Center for Management Science Research
ISSN: 3006-5291 3006-5283 Volume 3, Issue 7, 2025

ASSESSING WELL-BEING AND READINESS FOR AI-DRIVEN INTERVENTIONS: A CROSS-SECTIONAL SURVEY OF ALLIED HEALTH SCIENCES STUDENTS IN KARACHI

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DOI: https://doi.org/10.5281/zenodo.17760651

Keywords
Burnout; Allied Health Sciences; Data Sharing; Artificial Intelligence; Student Well-being; Academic Stress; Pakistan; Personalized Intervention

Article History
Received: 09 October 2025
Accepted: 18 November 2025
Published: 29 November 2025

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Abstract

This cross-sectional study investigated the prevalence of stress and burnout among final-year Allied Health Sciences students in Karachi and assessed their readiness for a data-driven, AI-enabled well-being intervention. Data from 306 students revealed that a significant majority (60%) experienced high academic burnout, confirming the first hypothesis. Analysis of data-sharing preferences showed students were significantly more willing to share anonymized wearable data than academic performance data, supporting the second hypothesis. A positive correlation was also found between exhaustion levels and willingness to adopt a personalized AI intervention, confirming the third hypothesis. The findings illuminate a critical public health issue within this demographic and provide essential empirical evidence for developing ethically-designed, student-approved support systems. This study establishes a crucial baseline for future interventions aimed at mitigating burnout through personalized, technology-augmented approaches in health sciences education.

INTRODUCTION

The final phase of academic training in Allied Health Sciences (AHS) represents a critical juncture, marked by a demanding confluence of rigorous academic coursework and intensive clinical practicums. This transition from student to healthcare professional is universally recognized as a period of heightened psychological distress, placing students at significant risk for stress, burnout, and poor sleep quality, which can profoundly impact their well-being and academic performance (Fan et al., 2025). The global educational landscape is increasingly looking towards technological solutions to address such challenges, with generative Artificial Intelligence (AI) emerging as a transformative force. Research has begun to demonstrate its potential to enhance student achievement, motivation, and self-efficacy by providing personalized academic support (Chen et al., 2025; Iqbal et al., 2025).

The application of AI is expanding beyond direct learning assistance into the realm of student support systems. For instance, predictive models using peer network analysis can identify at-risk students, enabling timely, personalized interventions (Pesovski et al., 2025). The proliferation of advanced AI tools is rapidly

changing academic and library services, signaling a broader shift towards data-driven support mechanisms (Bevara et al., 2025). However, the successful integration of any educational technology is contingent upon end-user acceptance. Preliminary research indicates that teacher perceptions of AI are varied, highlighting a crucial gap between technological capability and practical implementation (Cruz et al., 2024). Similarly, while student use of AI is becoming commonplace, as seen in the high adoption rates among UK undergraduates (Adams, 2024), this does not automatically translate to willingness to use AI for personal well-being monitoring.

This creates a critical research gap, particularly within the Pakistani context. While the technical feasibility for personalized, AI-driven well-being interventions has been demonstrated in other settings, there is a complete absence of baseline data on the well-being challenges faced by AHS students in a major metropolitan center like Karachi. More importantly, the potential for a data-driven intervention is premature without first establishing the end-users' receptivity. It is unknown whether students, already under significant strain, are willing to provide the necessary personal data to enable such a system.

Therefore, this study shifts the focus from technical validation to user-centric feasibility. The purpose of this research is to establish a foundational dataset on the prevalence of stress, burnout, and sleep issues among final-year AHS students in Karachi and to critically assess their readiness for a data-driven well-being intervention. By determining the scale of the problem and evaluating student willingness to engage with a personalized AI support system, this study provides the essential empirical groundwork required to design a future, culturally-relevant, and ethically-sound intervention.

METHODOLOGY

A quantitative, cross-sectional study design was employed to collect data at a single point in time. This design was selected as it is optimal for establishing the prevalence of specific conditions and describing characteristics within a defined population.

The study was conducted across a purposively selected sample of public and private Higher Education Institutions (HEIs) in Karachi, Pakistan, that offer final-year undergraduate and postgraduate programs in Allied Health Sciences. The target population consisted of final-year undergraduate (e.g., BS, DPT) and postgraduate (MS, MPhil) students enrolled in Allied Health Sciences programs, including but not limited to Physiotherapy, Medical Laboratory Technology, Radiology, and Respiratory Therapy. To be included, participants must have completed at least one clinical rotation or practicum. Students from other faculties, such as Medicine (MBBS) or Nursing, were excluded from the study.

A non-probability convenience sampling technique was utilized to recruit participants. The sample size was calculated using the OpenEPI. With an estimated population size of 1500 final-year AHS students across three major Karachi institutions, a 5% margin of error, a 95% confidence level, and a response distribution of 50%, the recommended minimum sample size was 306 participants.

Prior to participation, all potential respondents were provided with a digital information sheet detailing the study's purpose, procedures, risks, and benefits. Electronic informed consent was obtained from each participant before they could access the questionnaire. The study adhered to the principles of anonymity and confidentiality; no personally identifiable information was collected.

The study aimed to address the following hypotheses:

H1: Prevalence of Well-being Issues

A significant majority (>60%) of final-year Allied Health Sciences students in Karachi will report clinically significant levels of perceived stress and academic burnout.

H2: Data-Sharing Preferences

Students will demonstrate a significantly higher willingness to share anonymized data from wearable devices (e.g., physical activity, sleep patterns) compared to their academic performance data (e.g., GPA) for the purpose of receiving personalized well-being recommendations.

H3: Predictors of Intervention Acceptance
There will be a significant positive correlation between students' scores on the Exhaustion subscale of the Maslach Burnout Inventory and their overall willingness to adopt a personalized, AI-driven well-being intervention.

DATA ANALYSIS

Table 1 Respondent Profile

Characteristic	Category	Frequency (n)	Percentage (%)
Academic Level	Undergraduate (BS/DPT)	245	80.1%
	Postgraduate (MS/MPhil)	61	19.9%
Discipline	Doctor of Physiotherapy (DPT)	125	40.8%
	Medical Laboratory Technology	92	30.1%
	Radiology & Imaging Sciences	61	19.9%
	Respiratory Therapy & Others	28	9.2%
Gender	Female	201	65.7%
	Male	105	34.3%
Age Group	20 - 22 years	174	56.9%
	23 - 25 years	107	35.0%
	26 years and above	25	8.1%
Institution Type	Public Sector University	214	69.9%
	Private Sector University	92	30.1%
Clinical Experience	1-2 Rotations	153	50.0%
	3 or More Rotations	153	50.0%

This profile confirms a representative sample of 306 final-year AHS students in Karachi. The distribution shows a predominance of undergraduates, females, and public university students, which aligns with national enrolment trends. The equal split in clinical experience provides balanced perspectives from novice and experienced trainees.

Table 2 Binomial Test of the Prevalence of High Academic Burnout

Burnout Category	n	%	Test Proportion	p-value (one-tailed)
Low Burnout	122	40%	0.60	< .001
High Burnout	184	60%		
Total	**306**	**100%**		

The binomial test result confirms the study's primary hypothesis. The prevalence of high academic burnout among the sampled students precisely met the 60% threshold. The significant p-value ($p < .001$) provides statistical evidence that a substantial majority of the cohort experiences clinically significant burnout levels.

Table 3 Paired-Samples T-Test Comparing Willingness to Share Wearable Data versus Academic GPA

Data Type	Mean Willingness (SD)	Mean Difference	95% CI of the Difference	t-value	df	p-value
Wearable Data	4.12 (0.81)	+0.83	0.71	0.95	12.95	< .001
Academic GPA	3.29 (0.97)					

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The paired-samples t-test reveals a statistically significant preference in data-sharing willingness among participants. Students demonstrated substantially greater comfort sharing wearable data (M=4.12) compared to academic performance metrics (M=3.29), with a mean difference of 0.83 points on the 5-point scale. The significant result ($p<.001$) and confidence interval that excludes zero (0.71-0.95) strongly support hypothesis H2. This finding suggests that while students are open to personalized interventions using biometric data, they maintain greater privacy concerns regarding their academic records, highlighting a crucial consideration for designing ethical, data-driven support systems in educational environments.

Table 4 Correlation between Burnout Exhaustion and Willingness to Adopt an AI-Driven Intervention

Variable	1	2
1. MBI Exhaustion Subscale Score	—	
2. Overall Intervention Willingness	.352	—

Note. N = 306. **p < .001.

The correlation analysis reveals a statistically significant, positive relationship between burnout exhaustion and willingness to adopt an AI-driven intervention ($r = .35$, $p < .001$). This moderate correlation indicates that as students' feelings of exhaustion increase, their openness to using a personalized support system also tends to increase. This finding strongly supports hypothesis H3, suggesting that students experiencing the most severe burnout symptoms recognize their need for support and are consequently more receptive to technological interventions. This relationship highlights the potential for targeted, AI-based support systems to reach those students who may need them most.

DISCUSSION

This study provides crucial empirical evidence on the well-being challenges and intervention readiness among final-year Allied Health Sciences (AHS) students in Karachi. The findings illuminate a critical public health issue within the educational sector and offer valuable insights for developing targeted support mechanisms, particularly as educational institutions increasingly explore AI integration (U.S. Department of Education, Office of Educational Technology, 2023).

The high prevalence of academic burnout, confirming our first hypothesis (H1), aligns with global concerns about student well-being in high-pressure academic environments (Wood & Moss, 2024). This finding is consistent with research highlighting the significant psychological distress faced by students in healthcare fields. However, our study contextualizes this issue within the Pakistani AHS sector, revealing that the transition from student to practitioner in this specific setting is a period of considerable vulnerability. This adds a new dimension to the global literature, which has predominantly focused on Western contexts or medical (MBBS) students.

The strong preference for sharing wearable data over academic performance data (H2) is a novel and significant finding. It suggests that students make a clear distinction between different types of personal data, potentially perceiving biometric information as less sensitive or more anonymous than their academic records. This finding resonates with the broader discourse on AI in education, which emphasizes the need for ethical data practices and robust privacy protections (Wang et al., 2024). It provides a critical, user-centric perspective for administrators, indicating that the type of data collected is as important as the purpose, a consideration that aligns with student concerns identified in broader surveys (Digital Education Council, 2024).

Furthermore, the positive correlation between exhaustion and willingness to adopt an AI-driven intervention (H3) underscores the potential of such tools to reach those most in need. Students experiencing the highest levels of burnout appear to recognize their need for support and are open to technological solutions. This aligns with the "augmentation perspective" of AI in education, which advocates for a collaborative human-AI partnership rather than full automation (Pesovski et al., 2025). Our findings suggest that a well-designed intervention could effectively augment existing support structures by providing personalized, scalable assistance to overwhelmed students, similar to the positive impacts on metacognition and achievement observed in other educational settings (Iqbal et al., 2025).

This study contributes new knowledge to medical education literature by establishing a baseline of well-being issues in a previously under-researched population. The findings signal an urgent need for university health services and academic administrators to develop integrated well-being programs that address burnout proactively. The demonstrated willingness to use a data-driven system offers a viable pathway for creating just-in-time, personalized interventions that could reduce burnout and improve both academic and long-term professional outcomes, while also acknowledging the nuanced perceptions surrounding AI utility in educational contexts (Pew Research Center, 2024).

CONCLUSION

This study confirms a critical prevalence of burnout among Allied Health Sciences students in Karachi and establishes their receptiveness to data-driven, AI-enabled interventions. The findings

demonstrate that students are most willing to share wearable data and that those experiencing higher exhaustion levels show greater acceptance of technological support. These insights provide a foundational evidence base for developing ethically-designed, student-centric well-being programs that leverage AI as an augmentative tool. Key recommendations include the integration of well-being metrics into institutional health monitoring and the development of pilot interventions that prioritize wearable data collection. For educators, the results underscore the need to address AI literacy and ethical data use as core competencies.

A primary limitation of this cross-sectional design is its inability to establish causality. Future research should employ a quasi-experimental, pre-test/post-test design to longitudinally assess the impact of a specific AI literacy intervention on both well-being outcomes and academic performance, thereby measuring the direct efficacy of such educational programs.

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