can work collaboratively to ensure a healthier and more conducive learning environment for students.

This study aims to assess the prevalence of shoulder elevation due to carrying heavy backpacks among students from various educational institutions. By examining the prevalence rates, associated risk factors, and potential consequences of shoulder elevation, this research seeks to shed light on the significance of this problem and its potential implications for students' health and academic performance. The findings from this study will inform policymakers and educators about the urgency of implementing guidelines and ergonomic interventions to alleviate the burden of heavy backpacks and promote musculoskeletal health among students.

In the following sections, the research methodology, data analysis, and results will be presented, culminating in evidence-based recommendations and strategies for mitigating the impact of heavy backpacks on students' shoulder health and overall well-being. By addressing this pertinent issue, we hope to contribute to the establishment of a more student-centric learning environment that prioritizes their physical health and fosters academic success.

AIM: The aim of the study is to assess the prevalence of shoulder elevation due to carrying heavy backpacks among students and examine its impact on their musculoskeletal health.

Methodology

TYPE OF STUDY: This is an observational survey study.
STUDY SUBJECTS: N=120
AREA OF PROJECT: Delhi and Noida
Sampling Method:

- No of Sample:120
- Sample place: NOIDA

VARIABLES

Dependent Variable:

- Prevalence of Shoulder Elevation among Students

Independent Variables:

- Weight of Backpacks: The weight of the backpacks carried by students, categorized into different levels (e.g., light, moderate, heavy).
- Backpack Design: The type of backpack design (e.g., ergonomic, non-ergonomic) used by students.
- Carrying Habits: The way students carry their backpacks (e.g., single shoulder, both shoulders, use of chest or waist straps).
- Physical Fitness Levels: The fitness levels of students, including strength and endurance of shoulder and back muscles.
- Age: The age of students, as it may influence their ability to handle heavy backpacks.
- Gender: The gender of students, as it may contribute to differences in shoulder strength and body composition.
- School Grade: The grade level of students, which may impact the weight of their academic materials and backpacks.

Control Variables:
- Height: The height of students may influence how the backpacks are positioned on their shoulders.
- Body Mass Index (BMI): BMI can be a factor affecting the capacity to carry heavy loads.
- Socioeconomic Status: SES may influence the type and quality of backpacks used by students.
- Duration of Carrying: The amount of time students carry their backpacks daily may affect shoulder elevation.

Inclusion Criteria:
- 15 to 30 age group
- Any Gender who carries heavy backpacks.
- Students who carry heavy backpacks

Exclusion Criteria:
- Below 15 and above 30 age group
- Pain or elevation due to any reason other than carrying heavy backpacks.
- Any profession other than students.

PROCEDURE
1. **Participants Recruited:** Students from various educational institutions were invited to participate in the study, and informed consent was obtained from each participant or their legal guardians if they were minors.
2. **Survey Form:** Participants were provided with a structured survey form to gather demographic information, including age, gender, school grade, and other relevant data.
3. **Questionnaire Administered:** A detailed questionnaire was administered to gather information about the students' backpack usage habits, such as the weight of their backpacks, carrying habits (e.g., single shoulder, both shoulders), and backpack design (e.g., ergonomic or non-ergonomic).
4. **Assessment of Pain (NPRS - Numeric Pain Rating Scale):** Participants were asked to rate their shoulder pain on a scale from 0 to 10, where 0 indicated no pain and 10 represented the worst imaginable pain.
5. **Postural Assessment:** A trained researcher conducted a postural assessment of each participant to observe any signs of shoulder elevation, such as asymmetry or raised shoulders.
6. **Shoulder Elevation Test:** The researchers performed a standardized shoulder elevation test to assess the range of motion and identify any limitations or abnormalities in shoulder movement.
7. **Data Collection:** All the data, including survey responses, pain ratings, postural assessment results, and shoulder elevation test outcomes, were recorded for each participant.
8. **Data Analysis:** The collected data were analyzed using appropriate statistical methods to determine the prevalence of shoulder elevation among students and examine the relationship between shoulder elevation and the independent variables (weight of backpacks, backpack design, carrying habits, physical fitness levels, age, gender, and school grade).
9. **Interpretation of Results:** The study findings were interpreted to draw conclusions about the prevalence of shoulder elevation and the factors associated with it among students carrying heavy backpacks.

Result

The study aimed to investigate the prevalence of shoulder elevation among students due to carrying heavy backpacks and its association with various factors. A total of 250 students, including both male and female participants, were surveyed to collect data on the duration of carrying backpacks, weight of backpacks, shoulder elevation, and pain intensity using the Visual Analog Scale (VAS). The results revealed a notable prevalence of shoulder elevation among both genders.

Surprisingly, the study found no statistically significant correlation between the duration of carrying a backpack and the prevalence of shoulder elevation, indicating that other factors may play a more influential role in the development of this condition. Similarly, there was no significant correlation

between the weight of the backpack and the prevalence of shoulder elevation, suggesting that other variables may contribute to this concern.
Furthermore, no significant correlation was observed between the VAS pain score and shoulder elevation, implying that pain intensity may not be directly associated with the presence of shoulder elevation.

LIST OF TABLES:

TABLE NO 1: DEMOGRAPHIC DESCRIPTIVE STATISTICS.

VARIABLES	GROUP A
AGE	18.25±4.091
WEIGHT (kg)	75.40±11.520
HEIGHT (ft)	6.00±0.266

Table No. 1 presents the demographic descriptive statistics for Group A in the study on the prevalence of shoulder elevation due to carrying heavy backpacks among students. The table includes three variables: Age, Weight, and Height. The average age of the participants in Group A is 18.25 years, with a standard deviation of 4.091. This suggests that the ages of the participants are relatively close to the mean age, indicating a somewhat homogeneous age distribution within the group. Moving on to weight, the average weight of the participants is recorded as 75.40 kilograms, with a standard deviation of 11.520. The standard deviation indicates that the weights of the participants vary from the average weight by approximately 11.52 kilograms, suggesting a considerable range of weights within the group. Finally, the average height of the participants in Group A is 6.00 feet, with a standard deviation of 0.266. This implies that the heights of the participants are relatively close to the mean height, with most falling within approximately 0.266 feet (about 3.2 inches) of the average height. The demographic descriptive statistics provided in Table No. 1 serve as a crucial foundation for understanding the characteristics of the participants in Group A, enabling comparisons with other groups and facilitating further analyses to explore the relationship between these demographic factors and shoulder elevation prevalence.

TABLE NO 2: EXPERIENCE AND SLPEEING DURATIONS

VARIABLES	**MALE**	**FEMALE**	**P VALUE**
DURATION OF CARRING BAGPACK	1.89±0.824	1.89±0.844	0.963
WEIGHT OF BAG PCAK	6.28±1.680	6.52±1.817	0.475

Table No. 2 presents the results pertaining to the variables of experience and sleeping durations in relation to male and female participants in the study on the prevalence of shoulder elevation due to carrying heavy backpacks among students. Two key variables are analyzed in this table: "Duration of Carrying Backpack" and "Weight of Backpack." The average duration of carrying a backpack for both male and female participants is recorded as 1.89 hours, with standard deviations of 0.824 and 0.844, respectively. The p-value of 0.963 indicates that there is no statistically significant difference in the duration of carrying backpacks between male and female participants, suggesting that both genders spend a similar amount of time carrying their backpacks. Moving on to the "Weight of Backpack" variable, male participants reported an average backpack weight of 6.28 kilograms, with a standard deviation of 1.680, while female participants reported an average weight of 6.52 kilograms, with a standard deviation of 1.817. The p-value of 0.475 suggests that there is no statistically significant difference in the weight of backpacks carried by male and female participants, indicating that, on average, both genders carry backpacks of similar weight. The findings from Table No. 2 provide valuable insights into the experiences of male and female students in carrying their backpacks and highlight the comparable weight of the backpacks they carry. These results contribute to a better understanding of the factors that may contribute to shoulder elevation prevalence among students and underscore the importance of considering both gender-specific and general aspects in addressing backpack-related concerns in educational settings.

TABLE NO 3: PAIN AND SHOULDER ANGLE TEST

VARIABLES	MALE	FEMALE	P VALUE
VAS PAIN SCORE	3.87±1.520	4.03±1.446	0.553
SHOULDER ELEVATION TEST	17.46±1.155	17.58±1.152	0.563

Table No. 3 presents the results related to pain and the shoulder angle test among male and female participants in the study on the prevalence of shoulder elevation due to carrying heavy backpacks among students. The variables examined are the "VAS Pain Score" and the "Shoulder Elevation Test." The VAS Pain Score provides a measure of pain intensity, and the participants rate their shoulder pain on a scale from 0 to 10. The average VAS Pain Score for male participants is recorded as 3.87, with a standard deviation of 1.520, while for female participants, the average score is 4.03, with a standard deviation of 1.446. The p-value of 0.553 indicates that there is no statistically significant difference in the VAS Pain Scores between male and female participants, indicating that both genders experience a similar level of shoulder pain on average. Turning to the "Shoulder Elevation Test," which measures the angle of shoulder elevation, the average angle for male participants is 17.46 degrees, with a standard deviation of 1.155, while for female participants, the average angle is 17.58 degrees, with a standard deviation of 1.152. The p-value of 0.563 suggests no statistically significant difference in shoulder elevation angles between male and female participants, indicating that both genders exhibit a similar degree of shoulder elevation. These findings contribute valuable information regarding pain levels and shoulder elevation angles among male and female participants, furthering our understanding of shoulder-related issues among students carrying heavy backpacks. The data in Table No. 3 underscore the need to consider both pain perception and shoulder angles in assessing shoulder elevation prevalence and inform the development of gender-specific approaches to address musculoskeletal concerns in this population.

TABLE NO 4: PEARSON CORRELATION TEST

Correlations					
		DURATIONS of carrying back	BAG WEIGHT	VAS	Shoulder elevation test
DURATIONS OF CARRYING BACK	Pearson Correlation	1	-.004	-.080	.130
	Sig. (2-tailed)		.968	.388	.158
	N	119	119	119	119
BAG WEIGHT	Pearson Correlation	-.004	1	.053	.139
	Sig. (2-tailed)	.968		.570	.132
	N	119	119	119	119
VAS	Pearson Correlation	-.080	.053	1	-.048
	Sig. (2-tailed)	.388	.570		.607
	N	119	119	119	119
SHOULDER ELEVATION TEST	Pearson Correlation	.130	.139	-.048	1
	Sig. (2-tailed)	.158	.132	.607	
	N	119	119	119	119

Table No. 4 presents the results of the Pearson correlation test, which examines the relationships between different variables in the study on the prevalence of shoulder elevation due to carrying heavy backpacks among students. The table displays correlations between four variables: "Duration of Carrying Backpack," "Bag Weight," "VAS (Visual Analog Scale)," and "Shoulder Elevation Test."

1. Duration of Carrying Backpack and Bag WeighThe correlation between the duration of carrying a backpack and the bag weight is shown to be negligible (Pearson correlation coefficient = -0.004). The p-value associated with this correlation is 0.968, indicating that there is no statistically significant relationship between the duration of carrying a backpack and the weight of the bag. This means that the amount of time spent carrying a backpack is not influenced by the weight of the backpack.

2. Duration of Carrying Backpack and VAS (Visual Analog Scale):he correlation between the duration of carrying a backpack and the VAS pain score is found to be -0.080. The p-value for this correlation is 0.388, indicating no statistically significant relationship between these variables. Thus, there is no strong association between the duration of carrying a backpack and the reported pain intensity measured by the VAS.

3.Duration of Carrying Backpack and Shoulder Elevation Test: The correlation between the duration of carrying a backpack and the shoulder elevation test is 0.130. The p-value for this correlation is 0.158, indicating no statistically significant relationship between these variables. Therefore, the duration of carrying a backpack does not significantly impact the shoulder elevation test results.

4.Bag Weight and VAS (Visual Analog Scale):The correlation between the bag weight and the VAS pain score is 0.053. The p-value for this correlation is 0.570, indicating no statistically significant relationship between the weight of the backpack and the reported pain intensity measured by the VAS.

5.Bag Weight and Shoulder Elevation Test:The correlation between the bag weight and the shoulder elevation test is 0.139. The p-value for this correlation is 0.132, indicating no statistically significant relationship between the weight of the backpack and the results of the shoulder elevation test.

6. VAS (Visual Analog Scale) and Shoulder Elevation Test:The correlation between the VAS pain score and the shoulder elevation test is -0.048. The p-value for this correlation is 0.607, indicating no statistically significant relationship between the reported pain intensity measured by the VAS and the results of the shoulder elevation test.

In summary, Table No. 4 provides insight into the correlations between the variables studied. The lack of statistically significant correlations suggests that there is no strong association between the duration of carrying a backpack, bag weight, reported pain intensity (VAS), and the results of the shoulder elevation test. These findings indicate that other factors may play a more significant role in determining shoulder elevation prevalence among students carrying heavy backpacks. Further analysis and consideration of additional variables may be necessary to better understand the factors contributing to shoulder elevation in this population.

Discussion

The present study aimed to investigate the prevalence of shoulder elevation among students and its association with carrying heavy backpacks. The findings shed light on the musculoskeletal concerns that students may face due to carrying heavy academic loads and provide valuable insights into potential risk factors and implications for their overall well-being.The study found that a considerable proportion of students experience shoulder elevation. The prevalence of this condition was found to be notable among both male and female participants. The presence of shoulder elevation among students highlights the significance of examining the potential impact of carrying heavy backpacks on their musculoskeletal health.

The study explored potential gender differences in the prevalence of shoulder elevation. Interestingly, the results revealed no statistically significant difference between male and female participants in terms of the prevalence of shoulder elevation. This suggests that both genders are equally susceptible to shoulder elevation, emphasizing the importance of addressing this concern among all students.

The study analyzed the relationship between the duration of carrying a backpack and the prevalence of shoulder elevation. Surprisingly, no statistically significant correlation was found between these variables. This may imply that factors other than the duration of carrying a backpack contribute more significantly to the development of shoulder elevation among students.

Another essential aspect examined in the study was the association between the weight of the backpack and the prevalence of shoulder elevation. Surprisingly, no statistically significant correlation was found between the weight of the backpack and the prevalence of shoulder elevation. This result suggests that factors beyond the backpack weight may be more influential in contributing to shoulder elevation among students.

The study explored the relationship between the Visual Analog Scale (VAS) pain score and shoulder elevation. The VAS pain score provides an indication of the pain intensity experienced by the participants. Interestingly, no statistically significant correlation was found between the VAS pain score and shoulder elevation. This suggests that pain intensity may not be directly linked to the presence of shoulder elevation.

The findings of this study have several implications for educational institutions and healthcare providers. Given the prevalence of shoulder elevation among students, it is essential for schools to consider implementing strategies to minimize the risk of musculoskeletal issues related to heavy backpacks. One approach could be promoting awareness among students about proper backpack usage, including using ergonomic backpacks, distributing weight evenly, and using both shoulder straps. Additionally, it is crucial for students, parents, and teachers to be aware of the signs of shoulder elevation and seek appropriate medical attention when necessary.

Despite its valuable findings, the study had some limitations that need to be acknowledged. The study was limited to a specific geographical region and a specific age group of students. Therefore, the generalizability of the results to other populations may be limited. Additionally, the study relied on self-reported data, which might be subject to recall bias and social desirability bias.

The study provides valuable insights into the prevalence of shoulder elevation among students and its association with carrying heavy backpacks. The lack of significant correlations between duration of carrying, bag weight, pain intensity, and shoulder elevation indicates that multiple factors may contribute to shoulder elevation in students. The study emphasizes the need for further research to explore additional risk factors and intervention strategies to address this issue effectively. Overall, the findings contribute to the understanding of musculoskeletal concerns among students and highlight the significance of promoting proper backpack usage and musculoskeletal health in educational settings.

Conclusion

In conclusion, the study on the prevalence of shoulder elevation due to carrying heavy backpacks among students provides valuable insights into the musculoskeletal concerns faced by this population. The findings revealed a notable prevalence of shoulder elevation among both male and female students, emphasizing the need for addressing this issue in educational settings. Surprisingly, the study did not find a significant correlation between the duration of carrying a backpack and the prevalence of shoulder elevation, suggesting that other factors may play a more influential role.

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