## ORIGINAL ARTICLE

# Correlation of Academic Performance with Student Attendance in Pre-Clinical and Clinical Years of Undergraduate Medical Education

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## ABSTRACT

**Objective:** To investigate the correlation between student attendance and academic performance in undergraduate medical education, with a focus on exploring potential similarities or differences in correlation patterns between pre-clinical and clinical years.

**Study Design:** Retrospective cross-sectional, correlational study.

**Place and Duration of Study:** Saidu Medical College Swat Pakistan from 1st March 2018 to 26th November 2020.

**Materials and Methods:** A total of 450 students from preclinical and clinical years were studied. Student attendance and marks obtained during their annual exams were converted to percentage values. To measure the strength of correlation, the Pearson Correlation coefficient was calculated using SPSS version 25.

Initially, the correlation coefficient of Pre-clinical and Clinical students was calculated independently, the results were then compared against each other to understand the difference between the two cohorts. Scatter plots and regression analysis were calculated to depict the relation between variables. A p-value < 0.05 was deemed statistically significant.

**Result:** A statistically significant positive correlation between class attendance and academic performance of pre-clinical students was found (r = 0.227, $p < 0.001$). The mean attendance of Pre-Clinical Students was (86.4) with a standard deviation of SD ± 5.638. Analysis of clinical students revealed a very weak negative but statistically insignificant correlation, (r = -0.037, $p < 0.73$). Mean attendance was measured to be (83.1) with a standard deviation of SD ± 5.83.

**Conclusion:** This study points to a previously unexplored dissimilarity in the correlation between lecture attendance and academic performance among clinical year as compared with pre-clinical year students, underscoring the dynamic nature of the relationship between attendance and academic performance throughout different phases of medical education. Further research exploring the factors influencing academic performance in clinical years is required to understand the complex interplay between attendance and academic performance.

**Key Words:** *Academic Performance, Attendance, Clinical, Correlation, Pre-Clinical, Undergraduate Medical Students.*

## Introduction

Medical education is an ever-changing and highly challenging field. The extensive curriculum and the addition of newer information as a result of continuous advancement in technology and a better understanding of disease conditions through research have rendered the medical profession, one of the most challenging professions.[1]

The gradual decline in student attendance at medical schools[2] prompted researchers to identify factors that hamper the academic performance of medical students in class and their professional performance. Studies were carried out trying to find a link between attendance and the resulting academic performance.[3] Moreover, researchers also strived to identify the causes of poor attendance in classes and the perspectives of faculty and students regarding the importance of attendance.[4,5]

A vast literature in this regard pointed towards a positive correlation between attendance and academic performance in undergraduate medical students.[6] Student attendance is so much emphasized in Pakistan that major universities in

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Pakistan are barring students with lower attendance from appearing in exams.[7]

Research, however, also suggests that the failure to attend classes may not be attributed merely to the lack of interest in classes. Mandal identified a lack of motivation leading to decreased concentration and diminished interest as one of the factors affecting student academic performance during undergraduate medical studies however their findings also suggested that there was no significant link between academic performance and attendance.[8]

A few decades back, attending lectures was the primary source of learning. The only learning material a student could take back with him were the notes he took or the concepts he understood and memorized. The advent of modern technology, social media, and access to online learning resources, also raise the possibility that students who are failing to attend classes may be opting for better learning avenues.[9] Alternative reasons for student absenteeism may also exist where either a student does not perceive any value in attending classes or may have found a better alternative to attending class. Questions are now being raised on mandatory attendance.[10]

This necessitates the reassessment of the correlation of lecture attendance with academic performance in undergraduate medical education. Furthermore, the different requirements of participation and interaction during pre-clinical and clinical years in undergraduate medical education also warranted research to understand the correlation in this perspective.

The correlation in terms of pre-clinical and clinical years was also unexplored and required further research.[3] The main objectives of this study were to investigate the correlation between students' class attendance and academic performance in undergraduate medical education, with a focus on exploring potential similarities or differences in correlation patterns between pre-clinical and clinical years.

## Materials and Methods

We used an explanatory correlational design for our study. Two cohorts of students at Saidu Medical College were studied. One from pre-clinical students (n=359) between 1st March 2018 to 26th November 2020 and the second cohort (n=91) from clinical years between 1st March 2018 to 25th December 2019.

The convenience sampling technique was adopted. The sample size for this study was determined for a desired confidence level (α) of 0.05 and, power (1 - β) of 0.80, aligning with conventional standards. A smaller effect size (r = 0.1) was chosen to reflect the nuanced and potentially subtle correlation anticipated between the attendance of pre-clinical and clinical years. A sample size of n=50 was considered sufficient to demonstrate the presence of a relationship.[11]

IRC Approval, (Ref # Riphah/IRC/22/2018), was obtained from the Institutional Review Committee to pursue the research and analyze and use the data for research purposes. Institutional permission was sought to have access to the overall class attendance (not including practical and bedside teaching) and annual professional exam result data along with student identification data. (Ref # 100/SMC/PF). The attendance data obtained was anonymized. Once an anonymous number was assigned to each student the original student record was returned to the student affairs section. There was no direct interaction of the authors with students at any stage of the study.

Student attendance data and student's annual academic scores, converted to percent attendance and percent marks, were selected as independent and dependent variables. Students who were due to appear in supplementary exams were excluded from the study as studies have listed upcoming exams as a cause of low attendance [12]. Students with below 75% attendance were also excluded from the study as the University has a minimum 75% attendance criteria for eligibility to appear in the annual professional examination [7].

To measure the strength of correlation, the Pearson Correlation coefficient was calculated using SPSS version 25. Bivariate data analysis was also carried out. Descriptive statistics, Scatter plots, and regression analysis were calculated. A p-value < 0.05 was statistically significant.

## Results

Attendance and academic performance data of the two cohorts, (n=359) preclinical students and (n=91) clinical students were analyzed.

**Pre-Clinical Students Data Analysis**

Among the 359 Preclinical Students, 275 (76.6%) were male, and 84 (23.4%) students were female. The mean attendance of Pre-Clinical Students was (86.4) with a standard deviation of SD ± 5.638. A two-tailed, Pearson correlation coefficient for attendance and academic performance for pre-clinical students was calculated to be (r = 0.227, $p$ < 0.001) as shown in (table. II). This shows the likelihood of a significant positive correlation between the two variables.

A scatter plot as shown in (Fig. 1) indicated a linear positive relationship between the attendance and the academic performance of pre-clinical students.

In preclinical years, the mean attendance and performance of male students was 85.19 and 72.38 respectively, in contrast, female students in the clinical years showed a higher mean attendance of 90.37, accompanied by a mean performance of
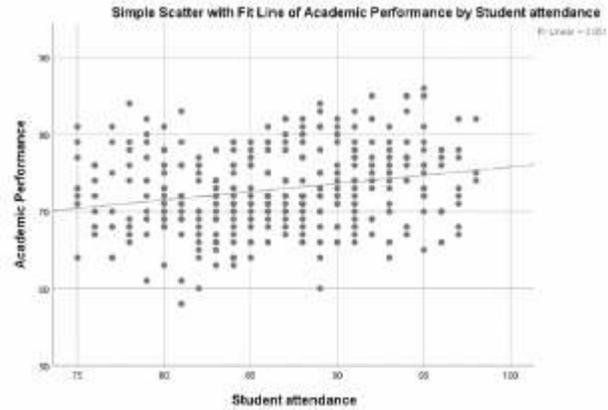


**Figure 1: Simple Scatter Plot with Fit Line of Academic Performance by Pre-Clinical Students' Attendance**

74.43. An independent sample t-test revealed a statistically significant difference between class attendance of both genders in Preclinical students. ($t$ = -7.998 $p$=0.001). (Table. I)

**Table I : Gender-Based Independent Sample T-Test, Pre-Clinical and Clinical Students**

| Student Attendance | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% (C.I.) of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. | Mean Diff | Std. Error Diff | Lower | Upper |
| Pre-Clinical | Equal variances assumed | 0.842 | 0.360 | -7.998 | 357 | 0.000 | -5.184 | 0.648 | -6.458 | -3.909 |
| Clinical | | 0.032 | 0.858 | -1.767 | 89 | 0.081 | -2.140 | 1.211 | -4.546 | 0.267 |

**Clinical Students Data Analysis**

A total of 91 Clinical students' data were analyzed, 48 (52%) of the students were male and 43 (47%) were female. Mean attendance was measured to be (83.1) with a standard deviation of SD ± 5.83. The Two-tailed, Pearson correlation coefficient for attendance and academic performance for Clinical students was calculated to be (r = -0.037, $p$ < 0.73) as shown in (table. II). This showed that there is a very weak negative association between the two variables and a P value greater than 0.05 showed that the correlation was insignificant in the case of Clinical students.
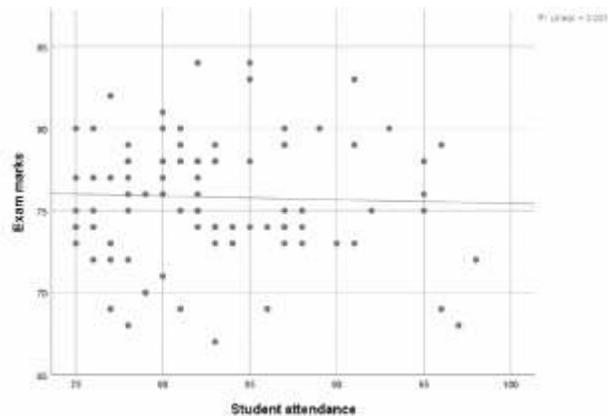


**Figure 2 : Simple Scatter Plot with Fit Line of Academic Performance by Clinical Student's Attendance**

In the case of Clinical students, the scatter plot (Fig. 2) indicated a linear weak negative relationship between attendance and the academic performance of pre-clinical students. The mean attendance and performance of male students was 82.00 and 75.44 respectively, while female students in the clinical years showed a slightly higher mean attendance of 84.14, accompanied by a mean performance of 76.26. An independent sample t-test showed a statistically insignificant difference between class attendance of both genders (t = -1.767 p = 0.081). (Table. I)

**Table II : Comparative Statistics, Attendance, and Academic Performance**

| Preclinical & Clinical | | | Student Attendance | Exam marks |
|---|---|---|---|---|
| Pre-clinical N=359 | Student Attendance | Pearson Correlation | 1 | .227** |
| | | Sig. (2 - tailed) $p=$ | | .001 |
| | Exam marks | Pearson Correlation | .227** | 1 |
| | | Sig. (2 - tailed) | .001 | |
| Clinical N=91 | Student Attendance | Pearson Correlation | 1 | -.037 |
| | | Sig. (2-tailed) $p=$ | | .726 |
| | Exam marks | Pearson Correlation | -.037 | 1 |
| | | Sig. (2 - tailed) | .726 | |
| ** Correlation is significant at the 0.01 level (2-tailed). | | | | |

From our analyses of the datasets of the two cohorts it is quite clear that in clinical years, student attendance does not affect their academic performance the same way as observed during pre-clinical years.

It is important to understand that our study of correlation provides a likely association between the two variables in both cohorts but does not imply causation.[13]

## Discussion

Our study explored the relationship between students' lecture attendance and academic performance in pre-clinical as well as clinical years of undergraduate medical education. Notably, a significant positive correlation was observed in pre-clinical years, indicating that higher class attendance was associated with improved academic performance during annual exams. Other studies,

exploring the correlation between attendance and academic performance during pre-clinical years reached the same conclusion. A correlational study conducted at Rawalpindi Medical University involving (n=317) students of first and second year MBBS, found a positive correlation between attendance and academic performance. Similarly, a positive correlation was observed between the two variables for individual subjects.[14] Another study conducted at Rehman Medical College involving (n=99) students explored the correlation between attendance and academic performance in third-year MBBS students and found a strong positive correlation. This study, however, was limited to the subject of pharmacology, considering the overall attendance including lectures and Practicals while students' academic performance was derived from internal exam results. Another study conducted at Eastern Medical College, Kabila, Bangladesh on (n=314) students of third and fourth-year MBBS also found a similar positive correlation between the two variables.[15]

Although in the case of pre-clinical years, our findings are consistent with the majority of the studies one study spanning over six weeks, conducted at the University of Central Florida, College of Medicine found no correlation between attendance and academic performance however, there was one significant difference in the attendance policy, where academic sessions were divided into 12 mandatory TBLs, CBL session and 29 lectures where attendance was voluntary, and all course material was made available online.[16]

However, in clinical years, our study found a weak and statistically insignificant correlation, suggesting a differing pattern in the relationship between lecture attendance and academic performance during different phases of medical education. This finding contrasts with other studies conducted limited to clinical subjects. A study conducted at a teaching Hospital in Dublin, Ireland where attendance of (n=147) students (tutorials and clinical teachings combined, in Obstetrics and Gynecology clinical rotations) were correlated with students' annual examination scores in the subject found a significant positive correlation.[17] Another study took a slightly different path by correlating absenteeism and academic performance in medicine and

pediatrics, involving (n=310) students, found a negative correlation suggesting that poor attendance led to lower performance, This study also correlated the overall attendance i.e. the combination of both tutorials and clinical teaching. [18] More recently a study conducted at the Arabian Gulf University, Bahrain also concluded a significantly positive correlation between student attendance during their surgical clerkship and corresponding academic scores. in this case, the attendance was not limited to lecture attendance but the combination of hospital-based activities, simulation sessions, and problem-based activities. [3]

Research exploring correlations during clinical years was scarce and primarily limited to individual disciplines. All three instances involving research in clinical disciplines discussed above employed combined attendance of lectures/tutorials and hospital-based sessions for their studies. Our study was limited to correlating lecture attendance only, with academic performance considering that research points towards diminishing attendance during lectures. [19]

The gender-based analysis of pre-clinical students' data revealed notable disparities in attendance rates between male and female students, with female students exhibiting higher attendance and achieving corresponding higher academic scores than their male counterparts. A similar trend was observed among clinical students, although the gender gap was significantly narrower in this cohort. This finding is in line with other studies comparing attendance and academic performance of male and female students. [3,20]

Didactic lectures are predominantly used as the primary teaching method in Pakistan during pre-clinical years, while more interactive, hospital-based bedside teaching, is employed during clinical years [21]. This difference in the mode of information transfer during clinical years appears to positively influence learning thereby enabling students to perform better and also explain the minimal effect of skipping didactic lectures on overall performance.

Additionally, Transition from adolescence to adulthood occurs between the ages of 18 years to 24 years [22]. So, one could argue that the students during their preclinical years are largely influenced by their experience as pedagogical learners, and this

gradually changes when the student reaches the clinical years, hence their predilection of self-directed learning and independent decision making about the choice of study pattern. Apart from that, a major portion of our population as of 2022 had little to no access to the internet and digital resources [23]. This leaves only a small number of students with resources and access to online learning. These factors could explain the significant effect of attendance on academic performance.

Considering self-determination theory, during the pre-clinical phase, autonomy is linked to expressing opinions and collaborating with peers, emphasizing in-class learning for academic success.[24] However, during clinical years, a shift in autonomy toward self-directed study, time management, and class selection is observed. Competence achievement becomes tied to personalized study strategies, allowing clinical students to balance online resources and self-study, minimizing the impact of reduced classroom attendance on academic performance.

A few limitations were observed during this study. Since the attendance was manually registered by the students via an attendance sheet circulated in class during lectures, the possibility of proxies could not be ruled out. Secondly, only a quantitative approach was used. Conducting a parallel analysis of attendance during bedside teaching sessions in clinical rotations could have provided a more comprehensive understanding of the correlation dynamics. The limited scope of this study, conducted within a single institution, also constrains its generalizability to broader contexts.

These findings underscore the importance of considering the dynamic nature of the attendance-academic performance relationship across distinct educational phases. Tailored interventions may be warranted to address the varying impact of attendance on academic success in pre-clinical and clinical years. Importantly, our study cautions against inferring causation from correlation, emphasizing the need for further research to explore the multifaceted factors influencing academic performance in clinical settings.

## Conclusion

This study points to a previously unexplored dissimilarity in the correlation between lecture

attendance and academic performance among clinical year as compared to pre-clinical year students, underscoring the dynamic nature of the relationship between attendance and academic performance throughout different phases of medical education. It also emphasizes the need for further research exploring the factors influencing academic performance in clinical years to enhance our understanding of the correlation between attendance and academic performance.

## Recommendations

Future research should consider a mixed-methods approach to delve deeper into the reasons behind student absenteeism, providing a better understanding of factors influencing attendance and academic performance. Comparative studies across diverse institutions, longitudinal analyses tracking changes over the entire medical education journey, and a qualitative exploration of the clinical years are recommended.

### REFERENCES

1. Guze PA. Using Technology to Meet the Challenges of Medical Education. Trans Am Clin Climatol Assoc. 2015;126:260–70.

2. Puntambekar V. Global trends in attendance in medical colleges and possible solutions. Natl Med J India. 2020;33(5):306–7. DOI: 10.4103/0970-258X.317471.

3. Al Shenawi H, Yaghan R, Almarabheh A, Al Shenawi N. The relationship between attendance and academic performance of undergraduate medical students during surgical clerkship. BMC Med Educ [Internet]. 2021 Dec 22;21(1):396. DOI: 10.1186/s12909-021-02833-2 Available from: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-021-02833-2.

4. Rehman R, Zehra T, Sultan A, Martins RS, Ali R. Absenteeism of Undergraduate Medical Students in Large Class Format Lectures: Causes, Solutions and the Way Forward. Pak J Physiol [Internet]. 2021;17(3):70–6. Available from: http://www.pps.org.pk/PJP/17-3/Rehana.pdf70.

5. Qureshi MI, Ahmad A. Medical Students' Perspective on Absenteeism and Its Remedies. Pakistan Armed Forces Med J. 2019;69(2):332–9.

6. Doggrell S. A Systematic Review of the Relationship Between Lecture Attendance and Academic Outcomes for Students Studying the Human Biosciences. Int J Innov Sci Math Educ. 2020;28(1):60–76. DOI: 10.30722/ijisme.28.01.005.

7. Khyber Medical University P. Examination Regulations, 2017 | Khyber Medical University [Internet]. Examination Regulation 2017. 2017 [cited 2022 Jan 6]. p. 01. Available from: http://www.kmu.edu.pk/examination-regulations-2017.

8. Mandal A, Ghosh A, Sengupta G, Bera T, Das N, Mukherjee S. Factors affecting the performance of undergraduate medical students: A perspective. Indian J Community Med. 2012;37(2):126–9. DOI: 10.4103/0970-0218.96104.

9. Cardall S, Krupat E, Ulrich M. Live lecture versus video-recorded lecture: Are students voting with their feet? Acad Med. 2008;83(12):1174–8. DOI: 10.1097/ACM.0b013e31818c6902.

10. Lamb S, Chow C, Lindsley J, Stevenson A, Roussel D, Shaffer K, et al. Learning from failure: how eliminating required attendance sparked the beginning of a medical school transformation. Perspect Med Educ. 2020;9(5):314–7.

11. Fraenkel, Jack R., Wallen NE. How to Design and Evaluate Research in Education. 8th ed. McGraw-Hill Higher Education. McGraw-Hill Education; 2009. 707 p.

12. Abdulaziz A. BinSaeed, Metib S. al-Otaibi, Hassan G. al-Ziyadi AAB& SAS. Association Between Student Absenteeism at a Medical College and Their Academic Grades. J Int Assoc Med Sci Educ. 2009;19(4):155–9.

13. Boelsterli UA. Correlation and Causality. Why Dose Matters. 2023;79–88. DOI: 10.1201/9781003346661-10.

14. Khan H, Aasif HA, Noor H, Aslam F. Correlation Of Academic Performance Of Medical Students With Their Attendance. J Rawalpindi Med Coll [Internet]. 2018;22(S-2):89–92. Available from: http://journalrmc.com/index.php/JRMC/article/view/1012.

15. Islam MZ, Foysal AA, Rahman NMW, Rayhan N, Islam ME, Khandaker M, et al. Relation of Academic Performance and Class Attendance of Undergraduate Medical Students and Reasons of Absenteeism. East Med Coll J. 2017;2(2):10–6.

6. Kauffman CA, Derazin M, Asmar A, Kibble JD. Relationship between classroom attendance and examination performance in a second-year medical pathophysiology class. Adv Physiol Educ. 2018 Dec;42(4):593–8. DOI: 10.1152/advan.00123.2018.

17. Deane RP, Murphy DJ. Student attendance and academic performance in undergraduate obstetrics/gynecology clinical rotations. Jama. 2013;310(21):2282–8. DOI: 10.1001/jama.2013.282228.

18. Shabuj MKH, Shaha CK. Class Absenteeism in Pediatrics and Its Impact on Performance: An Analytical Study on Under Graduate Students of a Medical College in Dhaka. Bangladesh J Child Heal. 2017;39(2):69–72. DOI:

10.3329/bjch.v39i2.31535.

19. Sharma SK, Vagha SJ, Ukey UU, Rathod PG, Patil SS. Dwindling Attendance of Undergraduate Medical Students, Reasons and Possible Solutions. J Evol Med Dent Sci. 2021;10(3):148–52. DOI: 10.14260/jemds/2021/31.

20. Albalawi M. Does gender difference have an effect in the academic achievements of undergraduate students' and later as interns? A single medical college experience, Taibah University, KSA. Allied J Med Res. 2019;3(1):20–5.

21. van Houten-Schat MA, Berkhout JJ, van Dijk N, Endedijk MD, Jaarsma ADC, Diemers AD. Self-regulated learning in the clinical context: a systematic review. Med Educ. 2018;52(10):1008–15. DOI: 10.1111/medu.13615.

22. Stockdale LA, Coyne SM. Bored and online: Reasons for using social media, problematic social networking site use, and behavioral outcomes across the transition from adolescence to emerging adulthood. J Adolesc. 2020;79:173–83. DOI: 10.1016/j.adolescence.2020.01.010.

23. Simon K. DIGITAL 2022: PAKISTAN [Internet]. 2022. Available from: https://datareportal.com/reports/digital-2022-pakistan.

24. Allen JP, Hauser ST, O'Connor TG, Bell KL. Prediction of peer-rated adult hostility from autonomy struggles in adolescent-Family interactions. Dev Psychopathol. 2002;14(1): 123–37. DOI: 10.1017/S0954579402001074.

**CONFLICT OF INTEREST**
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**DATA SHARING STATMENT**
The data that support the findings of this study are available from the corresponding author upon request.

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