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Prevalence and Predictors of Coccydynia Among Allied Health Science Students: The Influence of Prolonged Sitting, Physical Activity, and Body Mass Index

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ABSTRACT

Coccydynia is a painful musculoskeletal disorder that affects the coccyx (tailbone) and is frequently related to extended sitting, poor posture, trauma, obesity, and the lack of proper ergonomic support. Allied health students often sit for long periods of time, making them more vulnerable to coccygeal pain and functional problems. To find the prevalence of coccydynia and investigate sitting-related factors in allied health students of private institutes in Lahore, Pakistan. This study was a cross-sectional study in which the sample size was 288 students of private allied health institutes of Lahore. Convenience sampling was used to recruit participants. The self-structured questionnaire and the Numerical Pain Rating Scale (NPRS) were used to collect data. Demographic characteristics, body mass index (BMI), length of sitting time, type of chair used, use of cushions, tenderness around the coccyx, and pain characteristics were included in the variables. Data analysis was carried out using SPSS 26, and results were presented as frequencies and percentage. The average age of the subjects was 21.3 ± 2.4 years; 70.8% were female subjects. Overall, 24.0% (n=69) of the participants experienced tailbone pain. Almost 78.1% seated for over four hours per day, and 93.4%

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of students indicated that they did not use cushions when sitting. The most common seating surface was wooden chairs (45.8%), followed by plastic chairs (41.0%). Of the patients, 16.7% reported acute pain and 5.6% reported chronic pain. A round of tenderness around the coccyx was found in 9.7 per cent of students. A higher percentage of symptomatic students reported sitting for extended periods of time and sitting on hard seating surfaces. About 25% of allied health students suffered from coccydynia. Sitting on hard chairs, poor ergonomic support, and sitting for long periods each day seem to be significant factors of coccygeal pain. Educational programs that educate students about posture correction and implementation of ergonomic interventions can decrease the incidence of coccydynia amongst students.

Keywords— Coccydynia, Coccyx Pain, Tailbone Pain, Prolonged Sitting, Allied Health Students, Ergonomics, Musculoskeletal Disorders, Pakistan.

Introduction

Coccydynia is a musculoskeletal disorder and is known as tailbone pain, which is pain and tenderness in the coccygeal region (Garg & Ahuja, 2021). The coccyx is the final part of the vertebral column and is connected to several ligaments, tendons, and pelvic floor muscles. When this area of the body is painful, it can have a big impact on someone's ability to be able to sit comfortably, do tasks around the house, and enjoy an optimal quality of life. Coccydynia is believed to be a rare clinical problem; however, it has been on the rise in recent years because of lifestyle changes, extended periods of sitting, and extended periods of sedentary behaviour as part of educational and occupational activities (Sukun et al.). Several factors contribute to the etiology of coccydynia, such as direct trauma, repetitive microtrauma, childbirth, obesity, prolonged sitting, poor posture, degenerative changes, and anomalies of the mobility of the tailbone (Akar et al., 2023). Of these, one of the most commonly reported causes of coccygeal pain is extended sitting time on hard surfaces. Pressure on the coccyx during sitting can cause inflammation of surrounding soft tissues, straining of the ligaments, and irritation of the coccygeal tissues, which, in the long term, can cause pain and discomfort (Carayannopoulos et al., 2025). Lectures, study, and sitting for long periods of time with the use of electronic devices are particularly damaging for students as they spend a large part of their day in this position. Sedentary lifestyle has become a global public health problem in the age of the young adults. In modern educational systems, students spend several hours daily in a school setting, whether in the classroom, library, or study location, sitting. Sitting has become a common feature of schooling, with students in modern education systems being required to sit for several hours a day in classrooms, libraries and study areas (Clemes et al., 2020). Classroom furniture in many institutions, particularly in developing countries, may not have the proper ergonomic design which causes excessive pressure on the lower spine and coccygeal areas. Any long periods spent sitting on hard surfaces, without proper support, can lead to musculoskeletal complaints such as low back pain and coccydynia (Habib[1] et al., 2025). These complaints can have a negative impact on concentration, school performance, activity levels, and overall well-being.

A few studies have shown that sitting for long periods of time is associated with

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musculoskeletal disorders. Baccalaureate students in allied health and health-related fields often have extensive courses requiring theory, lab, and self-study (McKinney, 2024). This can include prolonged sitting for 4-6 hours or longer per day. Mechanical stress on the coccyx and the other surrounding structures may be increased due to the cumulative effect of prolonged sitting, making students more prone to coccygeal pain (Vecin & Gater, 2022). Also, poor sitting posture, poor breaks from sitting, and lack of understanding about ergonomic principles can make sitting more uncomfortable and possibly contribute to making the condition worse. Another key factor that has been determined to influence the development of coccydynia is the body mass index (BMI) (Lee et al., 2023). Excessive body weight and distribution of body weight are factors that can change the biomechanics of sitting and pressure over the coccygeal area. People who have a very low BMI may have less soft tissue that supports the base of the spine, and therefore may be more likely to experience discomfort when sitting on hard surfaces (Uçar et al., 2021). Thus, the analysis of BMI in conjunction with sitting-related behaviors offers a more comprehensive picture of the factors related to coccygeal pain in students. Females have been reported as being more affected by coccydynia than males (Arif et al., 2022). This increased susceptibility may be due to anatomical variations of the pelvis, hormonal factors, or differences in mobility of the coccyx. In addition, there are some musculoskeletal stressors or postural adaptations that may be more specific to females that can have a further impact on the development of coccygeal pain (Khalid et al., 2025). Therefore, it is important to assess the burden of coccydynia in students regarding gender-related patterns.

However, coccydynia can affect one's physical health and ability to function in life and is therefore not always reported or diagnosed (Chandra, 2025). When the problem is in the tailbone, many people think of it as a temporary pain and don't go to the doctor unless it is very bad or lasts a long time. This means that the actual prevalence of coccydynia among students could be much higher than that reported in the clinic (Fatima et al., 2025). The recognition of early signs and risk factors is crucial to provide early strategies to prevent the progression of pain-related disability. Very little research has been carried out in Pakistan to explore the prevalence of coccydynia among students, especially students pursuing allied health education (Jamil et al., 2024). The majority of existing studies are concerned with symptoms of low back pain and other general types of musculoskeletal complaints, with coccygeal pain only partially studied. Considering the high demands placed on the academic performance of students and the prevalence of non-ergonomic seating positions in school environments, it is imperative to assess the extent of the problem and identify and modify risk factors (Alibegović et al., 2020). This data could inform educational and health care providers to take appropriate measures to enhance pupils' health and wellbeing. Thus, the current study aims to find out the prevalence of coccydynia among the students at private allied health institutes in Lahore who are exposed to prolonged sitting on hard chairs. The study also sought to investigate potential demographic characteristics, BMI, sitting habits, and types of chairs, etc, that may be associated with coccygeal pain. The results of this study will offer a source of useful information for the burden of coccydynia among students that may help guide further research for the development of ergonomic and preventive strategies in school settings.

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Materials and Methods

Study Design

This was a cross-sectional analytical study to find out the prevalence of coccydynia and its associated factors among allied health students who are exposed to prolonged sitting on hard chairs in Lahore, Pakistan. The cross-sectional design was chosen due to the ability to estimate the prevalence of disease and associated risk factors in a population at a certain time.

Study Duration and Setting

The study was carried out for four months at selected private allied health institutes of Lahore. The institutions selected were those where students sit in hard chairs in the class for long durations to attend the lectures and academic activities.

Study Population and Sample Size

The target population included students attending Diploma, Bachelor of Science (BS), and Doctor of Physical Therapy (DPT) programs. A total of 288 students participated in the study. The sample size was determined with the standard formula for prevalence at 95% confidence interval and a 5% margin of error. The sample size chosen was deemed to be large enough to estimate the prevalence of coccydynia among allied health students.

Sampling Technique

To recruit participants, a non-probability sampling method of convenience was used. Eligible and available students were invited to participate in the study.

Inclusion and Exclusion Criteria

Students aged 16–30 years who regularly sat on hard chairs for prolonged periods during academic activities were included in the study. Students in allied health programs who agreed to participate and gave informed consent were eligible. To minimize potential confounding factors, students were excluded from the study if they had a coccygeal fracture, spine trauma, congenital spine deformities, neurological disorders affecting posture, or recent trauma affecting the coccyx.

Data Collection Instrument

Structured self-administered questionnaires were completed after a thorough literature search on the subject of coccydynia and sitting-related musculoskeletal disorders. The questionnaire consisted of questions regarding demographic information such as age, gender, academic program, and BMI. Other questions were added to measure sitting behaviours, including length of time spent sitting, type of chair used, sitting with pillows, and pain in the tailbone during sitting. Also, was recorded clinical information about duration of pain, tenderness around the coccygeal region, and characteristics of pain. We used the validated Numerical Pain Rating Scale (NPRS), which ranges from 0–10, with 0 indicating no pain and 10 indicating the worst possible pain.

Data Collection Procedure

The administrations of all institutions were informed of the data collection beforehand, and consent was sought. Eligible students were informed regarding the objectives and significance of the study, and informed consent was obtained from all the participants in the study. Questionnaires were handed out during school hours, and time was given for participants to complete them independently. Researchers were on hand throughout to explain any questions and to make sure there were full and accurate answers before

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data were collected.

Study Variables

The main outcome was coccydynia (self-reported pain or tenderness in the coccygeal region during sitting, prolonged pressure, or when sitting to standing). Independent variables were age, gender, body mass index, duration of sitting, type of chair used, utilization of cushions, tenderness around the tailbone, and pain intensity, assessed by the Numerical Pain Rating Scale.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) version 26 was used for data entry and analysis. Demographic, clinical, and sitting-related characteristics of the participants were summarized using descriptive statistics. Continuous variables were presented as mean ± standard deviation, and categorical variables were shown as frequencies and percentages. The associations between coccydynia and the selected demographic and ergonomic factors were analysed using the appropriate statistical methods. A p-value < 0.05 was considered to be statistically significant.

Ethical Considerations

The study was granted ethical approval by the institutional research committee before conducting the study. There was no compulsory involvement, and informed consent was obtained from everyone who participated in the study. The participants were told that they could drop out of the research at any time, with no negative consequences. Confidentiality and anonymity were respected throughout the research process, and questionnaires were given identification codes; the data collected were not made available. All the information that was collected during the study was strictly for academic and research purposes.

Results

Demographic Characteristics of Participants

In total, there were 288 students from private allied health institutes of Lahore who took part in the study. Table 1 shows people's characteristics based on the demographic data of the participants. The majority of the study population comprised females (70.8%, n = 204), with males making up 29.2% (n = 84). In terms of BMI, the majority of participants were categorized as having a normal weight (45.8%, n = 132), while 27.8% (n = 80) were classified as underweight. 18.4% (n = 53) of the participants were overweight, and 8.0% (n = 23) were obese. Academic enrolment was related to 44.4% (n = 128) being enrolled in BS programs, 29.5% (n = 85) as Doctor of Physical Therapy (DPT) programs, and 26.0% (n = 75) being enrolled in diploma programs.

Table 1. Demographic Characteristics of Study Participants (n = 288)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	84	29.2
	Female	204	70.8

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BMI	Underweight	80	27.8
	Normal Weight	132	45.8
	Overweight	53	18.4
	Obese	23	8.0
Program	Diploma	75	26.0
	BS Program	128	44.4
	DPT	85	29.5

Age Distribution of Participants

Participants' age distribution showed that most of them were in the younger age group. More than half of the respondents (54.9%, n = 158) were between 19 and 21 years of age, while 35.1% (n = 101) were aged between 22 and 23 years. A total of 25 participants (8.7%) were in the age group 16–18 years, while four participants (1.4%) were older than 26 years, as shown in Figure 1. The results of this study showed that the majority of the students were young adults in education for allied health professions.

Figure 1. Age Group Distribution of Participants

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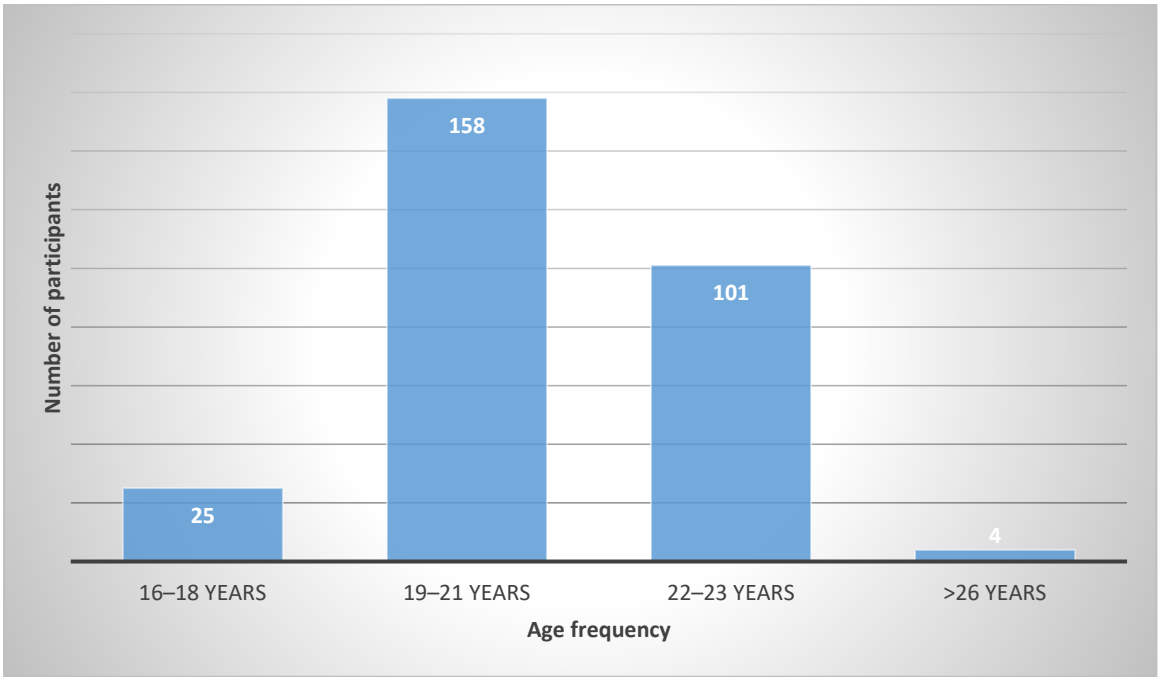

Prevalence of Coccydynia

The incidence of coccydynia in the study group was summarized in Table 2. Of the 150 students, 69 students (24.0%) reported pain in the tailbone. In contrast, 76.0% (n = 219) noted that there was no pain in the coccyx. These results suggest that 25% of students had symptoms of coccydynia.

Table 2. Prevalence and Clinical Characteristics of Coccydynia

Variable	Category	Frequency (n)	Percentage (%)
Tailbone Pain	Yes	69	24.0
	No	219	76.0
Pain Duration	Acute (<3 Months)	48	16.7
	Chronic (>3 Months)	16	5.6
	No Pain	224	77.8
Tenderness Around Coccyx	Yes	28	9.7
	No	260	90.3

Characteristics of Tailbone Pain

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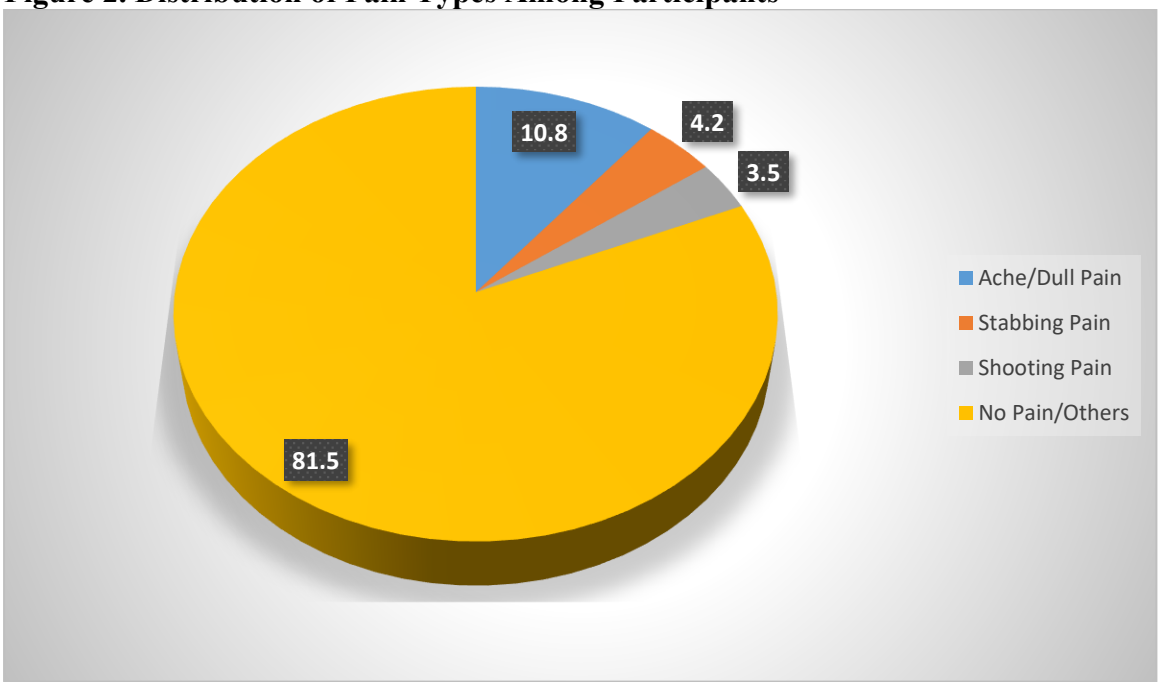
There were differences in the characteristics of the pain reported by those who had experienced pain. The most frequent complaint was ache or dull pain, with 10.8% reporting. 4.2% reported stabbing pain, while 3.5% reported shooting pain, as shown in Figure 2. This is a predominance of dull aching pain, indicating a chronic mechanical stress pattern that reflects prolonged sitting time as opposed to acute traumatic injury.

Figure 2. Distribution of Pain Types Among Participants



Duration of Pain

Based on pain duration, 16.7% (48) of patients had experienced acute pain (less than 3 months), and 5.6% (16) of patients reported chronic pain (more than 3 months). The other 77.8% (n = 224) did not have coccygeal pain. The results of this study suggested that more people had acute symptoms than chronic symptoms.

Tenderness Around the Coccygeal Region

The coccygeal region tenderness was reported by 9.7% (n = 28) of participants, while 90.3% (n = 260) did not report tenderness or pressure around the coccygeal area on palpation. Tenderness of the participants may be due to local inflammation or irritation due to the pressure applied over the coccyx for long periods of time.

Sitting Duration Among Participants

The sitting characteristics and ergonomic factors of the participants are described in Table 3. The average time spent sitting per day was quite high in the study population. Almost half (46.2%, n = 133) said that they spent 4 to 6 hours sitting a day, and 31.9% (n = 92) said that they spent more than 6 hours a day sitting. Only 19.4% (n = 56) sat for 2–4 hours, and 2.4% (n = 7) sat for less than 2 hours per day. When combined across all students, 78.1% of students sit for greater than 4 hours each day, indicating that time spent sitting is a widespread practice among allied health students.

Table 3. Sitting Habits and Ergonomic Characteristics

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Variable	Category	Frequency (n)	Percentage (%)
Sitting Duration	<2 Hours	7	2.4
	2–4 Hours	56	19.4
	4–6 Hours	133	46.2
	>6 Hours	92	31.9
Cushion Use	Yes	19	6.6
	No	269	93.4
Chair Type	Wooden Chair	132	45.8
	Plastic Chair	118	41.0
	Sofa Chair	36	12.5
	Stool	2	0.7

Cushion Utilization During Sitting

The percentage of use of supportive cushions while sitting was very low. Fewer than one in six participants (n = 19) said they used cushions, while 93.4% (n = 269) did not use any cushioning support when seated. This discovery implies that such direct pressure on the coccyx is common during extended sitting periods.

Type of Chair used by the participants

An evaluation of seating surfaces showed that wooden chairs were the most frequent type of seating surface used (45.8%, n = 132). 41.0% (n = 118) of participants sat in plastic chairs, and 12.5% (n = 36) sat in sofa chairs. There were only 2 who reported using stools without any back support as their main method of sitting on the toilet (0.7%). Wooden and plastic chairs are more dominant, suggesting that the participants of the study have considerable exposure to relatively hard seating surfaces.

Potential Risk Indicators for Coccydynia

Table 4 lists the possible risk factors for coccydynia. Female students were the predominant group among participants and could therefore be a significant contributor to the burden of coccydynia observed. In addition, 78.1% of students said they sat for a minimum of 4 hours per day, and 93.4% said that they did not use cushions when sitting. Also, 86.8% of participants used mainly wooden or plastic chairs. These factors all point to a prolonged sitting posture with limited ergonomic support, which could make one more susceptible to coccygeal pain.

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Table 4. Potential Risk Indicators Associated with Coccydynia

Variable	Frequency (n)	Percentage (%)
Female Gender	204	70.8
Sitting ≥4 Hours Daily	225	78.1
No Cushion Use	269	93.4
Wooden/Plastic Chair Use	250	86.8
Overweight/Obese	76	26.4
Tailbone Tenderness	28	9.7

Summary of Key Findings

In summary, the results of this study show that coccydynia is a relatively common complaint among allied health students. This prevalence rate of 24.0%, together with the high level of sitting time, the high frequency of hard chairs, and the low use of supportive cushions, suggests that there is a potential for ergonomic and behavioral factors to be important factors in the development of pain in the coccyx in this population.

Discussion

Coccydynia is the main objective of the present study, which examined the prevalence of coccydynia among allied health students who were exposed to prolonged sitting on hard chairs in private institutes (Mansha et al., 2025). The results showed that 24.0% of the respondents stated that they had coxalgia, suggesting that a quarter of all students had experienced symptoms that were compatible with coxalgia. The high prevalence shows that coccygeal pain is a relatively prevalent musculoskeletal problem in school students, and underscores the need to consider the factors related to sitting at school in an ergonomic manner (Abdulraheem et al., 2025). The prevalence observed is in line with the increasing evidence that has emerged on the link between a sedentary lifestyle and the risk of developing musculoskeletal disorders in young adults and between poor sitting posture and the risk of developing musculoskeletal disorders. One of the most striking of the results of the study was a relatively large percentage of pupils who indicated that they spend a significant amount of time sitting for more than half a day (Paulus et al., 2021). Over three-quarters of the participants spent more than four hours sitting daily, whilst almost a third spent more than six hours. The added pressure on the coccyx from extended sitting causes permanent pressure, decreased circulation, and irritation of ligaments and muscles that attach to the coccyx (White et al., 2022).

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Excessive pressure on the tailbone can eventually cause inflammation, discomfort, and pain. Based on the results of this study, it can be concluded that sitting for a long period of time is a significant risk factor for coccydynia among students who have long hours in school and while studying. The use of different seating surfaces may have additionally influenced the prevalence of coccydynia seen in the study participants (Garg & Ahuja, 2021). Most students stated that they use a wooden chair and/or a plastic chair, which are generally less ergonomic and have less surface comfort. Hard seat surfaces create localized pressure on the tailbone, especially if used for long periods of time without a cushion (Mohammed, 2022). Ergonomically designed chairs, on the other hand, will distribute the body weight more evenly and will decrease the strain on the lower spine and pelvic structures. This could also be attributed to the widespread use of hard chairs in the participating institutions and explain, at least in part, the rate of coccygeal pain among the study population (Čeredar et al.). The other salient point was the very low use of cushions for sitting. Over 90% of all respondents said they were not using any type of cushion support. A cushion (especially one that takes the pressure from the tailbone) can decrease direct pressure on the tailbone and increase comfort when sitting. If such supports had not been provided, possibly the risk of coccygeal irritation would have been higher for those who had been exposed to high sitting time. The result indicates that ergonomic measures can have a certain value in preventing coccydynia in students.

The analysis of the characteristics of pain showed that the most common symptom reported by affected participants was a dull or aching pain (Kashif et al., 2022). This is a typical pattern for pain that is caused by repetitive mechanical stress, and not from a sudden traumatic injury. In addition, the prevalence of acute pain was higher than that of chronic pain, suggesting that chronic coccygeal pain may be uncommon among students, while acute pain is common, possibly because of the early stages of the pain. Timely identification of symptoms gives the chance to intervene before a long-term or chronic pain state occurs (Larsson et al., 2020). Healthy sitting behaviors and frequent posture changes, such as those in educational programs, may consequently be effective in preventing symptom progression. BMI also seemed to show some relevance to the occurrence of coccydynia (Meer et al., 2022). Most of the respondents were within the normal range of BMI, but a significant number were underweight or overweight. The relation of excess body weight to mechanical loading of the coccyx when in a sitting position and the insufficient soft tissue cushioning in underweight people may also contribute to coccygeal discomfort. The existence of both extremes in the population studied indicates that body composition could have an effect on coccygeal biomechanics and therefore should be taken into account when evaluating the risk factors for coccydynia (Slitzky et al., 2025). The gender distribution in the study showed that there were more females than males. Anatomical and biomechanical differences between females and males regarding pelvic structure and the mobility of the coccyx have been suggested in the past to make females more prone to developing coccydynia. More female students than male students were in the present study, and the prevalence of coccydynia observed suggests a need for future studies focusing on sex-specific risk factors and prevention strategies (Sanobar et al., 2024).

Tenderness around the coccygeal area was reported by a sub-group of participants,

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another indication of the clinical relevance of the symptoms (Ridehalgh & Ward, 2023). Local tenderness is usually a feature of inflammation and tissue irritation and can be a sign of persistent coccygeal disease. Nearly 10% of participants were identified as being tender, implying that a percentage of students may need clinical evaluation and management to prevent their symptoms and function from worsening. The results of this study suggest that the school and health care providers may have implications. Extended sitting time may not be easily avoided in a school environment, and measures to reduce the coccygeal loading should be taken into account (Grabska-Klein et al.). They can involve ergonomically designed chairs, regular breaks for movement throughout lectures, raising awareness of sitting posture, and an awareness of musculoskeletal health. This can help to improve the symptoms of coccydynia as well as prevent other sitting-related musculoskeletal disorders. There are a number of strengths of this study that must be acknowledged and highlighted. This study enabled the evaluation of coccydynia in a wide cross-section of students from various allied health courses. Furthermore, several demographic, ergonomic, and clinical parameters were assessed; this allowed a complete picture of variables that could potentially be linked with coccygeal pain. The standardized pain assessment tool further improved the consistency of the assessment of symptoms (Von Korff et al., 2020). There are some weaknesses also to be taken into account. Since the study is cross-sectional, cause-effect relationships between long sitting and coccydynia can not be concluded. Convenience sampling will make it less likely that the results of this study can be generalized to other students (Andrade, 2021). Moreover, the use of self-reported data can also create recall bias and subjective reporting of pain. Longitudinal studies with larger samples and objective ergonomic evaluation would better elucidate the mechanism of the occurrence of coccydynia amongst students. The results suggest that coccydynia is a major musculoskeletal issue with allied health students, as a whole. The prevalence rates found in this study, along with the high proportion of time spent sitting, sitting on hard chairs, and lack of ergonomic support, highlight the need for preventive measures in educational settings. Consideration of the modifiable risk factors could help minimize the incidence of coccygeal pain, increase student comfort, and lead to better academic performance and quality of life.

Conclusion

The present study finally revealed that 24.0% of allied health students in private institutes of Lahore were suffering from coccydynia, considered a relatively common musculoskeletal condition. The results show that almost 1/4 of the participants reported experiencing pain in their tailbone, and this demonstrates the increasing prevalence of coccygeal pain among young adults involved in long academic sessions. Most students reported sitting for more than 4 hours per day; the most common type of chair used was wooden or plastic, and most students did not use a cushion or other supportive devices when sitting. These factors can cause more mechanical stress to the coccyx and thus a higher risk of developing coccydynia. The study also showed that the most common pain presentation was dull and aching, whereas acute pain was more frequent than chronic pain. While the majority of the participants had normal BMI, a significant proportion of the participants were either underweight or overweight, which indicates that body composition may also play a role in coccygeal discomfort. Tenderness around

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the tailbone in the affected participants further highlights the clinical relevance of the condition. In general, excessive sitting time, lack of ergonomic support, and contact with hard surfaces of seating seem to be relevant factors that contribute to the incidence of coccydynia among allied health students. The results highlight the importance of preventive measures in the educational context, such as implementing ergonomic adaptations, conducting posture training, implementing periodic breaks for physical activity, and providing greater awareness about musculoskeletal health. These measures could help to decrease the incidence of coccydynia, make students more comfortable, and increase academic achievement and quality of life.

DECLARATION

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All authors of the manuscript declare that they have no financial or personal interests that could influence this work.

Data Availability:
Raw data may be made available upon reasonable request.

Ethical Statement:
This article is purely a manuscript-based study; no animals were harmed in the course of this work.

Generative AI Statement:
The authors declare that no Generative AI was used in the writing/creation of this manuscript.

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