Impact of Gender and Attendance on Biochemistry Performance: A Study of BDS Students in Lahore, Pakistan

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Abstract

The aim of this research was to examine the first-year Bachelor of Dental Surgery (BDS) students' performance in the subject of biochemistry. Its focus was on determining the influence of gender and class attendance on their scores in theory and practical assessments. **Methods**: For the present study data were collected from 142 BDS students enrolled in a private medical college. The study employed multivariate analysis of variance statistical analysis to assess within-subject (theory vs. practical) and between-subject (gender and attendance) effects on academic performance of BDS students. Moreover, for the identification of the predictors of average marks, multiple regression

analysis was employed. **Results:** MANOVA results showed a distinct pattern of performance within-subject effects, with theory and practical scores showing distinct patterns of performance. Between-subject effects revealed significant differences based on attendance and gender. The analysis revealed a significant positive correlation between attendance and average marks, with attendance emerging as a strong predictor of academic performance. Not only attendance but gender too emerged as a significant predictor, with female students scoring comparatively higher average marks than male students. Additionally, the study found no significant interaction effects between class attendance and gender, depicting that regular class attendance is beneficial for both male and female students. **Conclusion:** These findings highlight the important role of attendance in improving academic performance in biochemistry, regardless of gender. Moreover, the need for promoting consistent class attendance should be emphasized for better academic outcomes among dental students.

Introduction

Students play a critical role in the globalization era, and their academic performance is a pivotal determinant in producing competent graduates, thereby fueling a country's economic progression (Pandiangan et al., 2022). Academic accomplishments mark the initial stage in the recruitment of fresh graduates, influencing their productivity and improving their quality of life. Medical education, a particularly challenging field, students to a multitude of stress factors, including intense study loads, limited leisure time, competition, emotional and financial strains, and concerns about prospects (Pandiangan et al., 2022). In the field of medical education, vast majority of medical literature depicts that attendance and gender are important factors that influences performance of medical students (Khan et al., 2019; Silva et al. 2010: Obadaki, & Omowumi, 2013; Pilotti, 2021 & Yakubu &Abubakar, 2022). It provides deeper understanding of various factors that may have an impact on student achievement in this particular subject. The factors influencing academic performance encompass sociodemographic elements such as language of instruction, prior academic achievements, socio-economic background, parental education levels, classroom attendance, and gender. Research in medical education has explored how gender impacts academic success, revealing differences in performance of both genders. While some studies suggest that females excel academically in comparison to their male

counterparts, others find no significant gender-based disparities in performance (Aguirre & Legaspi, 2020; Hakami, 2021).

In the medical curriculum, biochemistry stands as a fundamental science subject in the initial year of the MBBS program. In medical disciplines like surgery, gynae and obs and medicine the impact of gender has been studied and has received a lot of attention, its influence within the domain of biochemistry remains less comprehensively explored (Hakami, 2021). This study seeks to evaluate the effects of different factors such as gender and attendance on the academic achievement of medical students especially assessment for learning in biochemistry.

Medical science has remained a traditionally male-dominated field; however, academic performance within it is shaped by a variety of sociodemographic factors. Studies have aimed at forecasting outcomes in medical education by examining the roles of gender and attendance. The analysis presented in this research is centered on assessing the impact of these two variables on biochemistry formative assessment performance (Aguirre & Legaspi, 2020).

In dentistry, biochemistry is critically important. A comprehensive understanding of basic sciences underpins effective clinical decision-making. The understanding of molecular mechanisms is essential for treating orofacial complexities, and hence, dental students must grasp biochemistry's principles, as many diseases originate from molecular and ionic disruptions. It is therefore imperative for dental students to acquire a foundational knowledge in biochemistry, integrating the scientific underpinnings of health and disease into their clinical practice (Pandiangan et al., 2022)

Objectives

To compare the theory, practical, and overall biochemistry assessment marks between male and female BDS students.

To compare the impact of attendance on the average marks of male and female BDS students in theory, practical and combined.

To compare the impact of gender on the average marks of BDS students in theory, practical and combined.

To determine the relationship between attendance and academic performance among male and female BDS students

To examine the relationship between gender and academic performance among male and female BDS students

Hypotheses

Attendance has no effect on average marks of BDS male and female students.

There is no difference in average mark between male and female BDS students.

Attendance has an effect on average marks of male and female BDS male and female students.

There is a difference in average mark between male and female BDS students.

Materials and methods

The present research was conducted in the Department of Biochemistry at a private medical college in Lahore. The main focus was on the comparison of marks and attendance of first-year BDS students in biochemistry. Secondary data from the Department of Biochemistry was utilized to analyze 151 students' (62 males and 89 females) performance across theoretical, practical, and combined assessments. The main focus of the study was to draw comparison among marks gender and attendance BDS students in both theoretical, practical and combined assessments.

Descriptive statistics was used to compute the mean scores and variability for both the theoretical as well as the practical assessments for three different sessions (T1, T2, T3, P1, P2, P3) and between male and female students was computed using descriptive statistics while mixed between-within subjects and ANOVA was used to compare the differences in scores over time (within-subjects variable) and between genders (between-subjects variable). Moreover, regression analysis was performed to elucidate the association between gender, attendance, and average marks. Statistical analysis was performed on SPSS

Results

Mixed Between-Within Subjects Analysis of Variance

The within-subjects variable was theory assessment sessions taking place with regular intervals whereas gender was taken as between-subjects variable. All assumptions for Mixed-Between Subjects Analysis of Variance were satisfied.

Table 1: Descriptive Statistics for within Subject Variable Theory Assessments

Gender		Mean	Std. Deviation	N
T1 _Theory	male	47.3	17.6	59
	female	55.1	15.5	86
	Total	52.0	16.8	145
T2 _Theory	male	59.8	9.3	59
	female	64.3	9.6	86
	Total	62.5	9.7	145
T3 _Theory	male	58.9	9.4	59
	female	62.1	9.9	86
	Total	60.8	9.8	145

The descriptive statistics table 1 provide insights into the mean scores and variability of three theoretical tests (T1, T2, and T3) across different genders. For male students, the mean score is 47.40 with a SD of 17.6 whereas female students have a higher mean score of 55.1 with a slightly lower SD of 15.5 for theory test1. This shows that females scored higher marks on the theory test 1 as compared to male students. However, there is less variability in scores. The overall mean score for both genders combined is 52.0, with a total sample size of 145.

For theory test 2, male students have a mean score of 59.9 with a SD of 9.3 whereas female students attained a slightly higher mean score of 64.3 with a SD of 9.6 in theory test 2. This shows that female students outperformed male students on the theory test 2, as evidenced by their higher mean score. The variability in scores is relatively similar for both genders. The overall mean score for both genders combined is 62.5, with a total sample size of 145.

Similarly, for theory test 3 male students attained a mean score of 58.9 with a SD of 9.4 whereas female students achieved a slightly higher mean score of 62.1 with a SD of 9.9. The results shows that female students scored higher on the theory test 3 compared to male students. The SD for both

genders is comparable, indicating similar variability in scores. The overall mean score for both genders combined is 60.8, with a total sample size of 145. It shows that female students tend to perform better on theoretical tests compared to male students, although the extent of the difference varies across different tests. Additionally, the variability in scores appears relatively consistent across genders for each test.

The above table is visually represented through the following clustered bar graph.

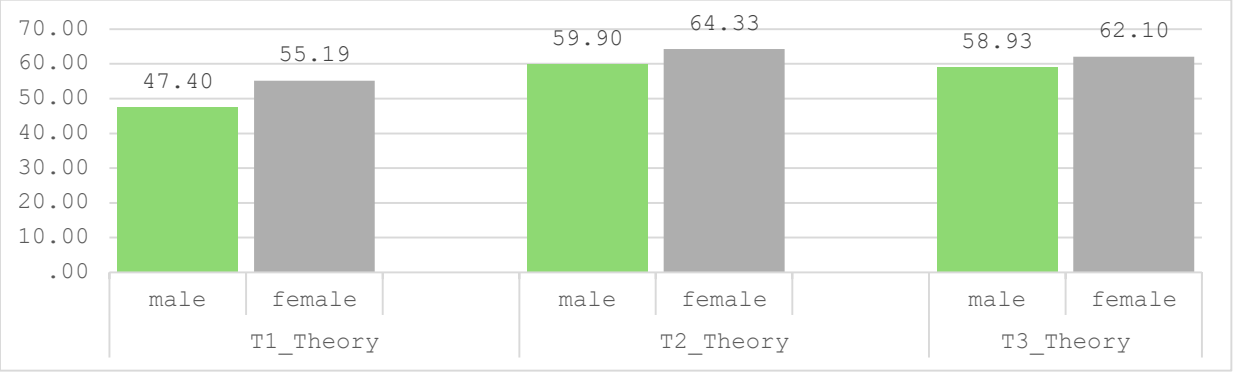

Table 2: Multivariate Tests Within-Subjects Effect for Theory Assessments

Effect		Value	F	df	Error df	Sig.	ηp2
Theory Assessment Sessions	Pillai's Trace	.37	41.62	2	142	.000	.37
	Wilks' Lambda	.63	41.62	2	142	.000	.37
	Hotelling's Trace	.58	41.62	2	142	.000	.37
	Roy's Largest Root	.58	41.62	2	142	.000	.37
Theory Assessment Sessions *Gender	Pillai's Trace	.02	1.82	2	142	.165	.02
	Wilks' Lambda	.97	1.82	2	142	.165	.02
	Hotelling's Trace	.02	1.82	2	142	.165	.02

	Roy's Largest Root	.02	1.82	2	142	.165	.02

Within-Subjects Effect

The above table shows Pillai's Trace (.37), Wilks' Lambda (.63), Hotelling's Trace (.58), and Roy's Largest Root (.58) values respectively with highly significant probability values ($p < 0.0001$), depicting a statistically significant effect for theory assessment sessions. This points to the fact that there was a significant difference among the three theory performances that took place with equal time intervals. The Partial Eta Squared is 0.37 showing a very large effect size (Cohen (1988).

Interaction Effect

The interaction effect of gender and theory assessment sessions are statistically insignificant with p-values greater than 0.05 as shown in the second row of the test. Almost the same change is found in theory performance of males and females across the three assessment sessions.

Table 3: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	MS	F	Sig.	ηp2
Intercept	1411348.9	1	1411348.9	4663.9	.000	.97
Gender	2762.0	1	2762.0	9.1	.003	.06
Error	43272.8	143	302.6			

The above table 3 shows between-subjects variable's effect size which is significantly high as the p-value is less than 0.05, depicting the presence of significant difference in theory scores of males and females. It also presents the effect size in the last column that is 0.06, revealing a moderate effect size.

Table 4: Descriptive Statistics for within Subject Variable Practical Assessments

The within-subjects variable was practical assessment sessions taking place with regular intervals whereas gender was taken as between-subjects variable.

Gender		Mean	Std. Deviation	N
P1 _Practical	male	57.4	12.0	59
	female	59.0	11.8	86
	Total	58.3	11.9	145
P2 _Practical	male	57.4	7.1	59
	female	60.8	9.4	86
	Total	59.4	8.6	145
P3 _Practical	male	57.6	9.8	59
	female	63.2	9.0	86
	Total	60.9	9.7	145

The descriptive statistics table 4 provides insights into the mean scores and variability of three practical assessments (P1, P2, and P3) across different genders. For male students, the mean score is 57.4 with a SD of 12.0 whereas female students have a higher mean score of 59.0 with a slightly lower SD of 11.8 for practical assessment1. This shows that female students as compared to male students have scored higher marks in practical 1. However, the variability is relatively consistent across all. The overall mean score for both genders combined is 58.2, with a total sample size of 145.

For practical assessment 2, male students have a mean score of 57.4 with a SD of 7.1 whereas female students attained a slightly higher mean score of 60.8 with a SD of 9.4 in theory test 2. This shows that female students outperformed male students on the practical assessment 2, as evidenced by their higher mean score. The variability in scores is relatively higher for females compared to males. The overall mean score for both genders combined is 59.4, with a total sample size of 145.

Similarly, for practical assessment 3, male students attained a mean score of 57.6 with a SD of 9.8 whereas female students achieved a slightly higher mean score of 63.2 with a SD of 9.0. The results shows that female students scored higher on the practical assessment 3 compared to male students. The SD for females is slightly lower indicating less variability in scores. The overall mean score for both genders combined is 60.9, with a total sample size of 145.

Overall, it shows that female students tend to perform better on practical assessment compared to male students, although the extent of the difference varies across different assessment.

Additionally, the variability in scores appears relatively consistent across genders for practical assessment 1 and 3 but for practical assessment 2 it is higher for females.

The above table is visually represented through the following clustered bar graph.

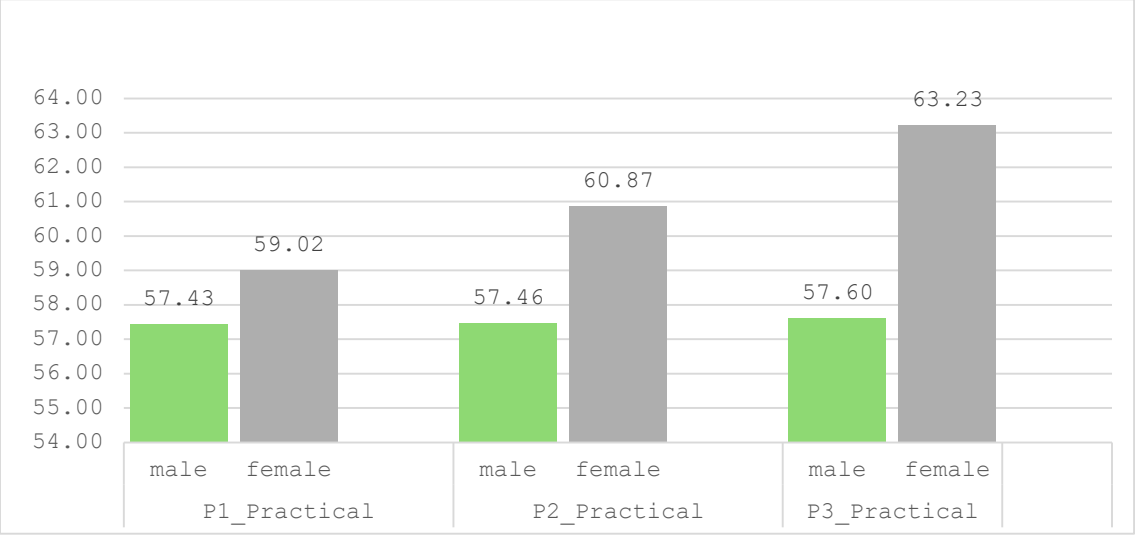

Table 5: Multivariate Tests Within-Subjects Effect for Practical Assessment Sessions

Effect		Value	F	df	Error df	Sig.	ηp2
Practical Assessment Sessions	Pillai's Trace	.05	4.21	2	142	.01	.05
	Wilks' Lambda	.94	4.21	2	142	.01	.05
	Hotelling's Trace	.05	4.21	2	142	.01	.05
	Roy's Largest Root	.05	4.21	2	142	.01	.05
Practical Assessment Sessions *Gender	Pillai's Trace	.04	3.52	2	142	.03	.04
	Wilks' Lambda	.95	3.52	2.00	142.0	.03	.04

Hotelling's Trace	.05	3.52	2.00	142.0	.03	.04
Roy's Largest Root	.05	3.52	2.00	142.0	.03	.04

Within-Subjects Effect:

The multivariate tests table 5 indicates that for the practical assessment sessions, the values for Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root are 0.05, 0.94, 0.05, and 0.05, respectively. These values are associated with highly significant probability values ($p < 0.05$), suggesting a statistically significant effect for theory assessment sessions. This implies that there was a notable difference in theory performance across the three sessions that occurred at equal time intervals. The Partial Eta Squared value of 0.05 indicates a moderate effect size, suggesting that the impact of these sessions on theory performance is noteworthy.

Interaction Effect:

The above table shows that the interaction effect between gender and practical assessment sessions is statistically significant, with p-value < 0.05. This suggests that there is no significant difference observed in all the three theory assessment scores comparison between males and females. In other words, the impact of practical assessment sessions on theory performance does not differ significantly between genders. Therefore, the interaction between gender and practical assessment sessions does not have any effect on theory performance.

Table 6: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	Df	MS	F	Sig.	ηp2
Intercept	1475039.9	1	1475039.9	7171.9	.000	.98
Gender	1316.7	1	1316.7	6.4	.012	.04
Error	29410.3	143	205.6			

The above table 6 shows between-subjects variable's effect size which is significantly high as the p-value is less than 0.05, depicting the presence of significant difference in theory scores of males and females. Table 3 also presents the effect size in the last column that is 0.04, revealing a moderate effect size. Hence, gender plays a notable role in influencing practical performance, with discernible differences observed between males and females.

Table 7: Descriptive Statistics for within Subject Variable Combined Theory and Practical Assessments

Gender		Mean	Std. Deviation	N
Combined 1	male	104.8	26.0	59
	female	114.2	23.8	86
	Total	110.3	25.1	145
Combined 2	male	117.3	14.2	59
	female	125.1	16.9	86
	Total	122.0	16.3	145
Combined 3	male	116.5	17.7	59
	female	125.3	17.1	86
	Total	121.7	17.8	145

The descriptive statistics table 7 shows the combined scores across different categories based on gender.

For Combined1 male students have a mean score of 104.8 with a SD of 26.0 based on a sample size of 59. Female students have a mean score of 114.2 with a SD of 23.8, based on a sample size of 86.

For Combined 2 male students have a mean score of 117.3 with a SD of 14.2, based on a sample size of 59. Female students have a mean score of 125.1 with a SD of 16.9, based on a sample size of 86.

For Combined 3 male students have a mean score of 116.5 with a standard deviation of 17.7, based on a sample size of 59. Female students have a mean score of 125.3 with a SD of 17.1, based on a sample size of 86.

Overall, the results indicate that female students have scored higher on average on all combined assessments as compared to male students. There is slightly less variability in scores between genders across three combines assessments, however, female students show less variability in Combined 1 and Combined 3, while more variability is exhibited in Combined 2. The total mean scores also depict the higher performance of female students.

The above table is visually represented through the following clustered bar graph.

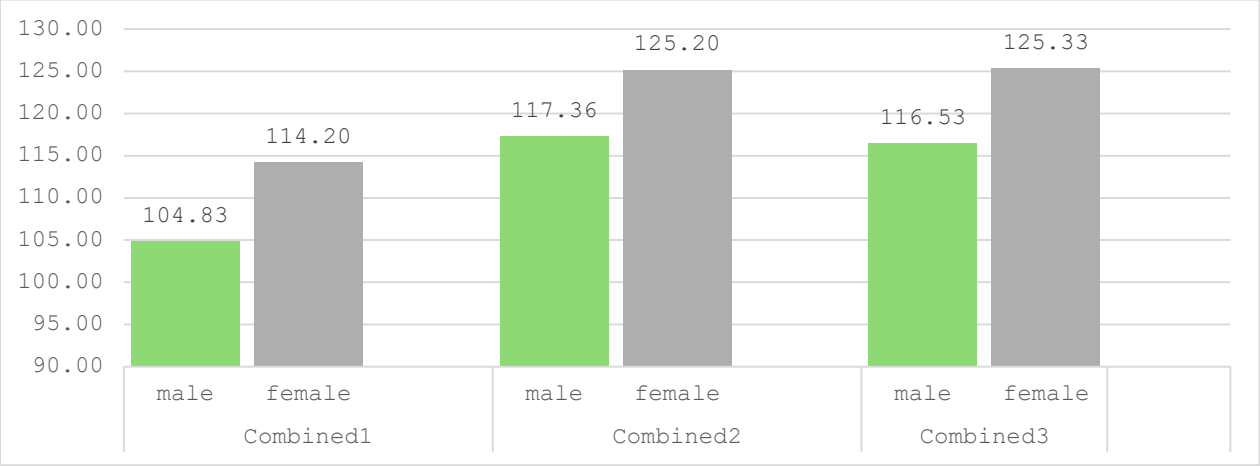

Table 8: Multivariate Tests Within-Subjects Effect for Combined Performance Assessment Sessions

Effect		Value	F	df	Error df	Sig.	ηp2
Combined Performance Assessment Sessions	Pillai's Trace	.27	27.07	2	142	.000	.27
	Wilks' Lambda	.72	27.07	2	142	.000	.27
	Hotelling's Trace	.38	27.07	2	142	.000	.27

	Roy's Largest Root	.38	27.07	2	142	.000	.27
Combined Performance Assessment Sessions *Gender	Pillai's Trace	.00	.158	2	142	.85	.00
	Wilks' Lambda	.99	.158	2	142	.85	.00
	Hotelling's Trace	.00	.158	2	142	.85	.00
	Roy's Largest Root	.00	.158	2	142	.85	.00

Within-Subjects Effect

The above table 7 for multivariate tests within-subjects effect reveals significant results for the combined performance assessment sessions. Pillai's Trace (0.27), Wilks' Lambda (0.72), Hotelling's Trace (.38), and Roy's Largest Root (.38) values, respectively. These statistics are accompanied by highly significant probability values ($p < 0.05$), indicating a substantial effect for the combined performance assessment sessions. It suggests that there exists a notable discrepancy in performance across the various assessment sessions, emphasizing the significance of these sessions in evaluating overall performance. The Partial Eta Squared value of 0.27 suggests a moderate effect size, highlighting the substantive impact of these sessions on performance outcomes.

Interaction Effect

Conversely, the interaction effect between gender and combined performance assessment sessions yields non-significant results, with p-values exceeding 0.05. This shows that there is no significant variance in the change of performance between male and female participants across the different assessment sessions. In simpler terms, the influence of combined performance assessment sessions on performance outcomes does not vary significantly based on gender. Therefore, gender does impact of these assessment sessions on overall performance.

Table 8: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	MS	F	Sig.	ηp2
Intercept	5772075.04	1	5772075.046	6633.85	.000	.97
Gender	7892.87	1	7892.879	9.07	.003	.06
Error	124423.38	143	870.094			

The above table 8 demonstrates a highly significant main effect for the between-subjects variable gender (p-value, 0.003). This indicates a substantial difference in combined performance between males and females. Moreover, the effect size, of 0.06, reveals a moderate effect size.

This underscores the meaningful impact of gender on combined performance, suggesting noticeable differences between males and females in their overall performance outcomes.

Table 9: Results of ANOVA Test

Model		Sum of Squares	df	MS	F	Sig.	
1	Regression	25974.19	2	12987.09	101.71	.000[a]	(F (2, 142) = 101.71 R^2 = 0.58 r= 0.76
	Residual	18131.23	142	127.68			
	Total	44105.42	144				

a. Predictors: (Constant), Attendance, Gender

b. Dependent Variable: Average_Marks

The ANOVA results in the above table 9 depict that the regression model with predictors like attendance and gender, there is a strong positive correlation (r= 0.76). The F statistics is highly significant (F (2, 142) = 101.712, p < .001) this suggests that it is a good fit model. This further shows that the variability in the dependent variable, average marks is due to predictors collective contribution

The regression model depicts a significant portion of the variance in the dependent variable, which is indicated by the large sum of squares for regression (25974.19). The mean squared value for regression (12987.09) shows that, on average, the variance of predictors is significantly higher than the residual variance

Moreover, the p-value (Sig. = .000) is less than 0.05 therefore, the null hypothesis is rejected and concludes that at least one of the predictors significantly contributes to the prediction of average marks.

Table 10: Results of Coefficients

Model		Unstd. Coef.		Std. Coef		
		B	Std. Error	β	T	Sig.
1	(Constant)	28.88	6.41		4.49	.000
	Gender	5.46	1.92	.15	2.84	.005
	Attendance	.93	.06	.73	13.52	.000

The coefficients table 10 presents the results of a regression analysis examining the relationship between two predictors, Gender and attendance, and the dependent variable, average marks. The constant term, representing the expected value of average marks when all predictors are zero, is 28.88. For gender, the unstandardized coefficient indicates a 5.46-unit increase in average marks for every one-unit increase in gender, with a standardized coefficient (Beta) of 0.15. This suggests a relatively small contribution of gender to the variability in average marks compared to attendance. Regarding attendance, the unstandardized coefficient indicates a 0.93-unit increase in average marks for every one-unit increase in attendance, with a standardized coefficient (Beta) of 0.73, suggesting a stronger influence on average marks as compared to gender. Both predictors are statistically significant ($p < .005$), indicating unique contributions to explaining the variation in average marks, with attendance exerting a relatively stronger influence. Overall, these findings underscore the importance of attendance as a significant predictor of academic performance, while gender plays a comparatively lesser role in explaining variations in average marks.

Discussion

The present research was conducted to examine the performance of first-year Bachelor of Dental Surgery (BDS) students in biochemistry, focusing on the influence of gender and class attendance on their scores in theory and practical assessments.

Biochemistry is considered as a dynamic and evolving subject that includes complex reactions, which are not easy to remember. A teacher plays an important role in bringing home the complex concepts and comprehending this subject. As it is classified as basic science subject and has greater applications in varying clinical specialties such as diagnostics, making the teaching/learning process effective seems to be a quite challenging process for the teachers. From the current study, there emerges vital intellectual points on attendance, gender and average score where the emphasis is on the factors that may determine the average score of a given student. This discussion is to understand and evaluate the outcomes, bringing them in-line with prior findings, and pointing to two contrasting effects. Our findings revealed several key insights into the academic dynamics of these students.

The present study results reveal that there is a significant positive correlation ($r = 0.76$, $p < 0.01$) between attendance and average marks, aligning with Hatabu et al. (2020), which underscores the crucial role of lecture attendance for students' academic success. Regular class attendance has been consistently associated with higher academic achievement, suggesting that students who are in their studies tend to score better in their tests. This correlation may result from the numerous benefits of attending classes, such as direct interaction with the teacher, clarification of concepts, and participation in class discussions, which are fundamental elements that facilitate actual learning (Alam, 2020).

Moreover, this finding is supported by regression analysis, highlighting attendance as a strong predictor of average scores ($\beta = 0.73$, $p < 0.01$). In other words, it means that with every additional unit increase in attendance, there will be of 0.93 units increase in average marks. This finding is similar to Peng et al. (2020). They also found a positive correlation between attendance and academic performance across many disciplines. Thus, suggesting that that there is a negative impact of discipline problems on attention to lessons and classroom dynamics.

Gender also emerged as a predictor ($\beta = 0.154$, $p < 0.01$), with females generally achieving higher marks than males. This finding aligns with Yang et al. (2020), who suggested that gender-related variations in academic performance might be influenced by factors such as study skills, communication skills, and activeness in class. However, the effect size for gender which is smaller

than that for attendance, indicates that while gender differences in academic performance exist, they are less pronounced compared to the impact of attendance. Ajai & Imoko (2015) and Else-Quest et al. (2010) noted that gender is not a good predictor of academic performance, suggesting that the academic gender gap is driven by various factors like subject choice, teaching methods, and societal expectations. Thus, while our research confirms some gender-based disparities in average marks, these findings are context-specific and may not be generalizable to all academic environments.

The association between attendance and academic performance observed in the present study is consistent with previous research, including Aubrey (2022), which showed a statistically significant correlation. This study provides solid evidence of the relationship between attendance and academic success, applicable to various students and types of courses. Active teaching methods enhance the role of attendance in academic performance more than passive ones.

The magnitude of the correlation obtained in this study ($r = 0.76$) is greater than the average moderate correlation reported in Mardov's (2021) meta-analysis. These variations highlight the need for a multi-layer approach, considering discipline-based differences when interpreting the relationship between attendance and academic performance.

Our findings are crucial in outlining the factors that impact academic performance, revealing significant roles for both attendance and gender. The consistent attendance-performance correlation reinforces the value of regular class attendance for academic achievement. Although a gender-based disparity exists in average marks, the effect size is smaller. The mixed stance in the literature suggests that these relationships are complex and context dependent. Some more research should be conducted to explore subject-specific aspects and identify potential moderating variables to make the findings more generalizable.

In educational research the impact of gender academic performance have been widely discussed. This area has been studied in much research. The findings have confirmed their differences (Carvalho, 2016; Weis et al., 2013). Like a study was conducted by Ehrtmann and Wolter (2018) females were more proficient readers as compared to males however mathematics skills of male students were better than female students. In another study by Carvalho (2016) found it was that female demonstrated better achievement as compared to male students. However, others did not report significant gender differences (Abubakar et al. 2011; Ebenuwa-Okoh, 2010; Fischer & Sliwka, 2018; Gibb et al., 2008)

Several studies have shown that, on average, female students tend to outperform their male counterparts in various academic subjects (Ehrtmann 2018). The present study results revealed that female first-year BDS students performed better than male BDS students by consistently achieving high mean scores in both theory and practical assessments (Reardon et al., 2019). Lower variability was also reported in the female student's performance which indicates greater consistency in their academic abilities. This finding also aligns with previous research suggesting that female students generally demonstrate more positive attitudes towards reading and enjoy it more as compared to male counterparts (Scholes, 2019). It is also said that Gender stereotypes and societal expectations may also be a contributing factor in these differences. Furthermore, it is important to recognize that individual differences are present in each gender group are also present, and therefore there should not be a generalization of these findings to all male or female students in the BDS program (Chen et al., 2021).

According to previous research, class attendance has long been recognized as a important factor that impacts academic performance and there is a positive correlation between them (Paisey & Paisey, 2004; Credé et al., 2010; Golding 2011 & Khanal, 2019). The present study examined the association between attendance and academic performance in the subject of biochemistry, depicting a significant relationship between them, both in theoretical and practical assessments. These findings are like existing literature, further supporting the idea that regular attendance is a contributing factor in better understanding and retention of concepts of biochemistry (Sangeeta & Mookherji, 2019; & Khanal, 2019).

Moreover, the present study examined the potential interaction effects between class attendance and gender on academic performance in biochemistry. It is deduced that there is no significant gender interaction effects, which indicates that both male and female students gained equal benefits from regular class attendance in their biochemistry assessment scores. This finding is contradictory to previous research in both liberal arts as well as in sciences subjects which suggested a potential difference exists in grades of male as well as female students (O'Dea et al., 2018; Fairlie et al., 2020; Hakami, 2020). It is deduced that, in the context of biochemistry assessments, there is no significant influence of gender on the benefits of class attendance. To enhance academic performance in biochemistry assessments, it is essential to promote regular class attendance for all students, regardless of their gender, (Raghavani et al. 2020).

Conclusion

The current study provides valuable insights into the factors affecting first-year Bachelor of Dental Surgery (BDS) students in biochemistry courses, with a focus on gender and class attendance. The results of this study confirm the importance of class attendance and gender as factors influencing academic performance of first year BDS Biochemistry students. The studies show that class attendance leads to improved comprehension and retention of difficult biochemical concepts, thus confirming the importance of attendance in academic achievement. Furthermore, though female students scored higher than their male counterparts in both theory and practical exams, the effect of gender on academic achievement was not as significant as the effect of class attendance. This indicates students are equally benefited by consistent attendance in classes.

Furthermore, as this research is of a particular subject, additional research is recommended to determine the case of attendance and gender on grades in various subjects and to include factors like motivation, learning strategies and teaching methods. Moreover, it would be useful to establish the effectiveness of utilization of digital technologies in promoting active learning and understanding materials for the improvement of pedagogy in biochemistry and other sciences.

As has already been stated, attendance in the class plays a pivotal role in the success of a student followed by gender as the secondary factor to academic achievement. It is crucial for the authorities of these institutions to identify and eliminate barriers to regular attendance while putting in place effective learning techniques that will work for all students in order to make the level of achievement more egalitarian and productive.

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