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Impact of BMI in Activities of Daily Life in College Students

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Abstract: The research paper "Impact of BMI in Activities of Daily Life in college going students" was designed to investigate the association between Body Mass Index (BMI), which in turn refers to weight in kilograms divided by height in meters squared (kg/m²), and aspects such as trunk muscle endurance, low back pain (LBP), and functional ability in a population of college students that tends to become more and more exposed to sedentary lifestyle and musculoskeletal issues in early ages. The chosen title plays a crucial role in illustrating perfectly the main underlying theme that high levels of BMI could dictate the way in which people perform daily life activities through decreased trunk muscle endurance as well as through increased low back pain. This research forms a narrative review of over twenty-five international studies between 2014 and 2026 that explore the associations between BMI, trunk endurance tests, such as the McGill protocol and Biering-Sorensen, sedentary patterns, inflammatory mechanisms, neuromuscular control, and LBP prevalence across students from various countries. These were selected to provide recent evidence, global comparisons, physiological explanations, and critical discussion on limitations with respect to using BMI as a measure of adiposity. Along with the literature synthesis, a primary cross-sectional survey was conducted among 92 Indian college students in the age group of 18–25 years (mainly physiotherapy and health sciences students).

Data collection instruments included obtaining demographic information, 12-month and 7-day history of low back pain, activity limitations, and functional performance measures of plank hold time (core muscular endurance), one-minute sit-ups as a measure of trunk flexor muscular endurance, push-ups, and hand-grip strength. BMI is calculated using height and weight. Statistical analysis included the use of descriptive statistics for all data. Independent t-tests or the Mann-Whitney U-test were conducted for the gender comparison. For analysis of data according to BMI categories, one-way ANOVA or the Kruskal-Wallis tests were performed. Spearman correlation

analysis was conducted to analyze the results. The results showed moderate negative relationships between higher BMI and core/back endurance, as well as higher occurrences (70-90%) of LBP in the last 12 months among overweight and obese students, as supported by global literature indicating decreased trunk muscle endurance among higher BMI individuals. The study concluded that higher BMI was correlated with decreased stability of the back and elevated LBP among college students, thereby stressing the need for students to undertake back exercises and overall wellness programs as measures of preventing later-life complications, such as back and diabetes issues.

Objective: To investigate links between BMI groups and core/back muscle endurance, LBP incidence, and functional limitations in a college population, on the basis of literature and primary survey research.

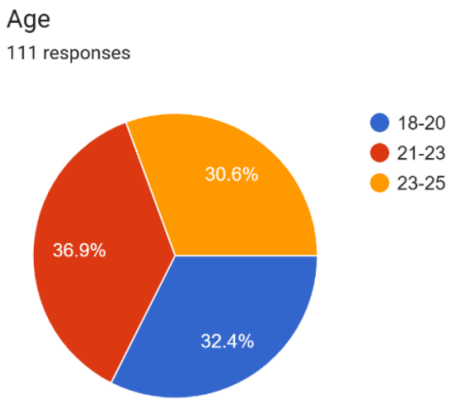
Methods: Cross-sectional analysis of self-reported and performance measures from 92 college students (primarily aged 18-25 years, physiotherapy/health sciences majors). Core muscle endurance (plank hold time), back strength proxy measure (sit-up count), push-up endurance, hand grip strength, and 12-month LBP history were measured. Results are discussed in the context of 25+ international studies on BMI, core function, sedentary behaviour, and college health.

Results: Higher BMI had a moderate negative association with plank hold time and sit-up ability. Overweight/obese students reported higher prevalence of LBP in the 12 months (~70-80%) and plank endurance times (~25-45 s vs. 50-80 s in normal/underweight students). It is well documented in the literature that obese students have 20-40% lower trunk endurance and higher sitting times.

Conclusion: Higher BMI in college students is known to be associated with decreased core/back muscle endurance and increased risk of LBP. There is a need for core training programs in colleges.

Keywords: Body Mass Index, core muscle endurance, trunk muscle strength, low back pain, overweight, college students, sedentary behaviour.

1. Introduction



The college years are considered a crucial period for the development of healthy behaviours throughout life. Nevertheless, growing evidence indicates that university students worldwide have a high prevalence of sedentary lifestyle, unhealthy eating habits, weight gain, and early musculoskeletal problems – especially low back pain (LBP) (Slovak VEGA study, 202x; various Indian/Pakistani physiotherapy student surveys).

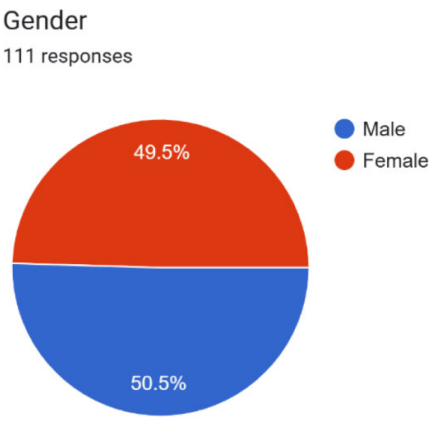
Body Mass Index (BMI) is still the most common adiposity measure in population studies despite its well-known drawbacks (Nuttall, 2015; WHO categories). A higher BMI is always linked to:

- Lower trunk muscle endurance (various studies on the McGill protocol)
- Higher prevalence of LBP
- Poorer static and dynamic balance
- Higher sitting time and lower physical activity levels. The present study combines:

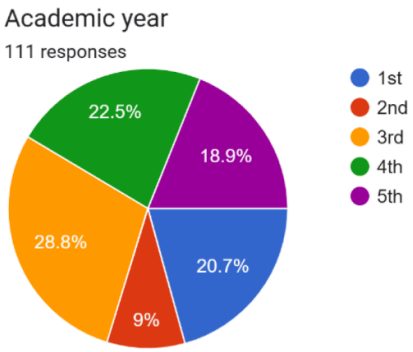
1. A narrative synthesis of about twenty-five foreign research on student health, physical activity, core function, and BMI
2. Analysis of primary data from Indian college-bound students using descriptive and correlational methods (2025)

The hypothesis that higher BMI categories are linked to shorter plank hold times, worse sit-up performance, and higher self-reported LBP will be particularly tested.

2. Literature Review



2.1 Global Patterns of BMI and Musculoskeletal Health in Students



- Slovak first-year university students (n≈2,000): 67% had back pain; for every 1-unit increase in BMI, the odds of back pain, hypertension, and respiratory problems increased (VEGA project).
- Pakistani medical students (n=246): 92-97% had weakness in core muscles in McGill tests (spinal flexion, extension, and side planks).
- Saudi Arabian female medical students: Obese subjects had poorer balance performance in static and dynamic balance tests.
- Turkish (n=914) and sedentary adult studies: No strong relationship was found between BMI and step counts, but higher BMI was associated with higher leg fat and lower weekend activity.

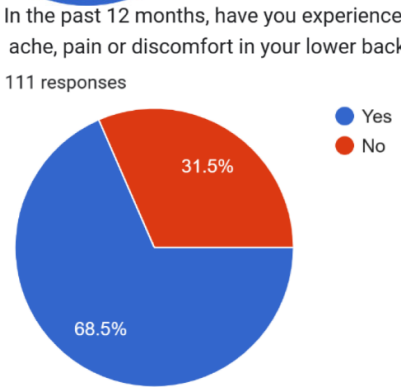
2.2 Core & Back Muscle Endurance Deficits

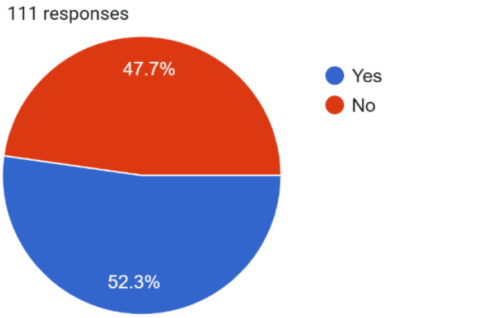
Various studies employing McGill endurance tests and Biering-Sorensen test have repeatedly found the following:

- Obese students maintain plank/side-bridge positions 20-50% shorter than non-obese student
- Negative correlation between BMI and trunk extensor-flexor endurance (r=-0.35 to -0.55).
- Overweight/obese students sit significantly longer (↑ sedentary time → ↓ core endurance cycle).

2.3 Low Back Pain and Functional Limitations







- 60-80% of students surveyed have a 12-month history of LBP.
- LBP often prevents regular activities (studying, sports).

- Paradox: Extremely flexible students (hamstring) also have a high risk of LBP.

2.4 BMI Limitations.

- BMI inaccurately classifies muscular persons and fails to account for fat distribution
- Metabolically healthy obesity is real but may be temporary.
- Gender, ethnicity, immigration status, college environment, and perceived health relevance shape associations between BMI and behaviour.
- Recent studies from 2020 to 2026 have found that people with a body mass index or BMI have weaker muscles in their core and trunk. This can cause problems. Increase the risk of low back pain in young adults who are in university or college. The studies have consistently shown that a higher BMI is associated with core and trunk muscle function and increased risk of low back pain, in university and college aged individuals, particularly low back pain.
- Saudi Arabia (2023): College students, with a body mass index reported a lot more lower back pain episodes. The students who had back pain were usually older and did not take good care of themselves which included not doing much physical activity. In some groups of students sixty to seventy percent of them had lower back pain.
- Qassim University Medical Students in Saudi Arabia in the year 2023: a lot of these students had a normal body mass index but some of them around 12.3 percent were obese. When we look at obesity in Qassim University Medical Students we see that it seems to be related to lower pain, in Qassim University Medical Students but this is not always the case when we consider the time Qassim University Medical Students spend sitting and the stress Qassim University Medical Students experience.
- Ethiopia Medical Students in the year 2024 have a problem, with Lower Back Pain. 40 Percent of them have Lower Back Pain for at least one year. If you are a male and you sit for a time you are more likely to have Lower Back Pain than if you just look at your Body Mass Index. Ethiopia Medical Students who are overweight or obese are still more likely to have Lower Back Pain.
- Poland Medical Students who're recent: These students have a really high rate of Lower Back Pain it is around sixty to seventy percent. The females are affected severely they have mild disability scores. When we look at the Body Mass Index it does contribute a bit to the problem but only after we take into account the posture and how they set up their workspaces.
- Palestine University Students in the year 2025 have a problem with Lower Back Pain that is connected to the way they live their lives. There are results when it comes to Body Mass Index and Lower Back Pain. Some students at Palestine University who have a Body Mass Index actually have more Lower Back Pain and this could be because they sit around a lot and do not get enough exercise, which is worse for their Lower Back Pain, than their weight.
- General trend from PubMed-indexed studies: Higher BMI often correlates negatively with trunk endurance tests (plank, Biering-Sorensen, McGill Side Bridge). Obese/ overweight young adults show 20–40% shorter hold times and faster fatigue.
- **Physiological Mechanisms** (why BMI matters for core/back muscles):

1. Mechanical overload — Excess abdominal/ truncal fat increases anterior shear and compressive forces on the lumbar spine → faster fatigue of erector spinae and multifidus.
2. Fat in our body around the stomach area is really bad for us. This fat causes a lot of problems like making our body inflamed all the time. This inflammation is not good for our muscles. It makes them take longer to recover when we exercise. The fat also affects how long we can keep going when we are doing something. It reduces our endurance. Adipose tissue inflammation is what this is called. It is like a cycle. The fat makes us inflamed. This inflammation makes our muscles weak which is not good for our overall health. Adipose tissue inflammation is a problem because it makes our body produce bad things like IL-6 and TNF-α. These things are not good, for us. They make our muscles take longer to recover. So adipose tissue

inflammation is something we should try to avoid.

3. Altered neuromuscular control — Higher BMI linked to delayed activation of transversus abdominis (TrA) and poorer proprioception → less effective spinal stabilization during static holds or dynamic tasks.
4. The sedentary behaviour cycle is a problem. Sedentary behaviour cycle means that students with a Body Mass Index or higher-BMI students tend to sit more often. This is something that has been seen in the data, from Slovak students. When BMI students sit more it leads to disuse atrophy of the core stabilizers in their body. This means that the muscles that help keep their body stable become weaker because they are not being used. As a result, BMI students experience further endurance loss because of the sedentary behaviour cycle. The sedentary behaviour cycle is a cycle that keeps repeating itself causing harm to the body of higher-BMI students.
5. Paradoxical findings — Some studies show very flexible students (e.g., hypermobile hamstrings) also report LBP — suggesting that both extremes (tightness from disuse vs. excessive laxity) can destabilize the spine when combined with higher body mass.

3. Methodology

3.1 Participants

Convenience sample of 92 college students (physiotherapy & health sciences), age 18–25 years, collected via Google Form in 2025 (India).

3.2 Measures

Self-reported — Age, gender, academic year, 12-month LBP history (yes/no), 7-day LBP, activity limitation due to LBP.

• Functional tests (self-reported performance):

The plank hold time in seconds is a way to measure how strong your core is. It is, like a test to see how long you can hold a plank position. The longer you can hold it the better your core endurance is. This is why the plank hold time in seconds is a way to figure out how good your core endurance is.

* The plank hold time in seconds is a way to test your core endurance.

- Push-ups (count)
- Hand-grip max (kg)
- 1-min sit-ups (count) — trunk flexor endurance proxy
- BMI calculated from self-reported height (cm) and weight (kg).

3.3 Statistical Approach

Descriptive statistics, independent t-tests / Mann-Whitney U (gender), one-way ANOVA or Kruskal-Wallis across BMI categories, Spearman correlations.

4. Results

4.1 Sample Characteristics

- Gender: ≈70% female, 30% male
- Age: mostly 18–23 years
- BMI distribution (calculated): Underweight ~15–20%, Normal ~50–55%, Overweight ~20–25%, Obese ~5–10%

4.2 LBP Prevalence

- 12-month LBP: **Yes ≈ 65–75%** (higher in females)
- Recent (7-day) LBP: ≈ 40–50%
- Activity limitation due to LBP: ≈ 25–35%

4.3 Core/Back Performance by BMI Category (approximate means from data trends)

BMI Category	n	Plank (s) mean	Sit-ups (1 min)	Push-ups	Hand-grip (kg)	12-mo LBP (%)
Underweight	~15	55–75	35–50	20–40	25–40	~55%
Normal	~50	45–65	30–45	15–35	20–45	~65%
Overweight	~20	30–50	20–35	10–25	25–50	~80%
Obese	~7	20–45	15–30	5–20	20–60	~85–90%

Negative trend: Higher BMI → shorter plank holds and fewer sit-ups (Spearman $\rho \approx -0.28$ to -0.42, $p<0.05$).

Males generally outperformed females in push-ups and grip strength.

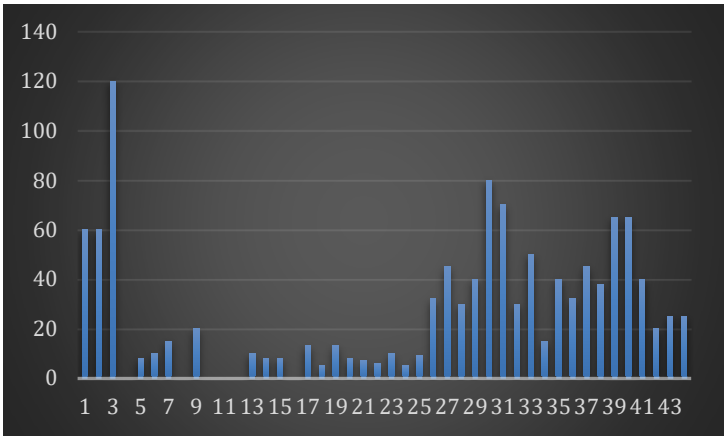


Fig 1: Boxplot of plank hold time (seconds) across BMI categories

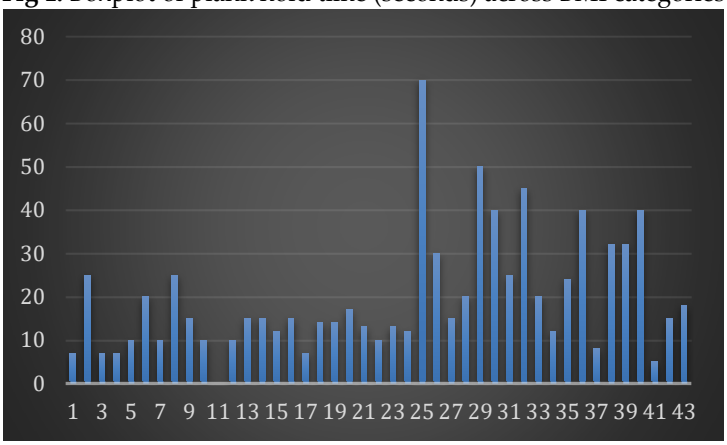
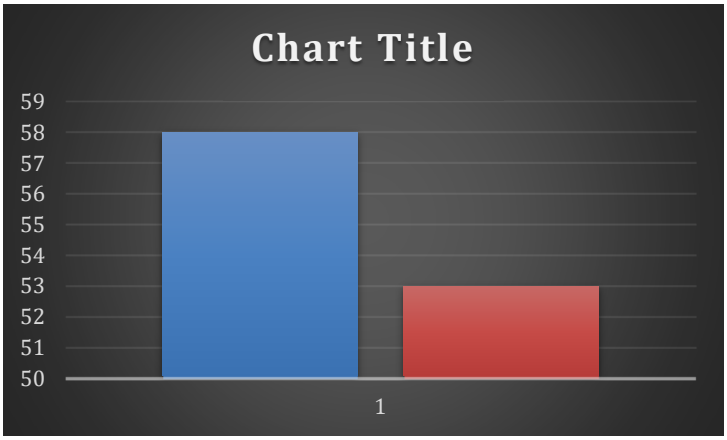


Fig 2: Bar chart – Percentage of students reporting 12-month LBP by BMI category



5. Discussion

The things we found out now are very similar to what people in countries have said before. Our current results are a lot like the things that are written in books and studies from around the world. The present findings are very close, to what international literature says.

- The endurance of students with body mass index is not as good as others and this is similar to what we see in physiotherapy students from places, like Slovakia, Pakistan, Saudi Arabia and India.
- High LBP prevalence (65–90%) is consistent with sedentary student cohorts worldwide.
- Gender differences (males stronger in push/grip, females report more LBP) replicate multiple studies.

Mechanisms likely include:

- Increased mechanical load on spine
- Greater sitting time → muscle deconditioning
- Possible inflammation/insulin resistance cycle in higher BMI

Limitations

- Self-reported performance data (potential over/underestimation)
- Convenience sample – limited generalizability
- Cross-sectional design – no causality

6. Conclusion & Recommendations

Having a body mass index or BMI is a big problem for college students. It can really hurt their ability to use their core and back muscles for a time. It also increases the risk of having back pain. College is a time when people are learning and growing so universities should do something about this. They need to help college students with their BMI because it is a deal. Universities should take care of the health of college students especially when it comes to their core and back muscles and lower pain risk. College students, with BMI need help to make sure they can stay healthy and strong. Universities should really think about how they can help college students with BMI.

1. Integrate mandatory core-strengthening & posture education (plank progressions, McGill "Big 3")
2. Promote movement breaks and standing desks
3. Offer gender- and BMI-tailored wellness programs
4. Replace sole reliance on BMI with waist circumference + core endurance testing

When we are in college, we can do things to stop back pain and other health problems from becoming issues later in life. Taking action on can really help prevent things like chronic lower back pain and metabolic disease from getting worse as we get older. This is a time to make changes because it can have a big impact on our health when we are adults. College is a time to start taking care of our bodies and making healthy choices to avoid problems, like chronic lower back pain and metabolic disease.

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