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Frequency of Pes Planus in Its Association with Ankle Pain and Risk of Fall Reported in School Students. Cross-Sectional Study

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ABSTRACT

To determine the frequency of pes planus in its association with ankle pain and risk of fall reported in school students. Cross-sectional study. A cross-sectional design was employed, enrolling 132 students selected through non-probability convenience sampling. Data were gathered using the Disability benefit questionnaire, foot and ankle ability measure questionnaire, and Berg balance scale. The information was analyzed using SPSS version 26, with results presented through descriptive statistics, cross-tabulations, and chi-square tests, and pie charts, bar charts, and histograms are used for data presentation as well. A total of 132 participants, 92 (69.7) of whom were men and 40 (30.3) women. Most of them belonged to KHAN (43.2%), then BITAL (38.6%), and ICA (18.2%). The vast majority were in class 10 (55.3%), fewer in class 9 (30.3%), and fewer in class 8 (14.4%). The weight distribution was 53.1 and 47.9 percent among 30-50 kg and 50-85 kg, respectively, and the mean height was 1.58 m (SD =.167). The chi-square test showed a significant level between the categories of FAAM and age ($p = 0.050$), the categories of PP and the total score of BBS ($p = 0.000$), and the categories of PP and the total score of BBS ($p = 0.001$). There was no significant association between the BMI and age ($p = 0.52$), between age and BBS ($p = 0.48$), between PP and FAAM ($p = 0.30$), or between BBS and FAAM ($p = 0.47$). The study suggests a borderline association between FAAM and age, indicating slight variation in functional activity across age groups, while BMI and BBS showed no significant link with age. In contrast, pes planus was strongly correlated with balance, highlighting the role of foot structure in physical performance. No meaningful associations were observed between FAAM and PP or FAAM and BBS, suggesting that self-reported function does not directly reflect balance or performance outcomes.

INTRODUCTION

A reduction or lack of the foot's medial longitudinal arch (MLA), with or without concomitant foot and ankle abnormalities, is referred to as flatfoot (Kaymaz, 2022). It falls into one of two general categories: rigid or flexible. The inflexible form is typically pathogenic and frequently results from inflammatory, rheumatological, neurological, genetic, traumatic, or osseous problems. Flexible pes planus is frequently asymptomatic and lacks a single known etiology. It may become uncomfortable and necessitate podiatric or orthopedic treatment (Smith *et al.*, 2021). In children, pes planus is very common due to ligamentous laxity and a lack of neuromuscular control. Infants and young children are more likely to have missing arches (Smith *et al.*, 2021). A fat pad beneath the medial longitudinal arch of infants protects the arch during the early years of life. The posterior tibial tendon supports the foot's inversion and plantarflexion in addition to the arch (Smith *et al.*, 2021). The most frequent cause of acquired pes planus is impairment of the posterior tibial tendon (Raj *et al.*, 2023). Pes planus is more likely to develop in patients who have suffered midfoot or hindfoot trauma that affects the navicular, first metatarsal, calcaneal, or Lis-Franc ligament complex. The malunion of those fractures is where it happens more frequently. Injuries to

soft tissues like the spring ligament or plantar fascia are other causes (Raj *et al.*, 2023).

The body portions that make contact with the earth are the feet. They serve to maintain the weight of the body and protect it from trauma, particularly when walking. They can perform a wide range of movements since they have several joints. Foot function depends on the arch of the foot. A lateral longitudinal arch and a transverse arch at the level of the tarsal and metatarsal bones are also present; the medial longitudinal arch is typically referred to as the "longitudinal arch." These arches collectively contribute to load distribution and stress absorption (Babu & Bordoni, 2020). Lower limb muscle imbalance from proximal to distal is caused by this malformation. In order to effectively treat pes planus, muscle imbalance must be corrected (Sawant Janhavi & Shinde, 2021). Plantar flexion and talar adduction are involved in pes planus (Alahmri *et al.*, 2022).

A number of functions during static standing and walking may be impacted by the height of the MLA, a changeable structure. Changes in lower limb alignment, such as subtalar pronation, tibial internal rotation and torsion, increased genu recurvatum, anterior knee laxity, pelvic anteversion, and lumbar lordosis, are associated with a decrease in MLA height (Zuil-Escobar *et al.*, 2019).

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The sole contains ten intrinsic muscles. Together, they stabilize the arches of the foot, as well as separately, to regulate digit mobility. The primary components of foot function are extrinsic and intrinsic foot muscles, with the latter being thought to play a more significant role in dynamic foot control. Research indicates that improving intrinsic muscle strength improves the dynamic support of the MLA and foot stability (Kate & Palkar, 2021).

With its complex and delicate motor function, the foot arch has a three-dimensional anatomical structure. The typical biomechanical properties of the foot arch are essential for the human body's ability to support weight and buffer pressure. Abnormal alterations in the foot arch structure always result in biomechanical alterations of the lower limbs, causing musculoskeletal disorders and diseases of the lower limbs, as well as varied degrees of impairment to motor function and quality of life (Liu *et al.*, 2023).

Ankle joint complex (AJC) kinematics research has long been a major subject of interest for orthopaedic surgeons and biomechanics. It is unclear, therefore, how walking with more weight influences the AJC's motion in comparison to walking with a normal body weight (BW) or what adaptations the AJC would naturally make to handle the extra burden (Wang *et al.*, 2024). The human ankle is frequently investigated and referred to as the ankle joint complex, even though we typically think of it as a single joint. The ankle joint is, in fact, the connection between the talus on one side and the tibia and fibula on the other, but the complex also comprises the subtalar joint, which is the articulation between the calcaneus and the talus. This intricate structure causes simultaneous translation and rotation across several articular surfaces (Labey, 2022).

A network of osseous and soft tissue structures makes up the ankle, a complex joint that naturally balances structure and function and permits stresses to be transmitted through the ankle during weight-bearing exercises. Each part collaborates biomechanically and is essential to the gait cycle (Yurek *et al.*, 2022). In those with proprioceptive issues, which are linked to joint stiffness, ankle joint mobility plays a role in lower extremity injuries. One condition known as "flat foot" occurs when the medial longitudinal arch collapses or is absent. There is calcaneal eversion. All age groups experience postural problems as a result of the changing center of gravity, which puts stress on joint structures such as the spine, hip, knee, and ankle. Additionally, it causes a reduction of shock-absorbing capacity, increasing the foot's vulnerability to osteoarthritis and trauma (James, 2024).

A biomechanical condition known as flat foot (pes planus) is characterized by several physical characteristics, such as excessive eversion of the subtalar complex when bearing weight, plantar flexion of the talus, plantar flexion of the calcaneus with respect to the tibia, and dorsiflexion as well as navicular abduction, forefoot supination, and heel valgus posture (Seshan *et al.*, 2021). The foot functions as a shock absorber despite being perceived as a stiff, immobile structure. It actively contributes to weight

support and movement. Its adaptable structure allows it to balance changes in the outside world. The system's biomechanics are intricate, and the ground reaction force transmission mechanism has been examined in numerous studies. For the foot to move dynamically and during walking, the arches of the foot are essential (Şahin *et al.*, 2022).

The capacity to maintain equilibrium by placing our center of gravity above our base of support is known as balance. One crucial motor ability that influences athletic performance is balance. Running, jumping, and kicking are just a few of the sports activities where maintaining balance is essential (Şahin *et al.*, 2022). Balance can be impacted by musculoskeletal aspects i.e pes planus, pes rectus, and pes cavus, as well as physiological factors i.e vestibular, visual, and proprioception. One of the most prevalent musculoskeletal disorders in youth is pes planus, which makes walking, running, and leaping painful and challenging (Şahin *et al.*, 2022). Static and dynamic balance are the two categories into which balance is divided. Dynamic balance is the capacity to change the body's center of gravity (COG) within the base of support in a controlled way, whereas static balance can maintain the COG inside it (Toprak *et al.*, 2018). Numerous investigations have shown that the reduced medial longitudinal arch height in individuals with pes planus causes severe postural instability. Plantar pressure, the ligaments that form the foot arch, the foot's intrinsic and extrinsic muscular tendons, sensory inputs from mechanoreceptors in the joint capsules, and the flexibility and stability of the foot arches are all strongly related to the balance of standing and walking. Changes in foot alignment produce abnormal sensory input, which impairs postural stability (Demircioglu & Genc, 2025).

It is believed that pes planus alters the hindfoot's angulations, creates soft tissue instability, and results in disorders such tibialis posterior insufficiency. These foot posture alterations affect the proximal portion of the lower extremity in addition to the foot and ankle. One risk factor for injuries to the lower extremities is foot position. The way the foot functions is influenced by its structural characteristics. Walking and other daily tasks require adjustments due to the biomechanical distribution and loadings in the lower extremities, which are impacted by foot posture and foot issues. Because the joints are loaded in an improper position, this compensatory mechanism accelerates the degenerative changes in the joints (Şahan *et al.*, 2023). Children with flat feet frequently complained of foot pain and difficulty running, walking on uneven terrain, walking great distances quickly, and maintaining balance. Usually, they are worried about how their feet look (Birhanu *et al.*, 2023).

Conservative treatment approaches often include adjusting activity levels, reducing weight if needed, changing footwear, immobility, anti-inflammatory drugs, massage, and, finally, physical therapy. Surgical intervention might be considered if conservative measures proved ineffective (Zupping, 2023). Physiotherapists can treat patients with flat feet in a variety of methods, including

employing various taping techniques, strengthening the foot muscles, and stretching the triceps surae muscle (Zupping, 2023). It is estimated that between 20% and 37% of people have some form of pes planus (Raj *et al.*, 2023). A comparatively high frequency of flat feet, ranging from 10.27% to 17.1%, has been found in numerous investigations. A study conducted in 2006 by Pfeiffer and associates found that the frequency among preschool-aged children was significantly greater, at 44%. There is ample evidence of racial and ethnic disparities in foot conditions and types, and a survey conducted in Southern Italy revealed that 9.35% of people between the ages of 10 and 20 had flat feet (Shpata *et al.*, 2025). With a prevalence of 40.6%, flatfoot is comparatively common among children in Lahore (Ateeque *et al.*, 2024).

Approximately 90% of all foot-related clinical visits globally are caused by flat feet. Among youngsters aged 11 to 15, the overall prevalence of flat foot was 17.6% in the northwest Ethiopian city of Gondar (Deshmukh *et al.*). This implies that almost one-sixth of kids between the ages of eleven and fifteen have flat feet (Birhanu *et al.*, 2023). According to certain epidemiologic research, having flat feet is common in the first few years of life.

The frequency of flat feet sharply declines with age, with only 4% of people remaining affected by the age of 102 (Ibrahim *et al.*, 2019). Males are twice as likely as females to have flatfoot (Deshmukh *et al.*). By the age of ten, most children have a normal arch, albeit it is usually more frequent in children. Between the ages of two and six (21 to 57 percent), the prevalence is lower among elementary school students (13.4 to 27.6%) than in the adult population, which ranges between 5 and 14 percent. In contrast, a survey conducted in Southern Italy revealed that 9.35% of people between the ages of 10 and 20 had flat feet (Shpata *et al.*, 2025). This study identifies the frequency of pes planus and its association with ankle pain and risk of falls in school students. Previous local researches focus on either the adult population or addresses isolated pes planus condition. Additionally, limited research has been conducted with local school settings, leaving a lack of context – specific data relevant to early prevention strategies. By bridging this knowledge gap, the findings can inform school health programs, guide early intervention, and ultimately reduce the burden of musculoskeletal issues during childhood and adolescence.

Objective

To determine the frequency of pes planus in its association with ankle pain and risk of falls reported in school students. Cross-sectional study.

LITERATURE REVIEW

Asaminew Birhanu *et al.* reported that Pes planus happens when the foot's longitudinal or medial arches are flat or depressed, resulting in the entire foot making contact with the ground when walking, standing, or bearing weight (Birhanu *et al.*, 2023). Chou Mei-Chia *et al.* reported

that it is thought that the lumbar spine and lower limb biomechanics are changed when the arch complex malfunctions in pes planus (Chou *et al.*, 2021). According to Ashok Aenumulapalli *et al.*, flat feet are particularly common in children and become less common as people develop and reach a more mature skeleton. The majority of earlier research on the prevalence of flat feet was conducted on children (Aenumulapalli *et al.*, 2017). Maria Markowicz *et al.* stated that, among other things, lowering the arches in flat-pronated feet tightens the plantar fascia and ligaments. A cycle of microtears, discomfort, and inflammation can also result from applying pressure on these tissues over an extended period of time. Furthermore, proprioception and balance may be impacted by flat feet. demonstrated how excessive pronation might alter muscle tactics to maintain a stable base of support or alter joint mobility or contact surface, which can impact peripheral, afferent somatosensory signals (Markowicz *et al.*, 2023).

V Shpata *et al.* stated that there is proof that the incidence of flat feet decreases with age. The results of and colleagues show that between the ages of six and seventeen, foot morphology experiences substantial developmental changes, and as children get older, the prevalence of flatfoot gradually declines (Shpata *et al.*, 2025). AJ Saarinen *et al.* stated that Previous research has demonstrated that FAAM is a viable tool for assessing several foot and ankle conditions, with strong construct validity, responsiveness, and content (Saarinen *et al.*, 2022). The literature describing the connection between pes planus and young adult balance, low back discomfort, and foot pain has produced contradictory findings. In accordance There have also been reports of flat feet by Shigeyuki Hara *et al.*, indicating that foot function is compromised. Research has shown that flat feet are associated with a higher incidence of plantar tendinitis as compared to normal alignment (Hara *et al.*, 2023). According to Du-Jin Park *et al.* Many musculoskeletal issues in both adults and children are thought to be caused by obesity. Increased BMI has been linked to foot discomfort and pes planus deformity in children, adolescents, and adults. Of the musculoskeletal issues, pes planus deformity is most prevalent in obese people (Park *et al.*, 2021).

James *et al.* stated that the range of mobility of the ankle and the degree of pes planus were found to be negatively correlated in this study. People with flat feet had a lower DF, which could affect their mobility and gait and increase their risk of injury (James, 2024). Maryam Ghorbani *et al.* stated that the biomechanical impact of the foot sole on the proprioception of the lower limb joints, however, has been the subject of fewer investigations. Only one study assessed the proprioception and ankle isokinetic strength of patients with flat feet. The findings showed that the error scores of passive reproduction of the dominant side's ankle joint position in eversion were considerably greater in individuals with flexible flatfoot than in the control group. The control group and those with flat,

flexible soles did not significantly differ in terms of aurator and invertor muscle strength (Ghorbani *et al.*, 2023).

Mahmut AÇAK It et al stated that issues brought on by pes planus have a detrimental impact on people's lives and abilities to perform daily tasks. Additionally, these alterations can result in gait abnormalities and foot, calf, and back discomfort, which can severely impact physical fitness, quality of life, and everyday activities like walking, standing for extended periods of time, and exercising (AÇAK, 2020). According to FN Şahin, et al Numerous investigations have shown that the reduced medial longitudinal arch height in individuals with pes planus causes severe postural instability (Şahin *et al.*, 2022). Plantar pressure, the ligaments that form the foot arch, the foot's intrinsic and extrinsic muscular tendons, sensory inputs from mechanoreceptors in the joint capsules, and the flexibility and stability of the foot arches are all strongly related to the balance of standing and walking. By producing abnormal sensory input, changes in foot alignment impair postural stability (Şahin *et al.*, 2022). Maryam Ghorbani et al found that the flexible flatfoot group has substantially less static balance than the normal foot group; in other words, foot biomechanics influences stability and balance when at rest. The kinematic chain of the lower limb, which is made up of 26 distinct bones, 33 joints connected to the ankle, knee, and femur joints, and more than 100 muscles, tendons, and ligaments, controls the body's equilibrium both in static and dynamic condition. The feet serve as the kinematic chain's base of support and are situated at the distal end of this chain (Ghorbani *et al.*, 2023).

I Mubeen,et al stated that On the other hand, earlier research revealed that the prevalence of flatfoot posture was about equal for men and women, highlighting the necessity of placing findings within the context of methodological and demographic variations (Ghorbani *et al.*, 2023). The correlation between foot biomechanics and balance was further emphasized by the correlation between FP and BBS scores. Higher BBS scores were linked to pronated FP, which is consistent with previous research that suggests a larger area of contact with the ground in flatfoot postures may improve postural stability (Ghorbani *et al.*, 2023). On the other hand, lower BBS scores were associated with supinated FP, indicating impaired static balance. This is in line with earlier research that suggests high-arched feet may have a detrimental effect on weight-bearing stability (Mubeen *et al.*, 2024).

Kazunori Okamura et al reported that the short-foot exercise in this study successfully altered the foot kinematics' temporal properties during walking (Mubeen *et al.*, 2024). This modification, which reduced the amount of time it took for the navicular height to drop to its lowest value, suggested that participants with pes planus had better windlass mechanisms. Consequently, programs aimed at preventing or treating injuries associated with the alignment of the pes planus should incorporate the short-foot exercise (Okamura *et al.*, 2020). According

to FN Şahin *et al.*, a study looking at the connection between lower limb injuries and foot arch structure, feet with excessive pes cavus or pes planus are more likely to sustain a variety of lower extremity injuries than feet with a neutral arch (Şahin *et al.*, 2022). According to S. Bakırhan *et al.*, people with high arch height were more likely than those with low arch height to sustain soft tissue and foot injuries, and the power of the foot muscles was linked to the fall-related injury (Bakırhan *et al.*, 2021).

MATERIALS AND METHODS

Search Engine

Google Scholar and PubMed were used as search engines for writing the literature review. A systematic search strategy was implemented to identify relevant studies published between January 2020 and September 2025, ensuring the inclusion of the most current and evidence-based literature. The search focused on articles examining pes planus, flat foot, risk of falls, and among school students.

Study Design

The study design was a Cross-sectional study.

Study Settings

The study was conducted at the Bitel Academy, Islamia Coaching Academy, and Khan Coaching Academy in Peshawar.

Study Duration

The study was completed within 6 months after approval of the proposal by the research committee of AMI.

Sample Size

This cross-sectional study was designed, where all individuals meeting the inclusion criteria were included. The total population size was 132 individuals. No sample size calculation was necessary.

Sampling Technique

Non-probability convenient sampling Techniques.

Sample Selection

Inclusion Criteria

- School-going students aged 5-16 years.
- Both genders (male and female)
- Ambulatory Students (can walk independently).
- Students who participate in regular physical activity.

Exclusion Criteria

- Students with a history of foot or ankle surgery
- Students with known neuromuscular or orthopedic conditions (eg, cerebral palsy, muscular dystrophy, spina bifida)
- Students currently receiving treatment for foot deformities (eg, orthotics, physical therapy)
- Students with recent lower limb injuries in the last 6 months that could affect gait or foot posture
- Obese students (BMI > 95th percentile for age and sex)

Data Collection Procedure

After approval was obtained from the Research Committee of Ahmad Medical Institute (AMI), data collection was carried out at Bitel Academy, Islamia Coaching Academy and Khan Coaching Academy in Peshawar. Prior to data collection, permission was obtained from the respective Head of the Institute. All willing participants were briefed about the purpose and procedure of the study, and written informed consent was obtained from each participant. An information sheet was provided to them. The agreed participants were screened according to the inclusion and exclusion criteria. Data were collected using the following tools.

Data Collection Tools

- Disability benefit questionnaire (DBQ)
- Foot and ankle ability measure (FAAM)
- Berg balance scale (BBS)

Data Analysis Procedure

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 26. For numerical data such as age, height, and weight, the mean and standard deviation were calculated. Categorical variables, including gender and grade level, were summarized using frequencies and percentages. The results were presented in the form of tables and graphs. Associations between categorical variables were assessed using the chi-square test

RESULTS AND DISCUSSION

Gender of Participant

A total of 132 participants were included in this study. Out of 132 participants, 92(69.7%) were male and 40 (30.3%) were female.

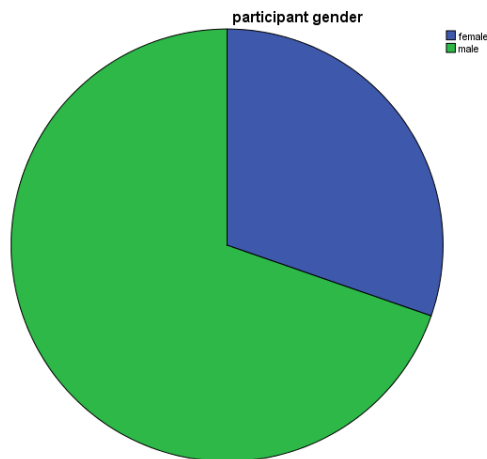


Figure 1: Participant Gender

Participant Institute

Total participant were 132 .out of the 132 participant those belong from BITAL had a frequency of 51, and a percentage (38.6%). Those who belong to KHAN have a frequency of 58 and a percentage (43.2%). Those belong to ICA, having frequency (24) and percentage (18.2%).

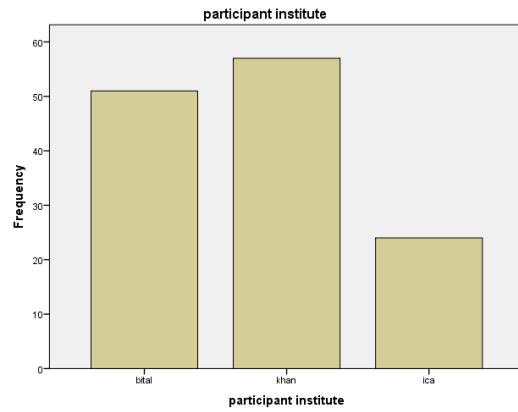


Figure 2: Participant Institute

Participant Study

Total participant were 132 .out of 132 participant frequency of class 8th student is (19) and percentage (14.4%). Those whose from class 9th having frequency (40) and percentage (30.3%). those whose from class (10) having frequency (73) and percentage (55.3).

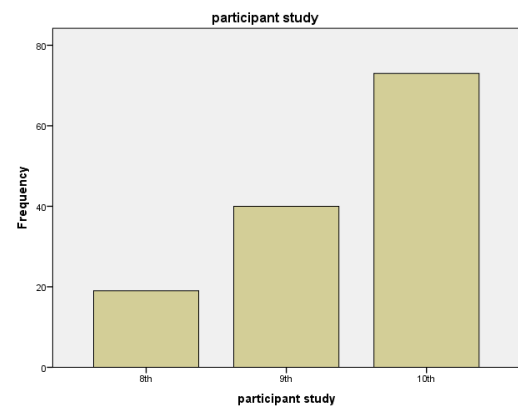


Figure 3: Participant study

Participant Weight

Total participant was 132. Participant who weighted (30-50), having frequency (95) and percentage (53.1%). Participant who weighted (50-85), having frequency (37) and percentage is (47.9%).

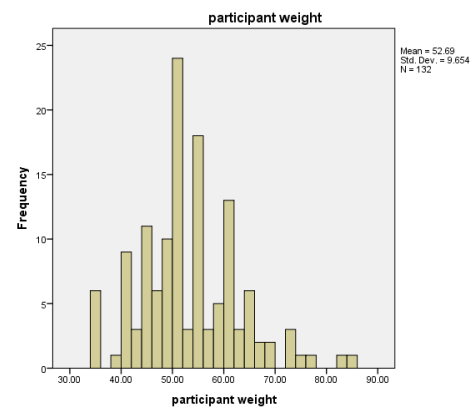


Figure 4: Participant weight

Participant Height

There were 132 participants having mean score of 1.58

with a standard deviation of 0.167.

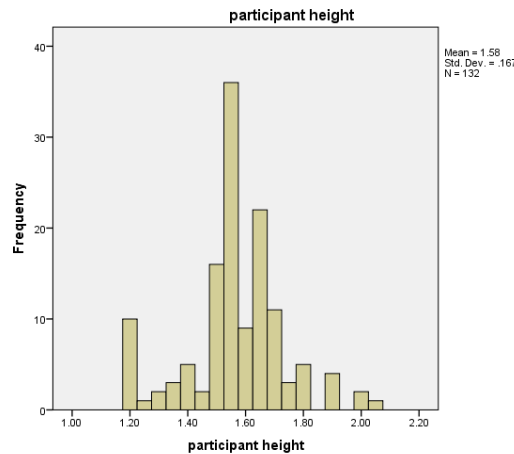


Figure 5: Participant height

FAAM Categorizes by Age

Chi-square test was applied between FAAM categorization

and age, which show positive association between FAAM and age. P-value is 0.050

Table 1: Chi-square test between FAAM and age

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.591a	6	.050
Likelihood Ratio	13.463	6	.036
Linear-by-Linear Association	.029	1	.864
N of Valid Cases	132		

Chi-Square test between BMI and Age

Chi-square test was applied between BMI and AGE, which

shows no association between BMI and AGE. P-value is .52 which is higher than the usual significance of 0.05.

Table 2: Chi-square test between BMI and AGE

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	200.063a	202	.525
Likelihood Ratio	224.686	202	.131
Linear-by-Linear Association	.042	1	.838
N of Valid Cases	132		

BBS Categories with Age

Chi-square test applied between BBS categorization and AGE,

which shows no association between BBS and AGE. P-value is .48 which is higher than the significance level of 0.05.

Table 3: Chi-square test between BBS Categories with Age

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.444a	2	.486
Likelihood Ratio	1.543	2	.462
Linear-by-Linear Association	.704	1	.401
N of Valid Cases	132		

Chi-Square Test between PP Category and BBS Total Score

Chi-square test was applied between the PP category

and the BBS total score, which show positive association between the PP category and the BBS total P VALUE is .00.

Table 4: Chi-square test between pp category and BBS total score

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	73.461a	19	.000
Likelihood Ratio	89.213	19	.000
Linear-by-Linear Association	60.108	1	.000
N of Valid Cases	132		

Chi-Square between PP Category and FAAM Total Score

Chi-square test was applied between the PP category and

the FAAM total score, which shows no association between the PP category and the FAAM total score. P-value is .30 which is higher than the usual significance of 0.05.

Table 5: Chi-square test between pp category and FAAM total score

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.566a	32	.304
Likelihood Ratio	44.969	32	.064
Linear-by-Linear Association	5.436	1	.020
N of Valid Cases	132		

Chi-Square between the BBS Category and the FAAM Category

Chi-square test was applied between BBS category and

FAAM category which show no association between BBS and FAAM category P VALUE .47 which is higher than usual significance .05.

Table 6: Chi-square test BBS category and FAAM total score

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.487a	3	.478
Likelihood Ratio	2.917	3	.405
Linear-by-Linear Association	1.708	1	.191
N of Valid Cases	132		

Chi-Square between the PP Total Score and the BBS Total Score

Chi-square test was applied between PP total score and

BBS total score, which show positive association between PP total score and BBS total score. P-value is .001.

Table 7: Chi Square between PP total and

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.816a	9	.001
Likelihood Ratio	29.859	9	.000
Linear-by-Linear Association	19.481	1	.000
N of Valid Cases	132		

Chi-Square between BMI and Age

Chi-square test was applied between BMI and Age, which show negative association between BMI and Age,

and P VALUE is .475 which is lower than the usual significance of 0.05.

Table 8: Chi-square between BMI and AGE

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	101.224a	101	.475
Likelihood Ratio	125.217	101	.052
Linear-by-Linear Association	.629	1	.428
N of Valid Cases	132		

a. 204 cells (100.0%) have expected count less than 5. The minimum expected count is .30.

Chi-Square between PP Total Score and FAAM Categories

Chi-Square test was applied between PP total Score and FAAM categories, which shows no association P Value is .340.

Table 9: Chi-square test between pp total score and the FAAM categories

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.443a	27	.340
Likelihood Ratio	29.353	27	.344
Linear-by-Linear Association	10.261	1	.001
N of Valid Cases	132		

a. 28 cells (70.0%) have expected count less than 5. The minimum expected count is .04.

Discussion

This study involved 132 people in all. 92 (69.7%) of the participants were men, and 40 (30.3%) were women. Individuals who are part of BITAL have a frequency of 51 and a proportion of 38.6%. Individuals from KHAN have a frequency of 58 and a proportion of 43.2%. ICA is the source of those with frequency (24) and percentage (18.2%). Students in class 8 have a participation rate of 19 and a percentage of 14.4%. those in class 9 with a frequency of 40 and a percentage of 30.3%. class (10) members with frequency (73) and percentage (55.3). Participants weighing between 30 and 50 had a frequency of 95 and a percentage of 53.1%. Participants weighing between 50 and 85 had a frequency of 37% and a percentage of 47.9%. height of participants with a standard deviation of 0.167 and a mean score of 1.58. The chi-squared test between FAAM categorization and age revealed a positive correlation between the two, with a P-value of 0.050. There is no correlation between BMI and AGE, according to the chi-square test between the two variables.

The P value is.52, which is larger than the typical significance level of 0.05. The results of the chi square test between AGE and BBS categorization indicate that there is no correlation between the two. The P value is 0.48, above the significance level of 0.05. PP category and BBS total score were compared using the chi-square test, which revealed a positive correlation (P VALUE =.00). The results of the chi-square test between the PP category and the FAAM total score indicate that there is no correlation between the two. The P VALUE is.30, which is greater than the typical significance level of 0.05. A chi-squared test between the BBS and FAAM categories revealed no correlation, with a P VALUE of.47, which is greater than typical significance. 5. A positive correlation between the PP and BBS total scores was found using the chi-square test, with a P value of.001 from the comparison. The chi-square test between BMI and age revealed a negative correlation, with a P value of 0.47—below the typical significance level of 0.05. The PP total score and FAAM categories were compared using the Chi-Square test, which revealed no correlation. The P value is.340.

A cross-sectional study conducted in Indonesia by IAASI Ayu, A Suadnyana, *et al.*, stated that there was a significant relationship between static balance and foot

posture score, which was in line with a study that looked at static balance and discovered that the flexible flatfoot had significantly worse static balance. It recognizes that having flexible flatfoot soles might affect one’s sense of balance and joint position (Ayu *et al.*, 2023). Tezel Yildirim Şahan et al has been highlighted that in numerous recent studies, any force loss in the foot structures or a factor influencing force output may have a detrimental effect on balance in both mediolateral and anteroposterior directions, increasing the risk of falling. One study has shown that the pes planus influences the anatomy of the foot via influencing force production and foot position (Şahan *et al.*, 2023).

According Ramazan Yıldız et al stated that Researchers discovered that during both static and dynamic exercises, student basketball players’ pes planus induced postural stability issues. Additionally, they demonstrated that people with pes planus had trouble balancing and that there may be a connection between foot anatomy and balance performance, particularly in athletes who engage in longer workouts. In line with previous research, our study found that the severity of pes planus was linked to a decline in balance performance (Yıldız & Yildiz, 2025). Balance and other performance metrics may be impacted by the pes planus’s diminished medial longitudinal arch and the deterioration of the muscles and ligaments there (Yıldız & Yildiz, 2025).

According to S Bakırhan et al In addition to the unequal load distribution brought on by the collapse of the medial arch support, people with pes planus experience quick tiredness and balance issues due to the weakness of their muscle, tendon, and ligament structures combined with biomechanical problems. As a result, balance metrics suffer, and people with pes planus take less time to maintain their equilibrium (Bakırhan *et al.*, 2021). According to MS Tan et al stated that As expected, the pes planus group’s time to maintain balance was shorter in all static and dynamic tests. Other than this, no statistically significant association was discovered ($p > 0.05$) when the relationship between groups, balancing tests, and demographic and clinical data was examined. As a result, both static and dynamic balance tests were useful in assessing flat feet, and the severity of the condition was unaffected by variables like gender or weight (Tan & Yildirim, 2023).

According to Elif Barutcu et al Upon conducting

assessments, which discovered that the groups with and without pes planus had similar results for foot and low back pain. The lower extremities and pelvis form a kinetic chain during several activities, including walking, running, and standing. Pes planus, hence, has the potential to impair the alignment and biomechanics of the structures and joints situated above, such as the upper body, in addition to adversely affecting the alignment and biomechanics of the foot's structures (Barutcu *et al.*, 2024). K Getie *et al.* stated that the current study's findings, nurses' ankle-foot pain was significantly correlated with their age (40 years and older), work in the intensive care unit or operating room, low shoe comfort, having at least two foot conditions, high physical demands, and working night shifts. The results of this study were similar to those of research conducted in Kenya (48.5%), Pakistan (47.2%), and Saudi Arabia (41.5%)(Getie *et al.*, 2021).

According to Maki Tojo One study's prevalence is more than that of studies done in Uganda and Japan, which found that the yearly prevalence of ankle-foot pain among nurses was 38.1% and 23%, respectively. This could be because study participants were younger, worked higher hours per week more participating in sports, had different operational definitions, reported being less overweight, and had different work setups. A study conducted in Japan found that 58% of participants were under 30 years old, had less weekly working hours, and reported being overweight (9%), whereas this study found that 15.6% of participants were overweight(Tojo *et al.*, 2018). Similar purposive sample techniques were utilized in a Ugandan study, albeit this one employed basic random techniques. According to this study, nurses who were 40 years of age or older had a 7.66-fold increased risk of experiencing foot or ankle pain. A Japanese study that found a favorable correlation between ankle-foot pain and nurses over 50 years of age provided support for this one (Tojo *et al.*, 2018).

Similarly, it is corroborated by additional research from the US and Sweden that showed a strong correlation between ankle/foot pain and being 40 years of age or older. A comprehensive analysis conducted by researchers revealed that growing older raises the incidence of ankle-foot pain in the overall population. The pathophysiological process may have changed in the elderly population, and several disorders, including osteoporosis and degradation of the ankle-foot joints, have been reported. These conditions may cause the elderly population to experience ankle-foot pain. On the contrary, two separate Australian investigations do not support this study. This might be because Australian nurses receive training on how to stay current on foot and ankle issues. This is aligned with our finding (Getie *et al.*, 2021).

V Shpata *et al.* stated that there was no statistically significant correlation between flat feet and BMI in our study. Obese or severely obese participants had a lower prevalence of pes planus (21.51% and 12%, respectively) than those with an average body weight, while the

overweight group had a slightly higher prevalence (25.59%) than the average body weight group (23.82%). Our findings run contrary to research showing that children who are overweight or obese have a 2.5-fold increased risk of flat feet when compared to children of normal weight(Shpata *et al.*, 2025).

V Shpata *et al.* stated that there is evidence that as people age, the prevalence of flat feet decreases. However, other research shows that between the ages of six and seventeen, foot morphology experiences substantial developmental changes, and the prevalence of flatfoot gradually declines as kids get older. Such an approach, however, is not correlational in our study because the prevalence is higher in those aged 13 (26.78%) and 14-15 (25.58%) than in those aged 10 (20.64%), which is comparable to other studies that found no association between age and flat feet. These results underline the need for more research by demonstrating the intricate and multifaceted relationship between body composition and pes planus(Shpata *et al.*, 2025).

Limitations

- The study was limited to students from selected schools, reducing the generalizability of findings.
- Some school students had difficulty understanding the questionnaire items, which may have influenced their responses.
- The cross-sectional design does not allow causal relationships to be established between pes planus, ankle pain, and fall risk.

CONCLUSION

The analysis revealed that there was a borderline relationship between FAAM and age, implying that the level of functional activity can be slightly different among age groups, but BMI and BBS had no significant relationship with age. Conversely, pes planus (PP) demonstrated a close and robust correlation with balance scores (BBS) at the categorical and the total levels, indicating that the superior physical performance is closely associated with a higher balance capability. None of the meaningful correlations were identified between FAAM and PP or between FAAM and BBS, which indicated that the self-reported functional ability was not directly correlated with performance or balance results.

Recommendations

- Introduce early screening programs in schools to identify students with pes planus and related ankle or balance problems.
- Provide awareness sessions and simple exercise programs to strengthen the foot, improve balance, and reduce fall risk among schoolchildren.
- Conduct longitudinal studies with larger and more diverse student populations to confirm these findings and evaluate long-term outcome.

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