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Evaluating Clinical Medical Students' Perceptions of Preclinical Anatomy Education at Universiti Putra Malaysia: Insights and Implications for Curriculum Enhancement

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ABSTRACT

Mastery of anatomy is crucial for medical students throughout their preclinical and clinical training. In Malaysian universities, anatomy is incorporated into the first two years of preclinical medical education. However, concerns have emerged about the adequacy of anatomical knowledge among clinical students at Universiti Putra Malaysia (UPM). This study examines clinical medical students' perceptions of their anatomy curriculum. A cross-sectional study was conducted with 279 clinical medical students at UPM, employing a universal sampling method. Data were collected through a self-administered online questionnaire, divided into four sections: sociodemographic characteristics, adequacy of anatomy teaching coverage, perceptions of teaching methods, and perceptions of anatomy assessments. The questionnaire's reliability was confirmed using Cronbach's alpha. Data analysis utilised descriptive statistics, ANOVA, Chi-square tests, and multiple linear regression. With a response rate of 69.88%, 116 completed questionnaires were analysed. Normality tests indicated non-normal distribution for teaching coverage adequacy and anatomy assessment data. Descriptive analysis revealed that most students perceived adequate teaching coverage in most systems but noted deficiencies in musculoskeletal and clinical correlation classes. Practical sessions were preferred for learning and retaining anatomy knowledge, while early clinical exposure was deemed less beneficial. Multiple regression analyses revealed no significant differences in perceptions across sociodemographic factors. The current anatomy curriculum at UPM is generally well-received by clinical medical students, with practical sessions particularly effective. These findings suggest that strengthening practical-based anatomy sessions and aligning teaching with student preferences could improve learning outcomes and curriculum effectiveness.

Keywords: *Anatomy education, Medical students, Teaching, Assessment, Perception*

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INTRODUCTION

Anatomy is a cornerstone of medical education, essential for understanding the human body's structure and functions, as well as for performing physical examinations and clinical procedures (1). A comprehensive understanding of anatomy forms the foundation for medical students' success in preclinical education and their effective application of knowledge in clinical settings (2). Despite its importance, some clinical students have expressed concerns about their level of anatomical knowledge.

In Malaysian universities, medical students usually complete foundational science courses before progressing to the first two preclinical years, during which anatomy is taught alongside other basic medical sciences such as physiology, pharmacology, biochemistry, and pathology (3). At Universiti Putra Malaysia (UPM), the integrated preclinical medical curriculum employs various teaching methods, including problem-based learning, student-centred learning, blended learning, practical sessions, and digital tools such as the Complete Anatomy Application, which has received positive feedback (4).

A significant issue in medical education is how clinical students perceive the anatomy curriculum, which impacts their educational experience and readiness for real-world medical scenarios (5). There is often a gap between classroom-based anatomical knowledge and its application in clinical settings, which can hinder students' ability to perform effectively (6). This issue is compounded by varying learning preferences among students, making it difficult for a one-size-fits-all approach to meet everyone's needs. Additionally, the rapid advancement in medical technology and the increasing importance of interdisciplinary collaboration necessitate regular updates to the curriculum (7). Failure to integrate modern resources and perspectives may leave students underprepared for the evolving challenges in healthcare (8). Understanding these perceptions is critical for enhancing the curriculum and improving the competency of future healthcare professionals.

This study aims to evaluate how clinical medical students at UPM perceive the adequacy, delivery methods, and assessments of preclinical anatomy education and whether these perceptions are influenced by sociodemographic factors such as gender, ethnicity, and year of clinical study. By understanding student perceptions, the study seeks to improve both student success in anatomy and the overall learning environment. A solid foundation in anatomy is essential for future physicians, impacting their ability to conduct research, diagnose, and treat patients effectively (9). Therefore, examining these perceptions is crucial for producing competent doctors and enhancing the quality of healthcare education at UPM, ultimately benefiting the broader healthcare system.

Additionally, studying gender and ethnicity is crucial to understanding how diverse backgrounds shape students' perceptions of the anatomy curriculum, especially in Malaysia's context of ethnic diversity (10). These factors can significantly affect how students experience and engage with their education, potentially revealing unique challenges or disparities (11). By analysing these aspects, the study ensures the curriculum is inclusive and equitable, meeting the needs of all students. This approach helps tailor teaching methods to different learning preferences, thereby enhancing student engagement and success.

The general objective is to determine the associations between UPM clinical year medical students' sociodemographic factors and their perceptions of the preclinical anatomy curriculum, as shown in the conceptual framework (Figure 1). Specific objectives include

assessing the distribution of these factors, evaluating students' perceptions of teaching coverage, methods, and assessments, and examining how these perceptions correlate with gender, ethnicity, and year of clinical study.

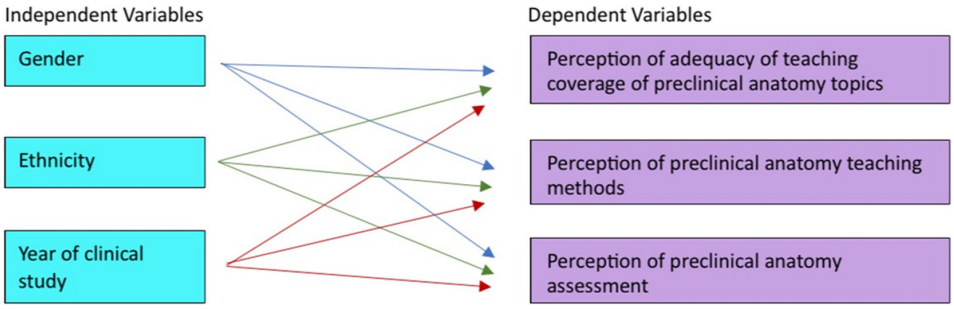

Figure 1: Conceptual framework of the study variables.

METHODOLOGY

Participant and Sampling

The study was conducted at the Faculty of Medicine and Health Sciences, UPM, targeting 279 clinical medical students as potential participants. This research adopted a cross-sectional design, organising the sampling population by gender, ethnicity, and years of clinical experience. The population included all UPM medical students enrolled in the 2023/2024 academic curriculum during their clinical years of study, specifically years 3, 4, and 5. Only year 3 to year 5 students were selected as they had fully completed the preclinical anatomy curriculum, allowing them to reflect on its relevance during clinical training. Including year 1 and 2 students would not provide comparable insights. The sampling frame consisted of a comprehensive list of these students who met the inclusion criteria, with a detailed breakdown provided: year 3 (113 students), year 4 (93 students), and year 5 (73 students).

Study Design

Each clinical medical student who met the inclusion criteria represented a sampling unit. A universal sampling method was employed to include all 279 clinical-year medical students at UPM. The sample size was calculated based on a previous study, resulting in different required sizes for various objectives (12). The largest sample size needed was 138 students. To accommodate a predicted non-response rate of 20%, at least 166 students were expected to participate. However, given the universal sampling method, the study targeted all 279 students. Exclusion criteria included clinical medical students who declined to participate, those with poor internet connectivity, and those who had completed a different preclinical curriculum.

The dependent variable in this study was the mean score of clinical medical students' perceptions of their anatomy education. Incontrast, the independent variables included sociodemographic factors such as gender, ethnicity, and year of clinical study. The inclusion criteria required participants to be clinical medical students at UPM in the 2023/2024 academic curriculum. Exclusion criteria included students who refused to participate, those with poor internet connectivity, and those studying a different preclinical curriculum.

Data Collection

Data were collected using a self-administered English-language questionnaire divided into four parts. Part A addressed sociodemographic characteristics. Part B evaluated the adequacy of anatomy teaching coverage by systems, with adequate coverage considered as 1 mark and both too long and too short considered as 0 marks. Although both categories received the same score, they were recorded separately to distinguish the direction of perceived inadequacy, yielding a total possible score of 0 to 12. Part C assessed perceptions of teaching methods, with 'strongly agree' receiving 4 marks and 'strongly disagree' receiving 1 mark, yielding a range of 10 to 40. Part D examined perceptions of assessments, using a similar scoring system to part C, yielding a range of 7 to 28. The validated questionnaire was adapted from previous study with their permission (12), and its reliability was tested using the Cronbach alpha test via SPSS version 29 (13).

Although the data collection relied on voluntary participation, which may introduce response bias, efforts were made to reach diverse student cohorts. The questionnaire, adapted from a validated instrument, was reviewed by an anatomist for contextual relevance. A new pilot test was deemed unnecessary due to the minimal modifications.

Data collection was conducted through an online survey via Google Forms, with responses automatically saved upon completion. Instructions were provided as necessary to ensure clarity.

Data Analysis

Before analysis, the data were cleaned and checked for any errors. Descriptive statistics were used to tabulate the data, reporting results in terms of frequency and percentage. Numerical variables were presented using mean and standard deviation if the data were normally distributed; otherwise, median and interquartile range were used. Subsequently, ANOVA or Chi-square tests were applied, and multiple linear regression was used to predict the influence of sociodemographic factors on perceptions of teaching coverage, methods, and assessments. The significance level was set at $p < 0.05$. Potential biases were addressed by ensuring a robust data collection and analysis process (14). The use of a self-administered questionnaire minimised interviewer bias (15), and statistical tests were carefully chosen based on the data distribution to avoid skewed results. Efforts were made to increase the response rate, such as follow-up reminders, to reduce non-response bias (16).

RESULTS

The study collected 116 completed questionnaires from a calculated sample of 166 respondents, yielding a response rate of 69.88%. Data collection was limited by timing, as many target respondents were undergoing assessments and exams. Additionally, some students experienced poor internet connectivity, particularly those without a reliable or strong connection at their college, which contributed to their reluctance. Non-response bias was also acknowledged, as approximately 30% of students did not participate, potentially skewing the results if non-respondents had different perceptions. Despite these potential biases, the study provides valuable insights into clinical medical students' perceptions of their anatomy education. The findings identify areas of strength and areas needing improvement in the curriculum, informing future enhancements to meet students' needs.

The internal consistency of the questionnaire was confirmed through Cronbach's alpha reliability testing. The perception of teaching coverage adequacy had a Cronbach's alpha of 0.831, indicating high reliability. The perception of teaching methods section had a Cronbach's alpha of 0.798, also reflecting good reliability. The perception of the anatomy assessment section had a Cronbach's alpha of 0.745, indicating acceptable reliability. These results suggest that the questionnaire items reliably measured students' perceptions of the anatomy curriculum.

Normality testing for teaching coverage adequacy, teaching methods, and anatomy assessment was conducted using skewness and kurtosis, the Shapiro-Wilk test, the Kolmogorov-Smirnov test, normality-based histograms, and Q-Q plots in SPSS version 29.0 (Table 1). These observations indicate that teaching coverage adequacy and anatomy assessment data were not normally distributed, whereas the teaching method data appeared to be normally distributed.

Descriptive analysis of sociodemographic characteristics showed that the majority of respondents were male (59.5%) and Malay (43.1%). The respondents were fairly evenly distributed across the clinical years, with the largest group being year 3 students (48.3%) (Table 2).

Table 1: Normality testing of dependent variables

Variables	Skewness/ SE	Kurtosis/SE	Kolmogorov-Smirnov	Shapiro-Wilk	Histogram	Q-Q Plot
Teaching coverage adequacy	−6.782 (Not normal)	5.330 (Normal)	< 0.001 (Not normal)	< 0.001 (Not normal)	Skewed to left	Almost normal
Teaching method	0.249 (Normal)	−0.883 (Normal)	0.015 (Not normal)	0.008 (Not normal)	Normal	Normal
Anatomy assessment	−2.674 (Not normal)	2.220 (Not normal)	0.002 (Not normal)	0.004 (Not normal)	Normal	Normal

Table 2: Sociodemographic characteristics

Independent variable		Frequency (n)	Percentage (%)		
Gender	Male	69	59.5		
	Female	47	40.5		
Ethnicity	Malay	50	43.1		
	Chinese	20	17.2		
	Indian	40	34.5		
	Others	6	5.17		
Year of clinical study	Year 3	56	48.3		
	Year 4	32	27.6		
	Year 5	28	24.1		
Dependent variable				Mean (SD)	Median (IQR)
Teaching coverage adequacy					11 (4)
Teaching method				39.77 (4.646)	
Anatomy assessment					23 (5)

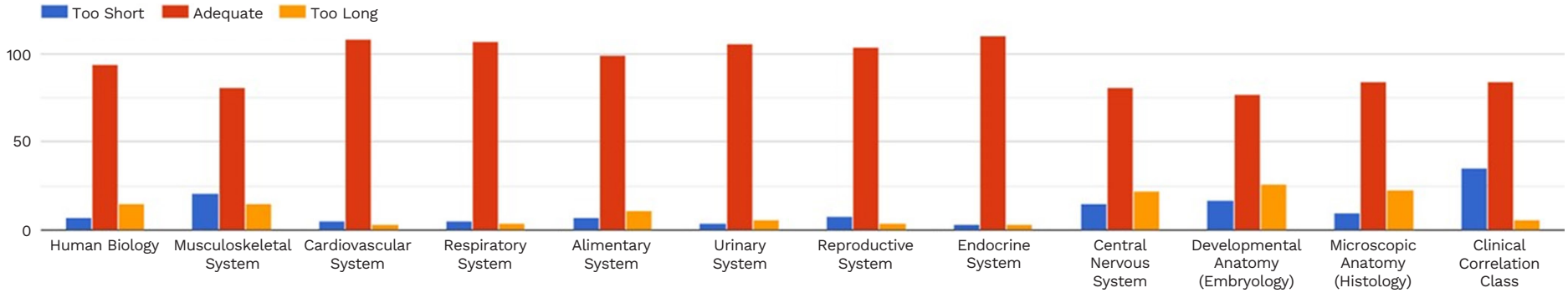

Figure 2: Students' perceptions of the adequacy of preclinical anatomy teaching coverage in clinical training.

Furthermore, descriptive analysis of teaching coverage adequacy exhibited majority of students find the teaching coverage for the cardiovascular, respiratory, urinary, reproductive, and endocrine systems to be adequate, as indicated by the predominance of red bars in these categories (Figure 2). However, certain areas, such as the musculoskeletal system and clinical correlation classes, are perceived by many students as being too short, as indicated by the blue bars. Conversely, classes on the central nervous system, developmental anatomy (embryology), and microscopic anatomy (histology) are often viewed as too long, represented by the orange bars.

The bar charts in Figure 3(a) and (b) provide insights into clinical students' perceptions of the effectiveness of various teaching methods in understanding and retaining anatomy knowledge at UPM. The majority of students believe that practical sessions are highly beneficial for understanding anatomy, as indicated by the high number of strongly agree and agree responses, whereas early clinical exposure sessions are not perceived as helpful. Similarly, in retaining anatomy knowledge, practical sessions again received strong positive feedback, whereas student-centred learning, problem-based learning, and early clinical experiences were not perceived as effective.

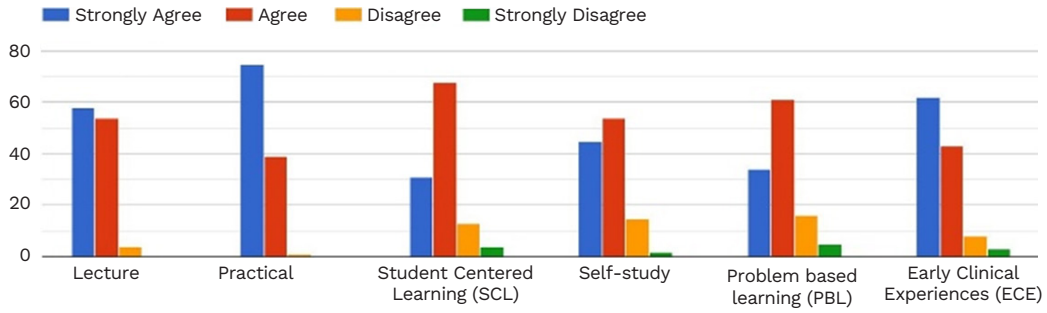

Figure 3(a): Students' perception of teaching methods helps in understanding anatomy.

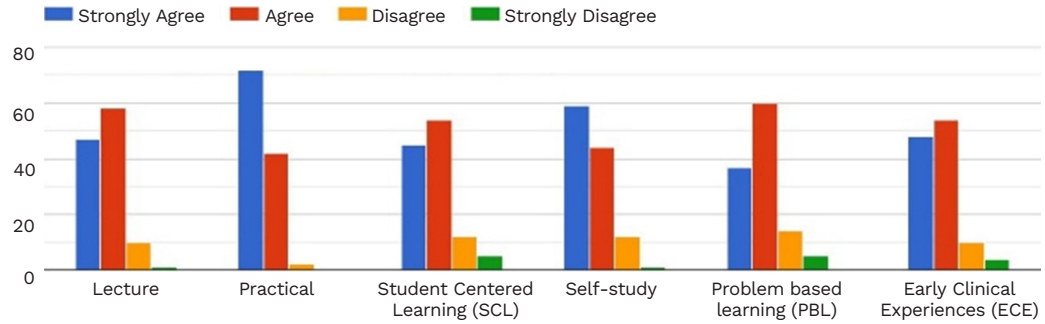

Figure 3(b): Students' perception of teaching methods helps in retaining anatomy knowledge.

The bar graph in Figure 4 illustrates perceptions of different anatomy assessment methods for retaining anatomy knowledge. The single best-answer question and the objective structured practical examination methods were perceived as having the highest levels of strong agreement. The extended matching item and the modified essay question also showed significant agreement, though they also showed notable disagreement. Multiple true/false and objective structured clinical examinations showed a mixed distribution, with both high agreement and disagreement. The short-answer question was relatively balanced across all response categories. This suggests varying preferences and perceptions of effectiveness across different anatomy assessment methods, with a general trend towards favouring more structured, objective formats.

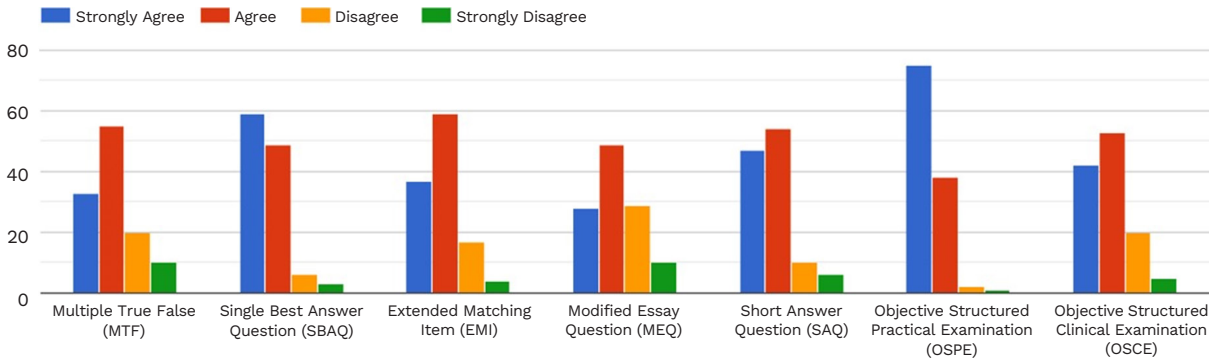

Figure 4: Students' perceptions of the examination format help in retaining anatomical knowledge.

Further analysis revealed no statistically significant differences in teaching coverage adequacy perceptions based on gender, ethnicity, or year of clinical study, as determined by Kruskal-Wallis H tests (Table 3). Similarly, one-way ANOVA tests showed no significant differences in teaching method perceptions across these variables (Table 4). For perceptions of anatomy assessment, Kruskal-Wallis H tests again indicated no significant differences across gender, ethnicity, or year of clinical study (Table 5).

Table 3: Association between sociodemographic factors and perception of teaching coverage adequacy

Dependent variable	Gender	n	Median (IQR)	Chi-square statistic (df)	*p*-value
Teaching coverage adequacy	Male	47	11.0 (4.00)	16.292	0.162
	Female	69	11.0 (3.00)		
Teaching coverage adequacy	Malay	50	11.0 (3.00)	31.407	0.814
	Chinese	20	11.5 (4.25)		
	Indian	40	11.0 (3.25)		
	Others	6	10.0 (1.50)		
Teaching coverage adequacy	Year 3	56	11.0 (4.00)	26.235	0.427
	Year 4	32	12.0 (4.00)		
	Year 5	28	10.5 (3.00)		

Note: A Kruskal-Wallis H test shows that there was no statistically significant difference in teaching coverage adequacy between the sociodemographic factors

Table 4: Association between sociodemographic factors and perception of teaching method

Dependent variable		Sum of squares	df	Mean square	F	*p*-value
Gender	Between groups	17.407	1	17.407	0.805	0.372
	Within groups	2465.308	114	21.626		
	Total	2482.716	115	–	–	–
Ethnicity	Between groups	64.357	3	21.452	0.994	0.399
	Within groups	2418.358	112	21.592		
	Total	2482.716	115	–	–	–
Year of clinical study	Between groups	30.104	2	15.052	0.693	0.502
	Within groups	2452.612	113	21.705		
	Total	2482.716	115	–	–	–

Note: There were no statistically significant differences between group means as determined by one-way ANOVA

Table 5: Association between sociodemographic factors and perception of anatomy assessment

Dependent variable		n	Median (IQR)	Chi-square statistic (df)	*p*-value
Gender	Male	47	23 (5.00)	14.074	0.217
	Female	69	23 (4.00)		
Ethnicity	Malay	50	23.0 (5.00)	40.013	0.898
	Chinese	20	22.5 (3.25)		
	Indian	40	21.5 (5.25)		
	Others	6	22.5 (3.25)		
Year of clinical study	Year 3	56	23.0 (5.00)	23.119	0.964
	Year 4	32	22.5 (4.00)		
	Year 5	28	23.0 (5.25)		

Note: A Kruskal-Wallis H test showed that there was no statistically significant difference in anatomy assessment between the sociodemographic factors

Multiple regression analyses were performed to predict perceptions of teaching coverage adequacy, teaching methods, and anatomy assessments from gender, ethnicity, and year of study (Table 6). None of these sociodemographic factors was a statistically significant predictor for any of the dependent variables. The overall models did not significantly predict the perceptions, as indicated by the *p*-values exceeding the 0.05 threshold.

Table 6: Predictors of sociodemographic factors on dependent variables

Regression coefficients (Model)	Unstandardised, B	Coefficients Std. error	Standardised coefficients, Beta	Test statistic, t	Significance level, Sig.	95% confidence interval for B	
						Lower bound	Upper bound
Constant	8.407	0.972	–	8.653	< 0.001	6.482	10.332
Gender	0.715	0.506	0.133	1.413	0.160	−0.288	1.717
Ethnicity	−0.096	0.248	−0.036	−0.385	0.701	−0.587	0.396
Year of study	0.210	0.304	0.065	0.690	0.491	−0.393	0.813

Notes: A multiple regression test was run to predict teaching coverage from gender, ethnicity and year of study. These independent variables did not statistically significantly predict teaching method, $F(3, 112) = 0.993$, $p = 0.399$, $R^2 = 0.026$. All three variables added were not statistically significant to the prediction, $p < 0.05$.

DISCUSSION

This study suggests that the current anatomy curriculum at UPM is perceived positively by clinical medical students. One strength of this study is the high reliability of the questionnaire, as indicated by Cronbach's alpha values of 0.831 for teaching coverage adequacy, 0.798 for teaching methods, and 0.745 for anatomy assessments. These reliability measures ensure that the questionnaire items consistently capture students' perceptions, thereby adding robustness to our results (17).

The generally positive feedback on teaching coverage adequacy, teaching methods, and anatomy assessments indicates that the curriculum is meeting students' expectations and needs effectively. This concludes that UPM has successfully implemented teaching strategies that resonate with students from diverse sociodemographic backgrounds,

fostering a supportive learning environment conducive to acquiring anatomical knowledge (18). The multiple regression analysis confirmed that none of the sociodemographic factors significantly predicted students' perceptions of teaching coverage, methods, or assessments. These findings imply that students across diverse backgrounds share similar experiences and attitudes towards the anatomy curriculum. The non-significant results may reflect the effectiveness of a standardised, inclusive curriculum design, a goal increasingly emphasised in modern medical education (19). While this is encouraging, it is also possible that structural consistency in curriculum delivery limits variability in student experiences. Additionally, other factors, such as prior academic background, language proficiency, and preferred learning styles, known to influence educational outcomes, were not captured in this study and warrant future exploration (11).

These positive findings are indicative of several strengths within the anatomy curriculum at UPM. Firstly, the integration of various teaching methods, including problem-based learning, student-centred learning, blended learning, practical sessions, and digital tools such as the Complete Anatomy Application, demonstrates a commitment to innovation and student engagement (20). By employing a diverse range of instructional approaches, UPM has catered to different learning preferences and styles, ensuring that clinical medical students have multiple avenues to acquire and retain anatomical knowledge effectively (21). This approach aligns with best practices in medical education, where active learning methods have been shown to enhance student learning outcomes and satisfaction (22).

It becomes evident that while core systems like cardiovascular and respiratory are well covered, there is a need to balance the duration and depth of coverage in areas such as the musculoskeletal system and clinical correlation classes. The high agreement levels for single best answer questions and objective structured practical examinations in retaining anatomy knowledge suggest that students favour assessment methods that align with well-covered and adequately taught systems (23). Conversely, the perceived inadequacy in certain teaching areas, such as the musculoskeletal system, might correlate with mixed responses to less favoured assessment methods, such as multiple true/false and objective structured clinical examination. This alignment highlights the importance of ensuring that teaching coverage and assessment methods are well-coordinated to meet student expectations and educational needs, providing a comprehensive yet efficient learning experience (24). The musculoskeletal system was perceived as inadequately covered, possibly due to its complex, high-volume content and limited integration with clinical scenarios during preclinical years. Students strongly favoured practical sessions, aligning with international literature, which shows hands-on approaches enhance anatomical understanding and retention. Although blended and digital tools were incorporated, they were perceived as less effective, underscoring a need to balance innovation with traditional, tactile teaching methods. Thus, these insights can be instrumental in refining both the curriculum and assessment strategies to enhance the overall educational experience for medical students (25).

Collectively, the results demonstrate no significant differences in perceptions of teaching coverage adequacy, teaching methods, and anatomy assessments based on gender and ethnicity. It seems that the anatomy curriculum at UPM is inclusive and effectively meets the needs of a diverse student population. The absence of significant disparities indicates that the current educational strategies are equitable, providing a consistent learning experience across different demographic groups. This is a positive outcome, reflecting that the curriculum does not favour any particular gender or ethnic group, thereby promoting equal learning opportunities. Ensuring that all students, regardless of their background, perceive the curriculum similarly supports the development of a diverse and competent medical

workforce (6). This finding underscores the importance of maintaining and enhancing inclusive teaching practices, which are crucial for preparing future medical professionals to work effectively in a multicultural and diverse society (26). Moreover, it highlights the effectiveness of UPM's efforts to create an equitable educational environment, which can serve as a model for other medical institutions aiming to achieve similar goals.

Overall, the study's positive findings reflect UPM's commitment to providing high-quality anatomy education to its clinical medical students. It may also offer valuable insights to medical institutions worldwide, particularly those adopting integrated curricula or facing similar challenges in maintaining long-term retention of anatomical knowledge. The strong student preference for practical sessions and structured assessments, such as objectivesingle-best-answer questions, nation and single best answer question highlights the enduring importance of hands-on learning, even within digitally enhanced or problem-based programs. Institutions worldwide may benefit from aligning teaching delivery with students' learning preferences and providing balanced coverage across systems. Moreover, the inclusive reception of teaching methods across gender and ethnic groups supports the applicability of this curriculum model in diverse, multicultural settings. As many medical schools move towards competency-based and student-centred education, the integration of equitable, practical-focused strategies, as seen at UPM, could serve as a model for curriculum development, especially in low- and middle-income countries where similar resource and diversity constraints exist (21). By leveraging innovative teaching methods, fostering student engagement, and ensuring equity and inclusivity, UPM has developed a curriculum that effectively prepares students for clinical practice. Moving forward, UPM can build upon these strengths by continuing to evaluate and update the curriculum based on student feedback and emerging educational trends, ensuring that it remains relevant and responsive to the evolving needs of medical students and the healthcare landscape.

Students' preference for practical sessions may stem from the hands-on, visual, and spatial nature of anatomy learning, which helps reinforce complex three-dimensional relationships. Conversely, less favourable responses to early clinical exposure may be due to limited prior clinical experience during preclinical years, making it challenging for students to link anatomical theory with practice (5). The perceived inadequacy in musculoskeletal and clinical correlation sessions might also reflect the high volume of content and the limited teaching hours allocated, a challenge frequently reported in anatomy education worldwide (25). These factors collectively highlight that student satisfaction is closely linked to the clarity, contextual relevance, and time allocation of anatomy teaching.

While the study provides valuable insights into clinical medical students' perceptions of their anatomy education, it is essential to recognise and address potential biases. Future research should aim to mitigate these biases by improving sampling methods, adopting mixed data collection approaches, and designing robust questionnaires (27). By doing so, the findings can more accurately inform curriculum enhancements, ultimately leading to better-prepared medical professionals.

Limitation and Recommendation

Although the study employed a universal sampling method targeting all 279 clinical students, only 116 responses were obtained, with fewer responses from years 4 and 5. This uneven representation may limit the generalisability of the findings. Additionally, non-response bias may have occurred, as students who did not participate may hold different perceptions of anatomy teaching and assessment than those who responded. To minimise this

limitation, follow-up reminders were sent to encourage participation, and responses were collected over an extended period to accommodate students' schedules. Nevertheless, the findings should be interpreted with caution, as they may not fully represent the perceptions of the entire clinical student population. Future studies should employ stratified or mixed sampling strategies to ensure more balanced representation across academic years and to further reduce potential response bias.

Additionally, future curriculum enhancement should focus on strengthening the integration between anatomy and clinical practice through case-based and cadaveric correlation sessions. Increasing the duration and depth of musculoskeletal and clinical correlation topics could address current gaps. The inclusion of more interactive, multimodal approaches such as 3D visualisation tools, small-group dissections, and simulation-based anatomy sessions may improve engagement and retention. Additionally, routine student feedback after each system block could guide continuous improvement in teaching effectiveness and curriculum alignment.

CONCLUSION

The study provides valuable insights into clinical medical students' perceptions of the anatomy curriculum at UPM. Overall, the findings indicate that the curriculum is well-received and supports effective learning across diverse student groups. The results highlight the importance of maintaining practical, student-centred teaching approaches and ensuring balanced system coverage to enhance learning outcomes. Strengthening hands-on anatomy teaching and aligning instructional methods with student preferences may further improve curriculum relevance and effectiveness. Future curriculum reviews should also consider feedback from both preclinical and clinical cohorts to ensure continuity and integration of anatomical knowledge throughout medical training.

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ETHICAL APPROVAL

Ethical approval was sought from the Ethical Committee for Research Involving Human Subjects (JKEUPM-2024-133). Ethical protocols were strictly followed, ensuring the confidentiality and protection of participants' privacy.

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