

Association between Prior Exposure to Non-Communicable Disease Information And Health Literacy among Allied Health Students in Pakistan: Implications for Curriculum Development

Ihtesham Ul Haq

Assistant Professor Respiratory Therapy and Intensive Care Technology, Rehman Medical Institute RCHAS Peshawar.

Email: ihtesham.haq1@rmi.edu.pk

Ferdos Raza

Assistant Professor of Emergency Care Technology at Ghazali Institute of Medical Sciences, Peshawar

Email: ferdosuop@gmail.com

Shah zaman

Emergency Care Technology at Ghazali Institute of Medical Sciences, Peshawar

Email: zshah2023@gmail.com

Muhammad Riaz

Emergency Care Technology at Ghazali Institute of Medical Sciences, Peshawar

Email: riyazghazalian@gmail.com

Mian Syed Ahmad

Principle at Ghazali Institute of Medical Sciences, Peshawar

Email: syedahmad091@gmail.com

Shagufta Naz

Facilitation Center Coordinator Benazir Nashunuma Program Shabqadar Tehsil Headquarter Hospital

Email: shaguftanaz96s@gmail.com

Basharat Ali*

Demonstrator Respiratory therapy at Khyber medical University institute of Allied health science Peshawar

Email: abbasharat636@gmail.com

Author Details

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Corresponding E-mails & Authors*:

Basharat Ali*

Email: abbasharat636@gmail.com

Abstract

Background: Non-communicable diseases (NCDs) account for approximately 74% of global mortality and impose a disproportionate burden on low- and middle-income countries. Despite this, NCD awareness — particularly among future healthcare professionals — remains inconsistently characterised. Understanding which factors independently predict NCD awareness is essential for designing targeted educational interventions (GBD 2019 Diseases and Injuries Collaborators, 2020).

Objective: To determine which sociodemographic and lifestyle variables independently predict NCD

awareness levels among undergraduate allied health sciences students in Peshawar, Pakistan, with a focus on the sole statistically significant predictor identified in chi-square analysis.

Methods: A cross-sectional study was conducted among 250 undergraduate allied health sciences students at selected private institutions in Peshawar from January to May 2026. NCD awareness was assessed using a structured, self-administered questionnaire. Awareness was categorised as low, moderate, or high. Eleven variables were evaluated for association with awareness level using Pearson chi-square analysis ($p < 0.05$ considered statistically significant).

Results: Overall, 81.2% of participants achieved high NCD awareness. Of eleven variables evaluated, only prior exposure to NCD information (having previously heard about NCDs) was significantly associated with awareness level ($\chi^2 = 21.510$, $df = 2$, $p < 0.001$). Students with prior exposure were substantially more likely to attain high awareness (87.8% vs. 64.3%) — a 23.5 percentage-point excess. All demographic variables (gender, age, residence, year of study) and lifestyle variables (smoking, physical activity, stress, diet, health check-up practices) were non-significant.

Conclusion: Prior exposure to NCD information is the sole independent predictor of NCD awareness among allied health students in Peshawar. These findings provide compelling evidence for the mandatory integration of structured, early NCD orientation programmes into allied health curricula a zero-cost, evidence-based intervention to close the NCD knowledge gap in future healthcare professionals.

Introduction: Non-communicable diseases (NCDs) — encompassing cardiovascular disease, cancer, type 2 diabetes, and chronic respiratory conditions — now account for approximately 74% of all global deaths, with over 80% of NCD-related mortality occurring in low- and middle-income countries (LMICs) (World Health Organization, 2023). In Pakistan, NCDs contribute to approximately 59% of total national mortality, a burden driven by urbanisation, sedentary behaviour, and suboptimal nutrition (Kazmi et al., 2022). Effective NCD prevention is inextricably dependent on population-level awareness of modifiable risk factors, yet this awareness — even among individuals with health science training — remains inconsistently mapped.

Undergraduate allied health students represent a strategically important population for NCD awareness research. As future frontline healthcare practitioners, they will be instrumental in patient education, community health promotion, and lifestyle counselling. Evidence of knowledge gaps at this formative stage of training has direct implications for curriculum design, public health preparedness, and the downstream quality of preventive care (Bykovskiy et al., 2024; Ba-Haj et al., 2025). Yet, existing literature from South Asia has rarely identified which specific variables — beyond broad academic exposure — independently predict NCD awareness levels in this population.

This study addresses that gap by evaluating eleven sociodemographic and lifestyle variables for their association with NCD awareness in a cohort of 250 allied health students in Peshawar, Pakistan. Its central finding — that prior exposure to NCD information is the sole statistically significant predictor of awareness ($\chi^2 = 21.510$, $p < 0.001$) — carries direct and actionable implications for curriculum reform in allied health education.

Method

Study Design and Setting: A cross-sectional descriptive study was conducted in accordance with the STROBE guidelines for observational research. The study was undertaken among undergraduate allied health sciences students enrolled at selected private institutions in Peshawar, Khyber Pakhtunkhwa, from January to May 2026.

Participants: Two hundred and fifty participants were enrolled using convenience sampling. Eligibility required active enrolment in an allied health sciences programme and age ≥ 18 years. Students who were unable to complete the questionnaire or not enrolled in allied health programmes were

excluded. Sample size was calculated using $n = Z^2 \cdot p(1-p)/d^2$ ($Z = 1.96$, $p = 0.5$, $d = 0.05$), with finite population correction, yielding a minimum of 250.

Instrument and Data Collection: A structured, self-administered questionnaire assessed sociodemographic characteristics (gender, age, year of study, residence), lifestyle behaviours (physical activity, diet, smoking, stress, health check-up practices), and NCD knowledge items. NCD awareness was scored across six validated knowledge items and classified as low, moderate, or high. Questionnaires were administered on-site following written informed consent. Data were checked, coded, and securely stored. (Gamage & Jayawardana, 2017; Chaudhari et al., 2016).

Statistical Analysis: Data were entered and analysed using IBM SPSS v26. Descriptive statistics summarised sociodemographic and lifestyle characteristics. Pearson chi-square tests assessed associations between NCD awareness level (low/moderate/high) and each of eleven categorical predictor variables. Statistical significance was defined as $p < 0.05$ (two-tailed).

Ethics: Ethical clearance was obtained from the Institutional Research Ethics Committee. Written informed consent was provided by all participants, with full anonymisation of data and the right to withdraw without consequence.

Results

Participant Profile

Of 250 participants, 75.2% were male and 64.4% were aged 21–25 years — a distribution consistent with the demographic profile of allied health programmes in Peshawar. Fourth-year students comprised 48.0% of the cohort. A majority resided in urban areas (62.0%). Sociodemographic characteristics are summarised in Table 1.

Variable	Category	n (%)	
GENDER	Male	188 (75.2%)	
	Female	62 (24.8%)	
AGE GROUP	18–20 years	55 (22.0%)	
	21–25 years	161 (64.4%)	— Largest group
	26–30 years	34 (13.6%)	

YEAR OF STUDY			
	1st Year	40 (16.0%)	
	2nd Year	44 (17.6%)	
	3rd Year	46 (18.4%)	
	4th Year	120 (48.0%)	— Largest group
RESIDENCE			
	Urban	155 (62.0%)	
	Rural	95 (38.0%)	

Overall NCD Awareness and Knowledge Item Profile:

Overall, 81.2% of participants achieved high NCD awareness, 13.2% moderate awareness, and 5.6% low awareness. Knowledge of specific risk factors was generally strong: awareness of excessive salt intake as a hypertension risk was highest (92.0%), followed by smoking–heart disease linkage (90.4%), and obesity as a diabetes/CVD risk factor (90.0%). Awareness of fast-food-related NCD risk (77.6%) and physical inactivity (74.8%) was comparatively lower, and 28.0% of participants had never heard about NCDs prior to the study (see Figure 1).

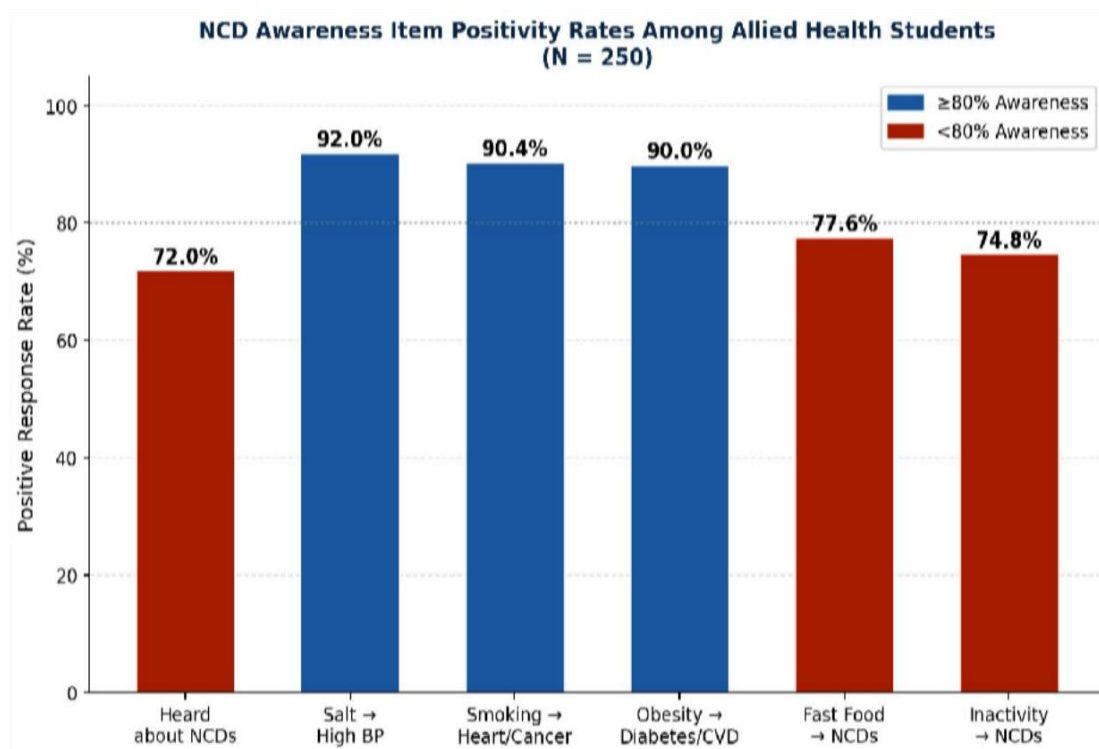


Figure 1. NCD Awareness Item Positivity Rates Among Allied Health Students (N = 250)

Prior NCD Exposure: The Sole Significant Predictor: Chi-square analysis across all eleven variables identified prior exposure to NCD information as the sole statistically significant predictor of NCD awareness level ($\chi^2 = 21.510$, $df = 2$, $p < 0.001$). All other variables including gender, age, residence, year of study, smoking, physical activity, dietary habits, stress, and health check-up practices were not significantly associated with awareness level and are not further interpreted (Table 2).

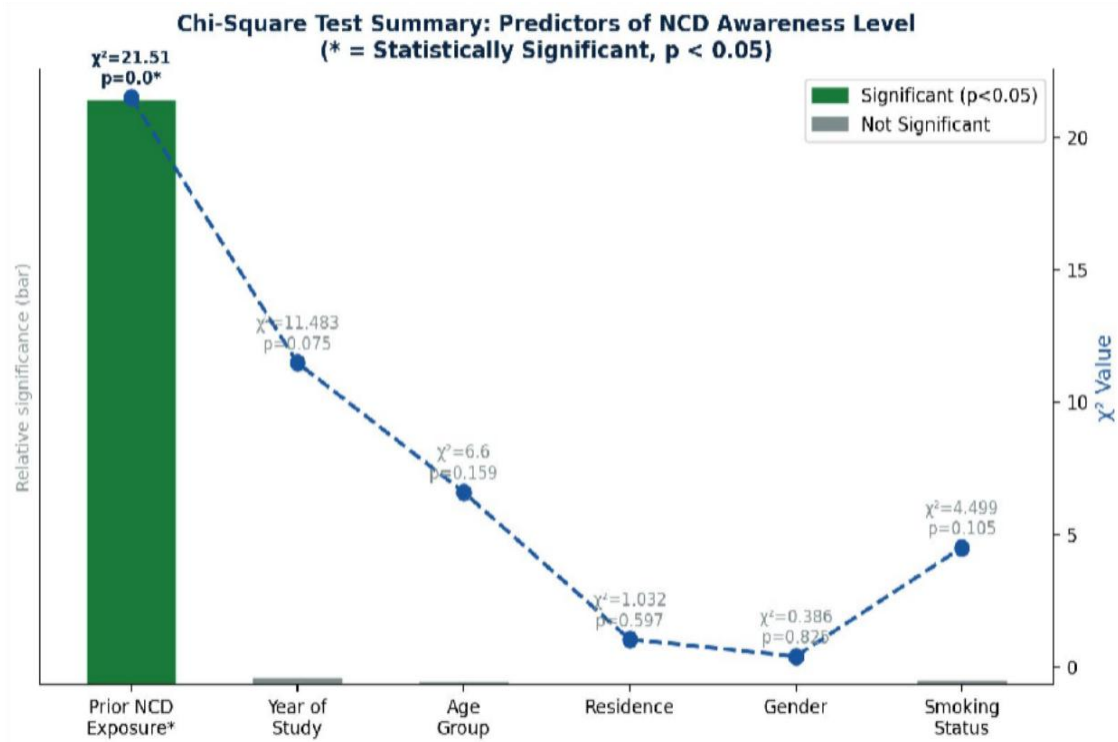
Table 2. Chi-Square Test Summary: Predictors of NCD Awareness Level (N = 250)

Variable	χ^2	df	p-Value	Result
Prior NCD Exposure (Heard of NCDs)	21.510	2	<0.001	SIGNIFICANT ★
Year of Study	11.483	6	0.075	Not Significant
Age Group	6.600	4	0.159	Not Significant
Place of Residence	1.032	2	0.597	Not Significant

Variable	χ^2	df	p-Value	Result
Gender	0.386	2	0.825	Not Significant
Cigarette Smoking	4.499	2	0.105	Not Significant
Smokeless Tobacco Use	0.122	2	0.941	Not Significant
Fast Food Consumption	9.082	6	0.169	Not Significant
Physical Activity	8.051	6	0.234	Not Significant
Stress Levels	1.672	2	0.433	Not Significant
Regular Health Checks	0.461	2	0.794	Not Significant

$\chi^2 =$ Chi-square value; $df =$ Degrees of freedom; ★ = Sole statistically significant predictor ($p < 0.05$).

Figure 2. Chi-Square Summary: Statistical Significance of All Variables Against NCD Awareness Level



Cross-Tabulation: Prior NCD Exposure × Awareness Level: Among 180 students who had previously heard about NCDs, 87.8% attained high awareness, compared with 64.3% of the 70 students who had not. Conversely, low awareness was recorded in only 2.2% of exposed students versus 14.3% of unexposed students — a 12.1 percentage-point differential in the low-awareness category. Students with prior NCD exposure were thus 23.5 percentage points more likely to attain high NCD awareness (Table 3).

Table 3. Cross-Tabulation: NCD Awareness Level by Prior Information Exposure ($\chi^2 = 21.510, p < 0.001$)

Prior NCD Exposure	Low Awareness	Moderate Awareness	High Awareness	Total
Heard of NCDs (n=180)	4 (2.2%)	18 (10.0%)	158 (87.8%)	180 (72.0%)
Never Heard (n=70)	10 (14.3%)	15 (21.4%)	45 (64.3%)	70 (28.0%)
Total	14 (5.6%)	33 (13.2%)	203 (81.2%)	250 (100%)

p < 0.001. High Awareness = correctly answered ≥5/6 NCD awareness items.

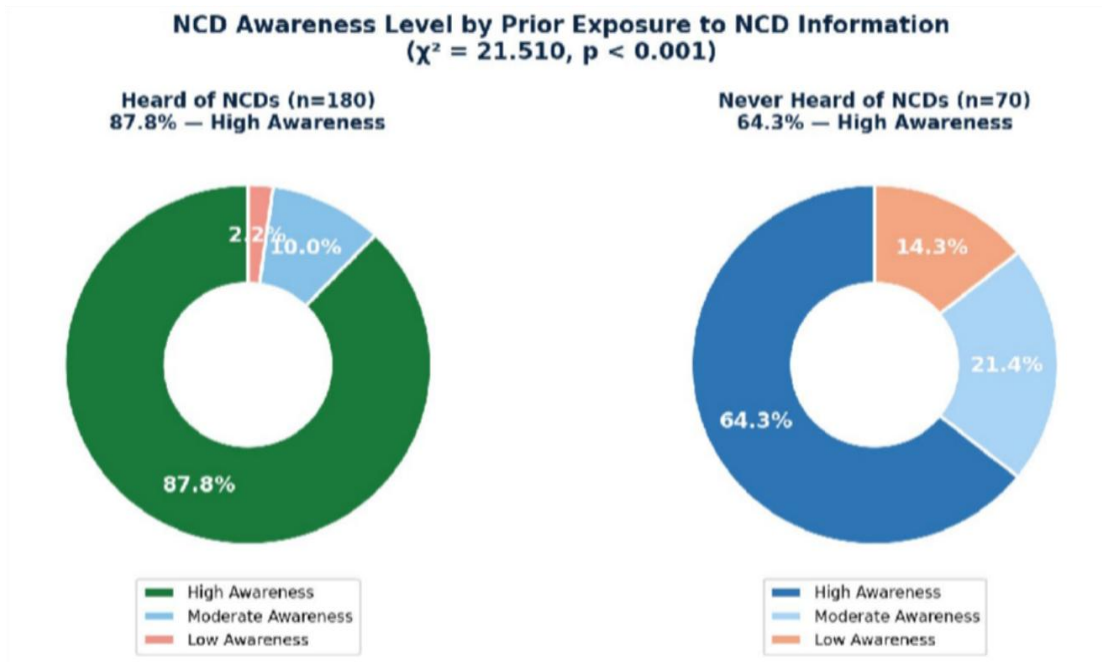


Figure 3. NCD Awareness Level by Prior Exposure to NCD Information ($p < 0.001$)

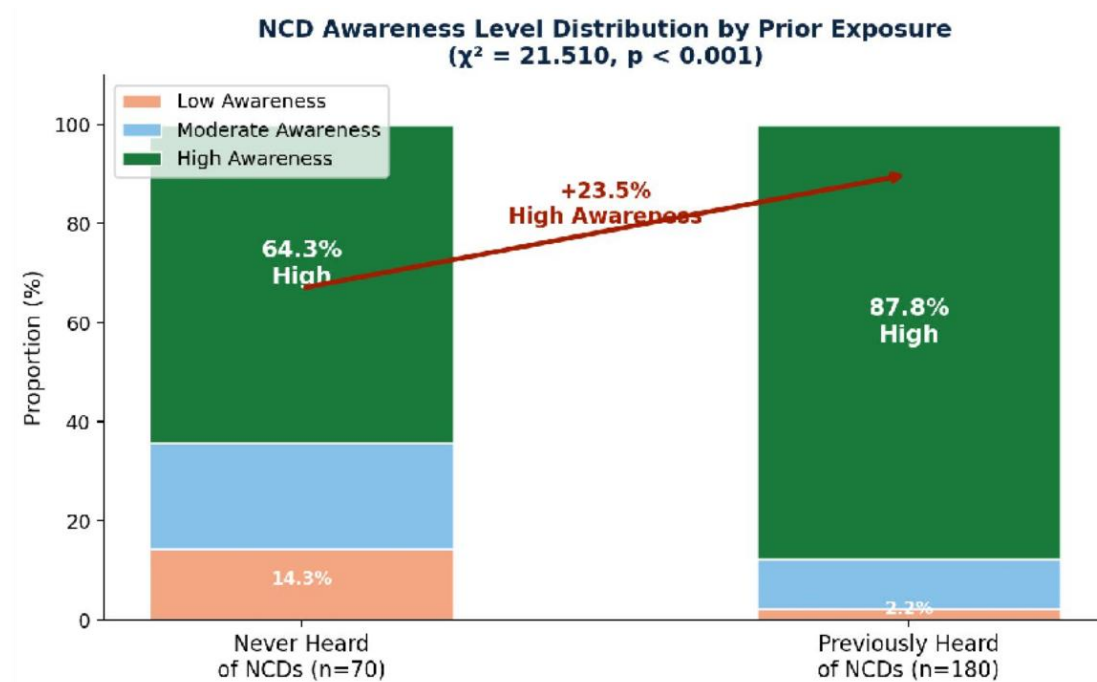


Figure 4. Stacked Awareness Distribution by Prior NCD Exposure (+23.5 Percentage-Point Excess in High Awareness)

Discussion

Prior NCD Exposure: A Clinically Actionable and Statistically Unambiguous Finding: The central finding of this study is unequivocal: of eleven demographic and lifestyle variables evaluated, only prior exposure to NCD information was significantly associated with NCD awareness ($\chi^2 = 21.510$, $p < 0.001$). Students who had previously encountered NCD-related information were 23.5 percentage points more likely to attain high awareness (87.8% vs. 64.3%) a difference not attributable to age, gender, academic year, residence, or any lifestyle factor examined. This finding establishes prior information exposure as a specific, modifiable, and educationally actionable predictor of NCD literacy, rather than a passive by-product of demographic circumstance.

Mechanistic Basis: Priming, Encoding, and Retention of Health Knowledge

The association between prior information exposure and awareness aligns with established principles in health literacy and cognitive learning theory. Prior exposure creates schema-based knowledge frameworks that facilitate encoding, retention, and application of new health information. In educational contexts, this “priming effect” is well-documented — students who enter formal health education with pre-existing NCD knowledge consistently demonstrate superior awareness integration compared with those encountering NCD concepts de novo (Mukherjee et al., 2016; Gamage & Jayawardana, 2017). This is consistent with our observation that even among unexposed students, 64.3% achieved high awareness, suggesting that formal allied health curricula provide a meaningful baseline — but that prior exposure substantially amplifies that effect.

Contextualisation with Regional and International Evidence:

Our finding is broadly consistent with published literature from South and Southeast Asia. Rahman (2025), studying university students in Dhaka, reported that media exposure and prior health education were the strongest predictors of NCD awareness, independent of sociodemographic factors (Rahman, 2025). Ba-Haj et al. (2025), in a Yemeni cohort, similarly found that prior contact with NCD-related information — through media, family, or formal education — predicted awareness more robustly than any demographic variable (Ba-Haj et al., 2025). Gamage and Jayawardana (2017) identified analogous patterns in Sri Lankan adolescents, where school-based NCD education significantly elevated awareness scores. These converging findings support a knowledge-exposure model of NCD literacy, in which structured, early information delivery is the primary lever for awareness improvement, irrespective of learner demographics (Gamage & Jayawardana, 2017).

Implications for Curriculum Design in Allied Health Education: The clinical and educational imperative emerging from these data is direct: allied health programmes should not assume that demographic diversity or baseline health training equates to adequate NCD awareness. With 28.0% of students having never heard about NCDs prior to this study — and these students disproportionately concentrated in the low and moderate awareness categories — the evidence supports a mandatory, early-year NCD orientation module as a structural component of all allied health curricula. Such a module, integrating NCD epidemiology, risk factor recognition, and lifestyle counselling skills, aligns with competency-based medical education frameworks and requires no additional resource allocation beyond curriculum restructuring (Cicekli & Gokce Eskin, 2025; Chaudhari et al., 2016).

The trend toward higher awareness in advanced academic years (4th year: 87.5% vs. 1st year: 67.5%) further validates the cumulative benefit of structured health education exposure. While this trend did not reach statistical significance ($p = 0.075$), its clinical direction is consistent with the causal pathway suggested by the primary finding: structured information exposure, delivered early and consistently, is the mechanism through which awareness is built.

Knowledge–Behaviour Gap and Public Health Implications: A critical finding complementing the primary statistical result is the ‘knowledge–behaviour gap’: despite 81.2% high awareness, 81.6% of students consumed fast food at least once weekly, 66.0% consumed fewer than three daily servings of fruits and vegetables, and only 9.2% engaged in regular preventive health screening. This disconnect — documented across multiple NCD awareness studies globally (Alleyne et al., 2011; Goel et al., 2025) — underscores that information exposure, while necessary, is insufficient alone to modify behaviour. Future interventions must therefore pair awareness delivery with behaviour-change frameworks, peer support structures, and institutional enablers (e.g., on-campus healthy food options and free screening services) to translate knowledge into preventive action (Flor et al., 2020).

Limitations: This study has several limitations. The cross-sectional design precludes causal inference between information exposure and awareness. The convenience sample, predominantly male (75.2%) and concentrated among fourth-year students (48.0%), may not fully represent the broader allied health student population in KPK. The questionnaire, while adapted from published instruments, was not formally validated using psychometric testing. Self-reported awareness and lifestyle data are subject to recall and social desirability bias. Future studies should employ longitudinal designs, validated instruments, objective lifestyle measures, and gender-balanced sampling.

Conclusion:

This study provides clear, statistically robust evidence that prior exposure to NCD information is the sole independent predictor of NCD awareness among undergraduate allied health students in Peshawar ($\chi^2 = 21.510$, $p < 0.001$). Students with prior exposure were 23.5 percentage points more likely to achieve high awareness, a finding unconfounded by any demographic or lifestyle variable assessed. These data establish a direct, actionable mandate: structured NCD education should be integrated into allied health programmes from the first year of training, not assumed to emerge incidentally from demographic background or lifestyle experience. This is a zero-cost, evidence-based curricular reform that can materially improve the NCD literacy — and ultimately the preventive practice — of the next generation of healthcare professionals in KPK and comparable LMIC settings (Alleyne et al., 2011; Goel et al., 2025).

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