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Career decision regret and its associations with depressive symptoms and Suicide Probability Scale scores among medical students at a Turkish university: a cross-sectional study

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Abstract

Background Career decision regret may reflect a mismatch between expectations of medicine and experiences during training. We examined whether regret was associated with depressive symptoms and Suicide Probability Scale (SPS) scores independently of key demographic and clinical covariates.

Methods This single-centre cross-sectional survey used a voluntary convenience sample of 208 first-, fourth-, and sixth-year medical students. Participants completed a sociodemographic questionnaire, Beck Depression Inventory (BDI), SPS, and Career Decision Regret Scale (CDRS). Two multivariable linear regression models with HC3 robust standard errors were fitted with BDI and SPS total scores as the respective outcomes. The SPS model included BDI; both models adjusted for previous suicide attempt, psychiatric diagnosis, sex, year, and socioeconomic status.

Results Of 208 participants, 149 reported career regret (sample proportion 71.6%, Wilson 95% confidence interval [CI] 65.2%–77.3%). CDRS correlated with BDI (Spearman's $\rho = 0.421$, bootstrap 95% CI 0.292–0.536) and SPS total scores ($\rho = 0.415$, 95% CI 0.285–0.527; Holm-adjusted $p < 0.001$ for both). In adjusted analyses, each 10-point higher CDRS score was associated with a 1.98-point higher BDI score (95% CI 1.40–2.56; standardized $\beta = 0.430$; $p < 0.001$; $\Delta R^2 = 0.164$) and, after adjustment for BDI and other covariates, a 1.43-point higher SPS total score (95% CI 0.56–2.30; standardized $\beta = 0.173$; Holm-adjusted $p = 0.001$; $\Delta R^2 = 0.021$). Students directly reporting regret had a 10.94-point higher mean SPS score (95% CI 6.08–15.60; Hedges' $g = 0.67$, 95% CI 0.36–0.96).

Conclusions Higher career regret remained associated with greater depressive and suicide-related symptom scores after adjustment for measured covariates, although its incremental association with SPS scores beyond depressive

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symptoms was modest. The cross-sectional design, unknown response rate, and non-representative sampling preclude causal, prevalence, or individual suicide-risk interpretations.

Keywords Medical students, Career decision regret, Depressive symptoms, Suicide probability scale, Medical education, Türkiye

Background

Medical education exposes students to sustained academic workload, repeated high-stakes assessment, sleep disruption, clinical responsibility, and uncertainty about future working conditions. International meta-analyses estimate that approximately one in four medical students experience depression or depressive symptoms and about one in nine report suicidal ideation, although estimates vary substantially by instrument, setting, and study quality [19, 21]. Psychological distress may intensify during training and can affect academic performance, professionalism, help-seeking, and later patient care [8]. Recent research from the Middle East documents substantial depressive burden [22], Turkish studies link depressive and anxiety symptoms with educational and career-related stressors [30], and large medical-student samples elsewhere report similarly high psychological strain [18].

Suicide-related outcomes require particular care in interpretation. A self-report suicide-probability score is not equivalent to a clinical risk assessment, diagnosis, or prediction of suicide. Nevertheless, prior attempts, depression, substance use, low perceived support, and stressful academic environments are consistently associated with suicidal thoughts and behaviours [2, 8, 18, 27]. Evidence from medical-student populations indicates that poor mental health and stress are among the strongest correlates of suicidal ideation and attempts [23]. These findings support early, confidential, and clinically appropriate routes to assessment without treating screening scores as diagnostic labels.

Career decision regret is the counterfactual perception that a different educational or occupational choice would have produced a better outcome. It is related to, but distinct from, dissatisfaction, burnout, and intention to leave. The Turkish Career Decision Regret Scale was adapted from the Decision Regret Scale to quantify this construct [4, 10]. Studies in Jordan, China, Kazakhstan, India, and Sudan have reported widely varying levels of regret among medical students and health professionals, with learning climate, clinical exposure, stress, and working conditions repeatedly implicated [13, 15, 17, 24, 29]. Among Turkish resident physicians, occupational decision regret has also been associated with depression, anxiety, and stress [9].

The association may be bidirectional: depressive cognition and hopelessness may make a career appear less tolerable, whereas persistent disappointment with training, anticipated practice, or professional identity may contribute to distress. Shared causes, including academic overload, financial strain, adverse learning environments, weak social support, and pre-existing vulnerability, may influence all constructs. Few studies have evaluated whether career regret is related to depressive symptoms and SPS scores after accounting for established clinical and demographic correlates.

We therefore aimed to (1) compare career regret, depressive symptoms, and SPS scores among first-, fourth-, and sixth-year students; (2) estimate the associations of CDRS scores with BDI and SPS total scores after adjustment for previous suicide attempt, psychiatric diagnosis, sex, year, and socioeconomic status, with additional adjustment for BDI in the SPS model; and (3) describe educational and contextual reasons for regret. We hypothesised that higher CDRS scores would remain associated with both mental-health scale outcomes after adjustment.

Methods

Study design and setting

We conducted a single-centre cross-sectional survey between 1 February and 1 May 2023 at Bursa Uludağ University Faculty of Medicine, Türkiye. First-year students represented entry into medical education, fourth-year students the transition to predominantly clinical training, and sixth-year students the internship and immediate pre-graduation stage. The reporting structure follows the principal elements of the STROBE guidance for cross-sectional studies [28].

Participants and sampling

Students enrolled in years 1, 4, or 6 who volunteered during the study period were eligible; students who declined participation were not enrolled, and no additional exclusion criterion was applied. Recruitment therefore constituted convenience sampling. The analytic workbook contained 208 participant rows (83 first-year, 65 fourth-year, and 60 sixth-year students) and no missing values in the 90 recorded fields. All BDI, SPS, SPS-subscale, and CDRS totals were recalculated from their constituent items and matched the stored totals. Thus, all 208 returned questionnaires were analysed, with no post-enrolment exclusions for incompleteness. The retained records did not include the numbers of eligible students, invited students, refusals, or questionnaires initiated but not returned; a response rate and participant flow outside the analytic dataset could not be reconstructed. No

a priori sample-size calculation was performed. The sample was not designed to estimate faculty-wide or national prevalence.

Sociodemographic and career questionnaire

The investigator-developed form recorded age, sex, study year, repetition of a clerkship or academic year, living arrangement, self-rated socioeconomic status, chronic medical illness, self-reported psychiatric diagnosis and regular psychiatric medication use, smoking, alcohol use, past or current substance use, and whether a family member was a physician. Previous suicide attempt was assessed with the single lifetime yes/no item, 'Have you ever attempted suicide?'; timing, intent, method, lethality, and recency were not assessed. A checklist asked participants to select either 'no regret' or one or more non-mutually exclusive reasons for regretting medical-school choice: academic workload, anticipated working conditions, economic concerns, and declining professional prestige. Selection of any reason was coded as direct self-reported regret; the number of reasons ranged from 0 to 4.

Beck depression inventory

The Beck Depression Inventory is a 21-item self-report measure scored from 0 to 63, with higher scores indicating more severe depressive symptoms [3]. The validated Turkish version was used [11]. In the present sample, Cronbach's α was 0.887. Scores were analysed continuously; the study did not establish a clinical diagnosis of depressive disorder.

Suicide probability scale

The Suicide Probability Scale (SPS) is a 36-item self-report measure covering self-evaluation/social support, anger/impulsivity, hopelessness, and suicidal thoughts [25]. The revised Turkish version was used [6]. Total scores range from 36 to 144, with higher values indicating greater endorsement of suicide-related cognitive and affective symptoms. Cronbach's α was 0.926 for the total scale and 0.770–0.861 for the subscales. The SPS was treated as a dimensional research measure, not as an individual clinical suicide-risk assessment, diagnosis, or prediction.

Career decision regret scale

The five-item Turkish CDRS yields a score from 0 to 100, with higher scores indicating greater regret [10]. It was adapted from the Decision Regret Scale.

Brehaut et al., [4]. Cronbach's α was 0.862 in this sample. Directly reported regret and the continuous CDRS score were treated as related but non-identical indicators. No clinical screening threshold was assumed or proposed.

Statistical analysis

Analyses used the complete participant-level dataset ($N = 208$). Continuous distributions were assessed using histograms, Q–Q plots, skewness, and Shapiro–Wilk tests. Approximately symmetric outcomes were summarised as mean ± standard deviation (SD) and compared using independent-samples t tests or one-way analysis of variance. Clearly non-normal outcomes were summarised as median [interquartile range] and compared using Mann–Whitney U or Kruskal–Wallis tests. Categorical variables were compared using Pearson χ^2 tests. The 71.6% direct-regret sample proportion and other selected proportions are reported with Wilson 95% confidence intervals (CIs).

Unadjusted monotonic associations were estimated using Spearman's ρ with 10,000-resample bias-corrected and accelerated bootstrap 95% CIs. Group contrasts are accompanied by Cramér's V for categorical outcomes, η^2 for analysis-of-variance contrasts, ε^2 for Kruskal–Wallis contrasts, rank-biserial correlation for Mann–Whitney contrasts, and mean difference plus Hedges' g for the SPS comparison. Bootstrap CIs were calculated for correlation and effect-size estimates where appropriate.

Two covariate-adjusted ordinary least-squares models were fitted using clinically selected covariates entered simultaneously. Model 1 used BDI total score as the outcome and CDRS score per 10-point increase as the principal exposure, adjusting for lifetime previous suicide attempt, self-reported psychiatric diagnosis, sex, study year (categorical), and self-rated socioeconomic status (five ordered levels, higher indicating better status). Because BDI was the outcome, it could not also be included as a covariate. Model 2 used SPS total score as the outcome and included CDRS per 10 points, BDI per 5 points, and the same covariates. No data-driven variable selection was used.

Models are reported with unstandardised coefficients (B), HC3 heteroscedasticity-consistent standard errors, 95% CIs, standardised coefficients (β), adjusted R^2, and the incremental R^2 associated with adding CDRS to the reduced model. Variance-inflation factors (VIFs), residual diagnostics, leverage, and Cook's distance were examined. Because BDI residuals remained non-normal, 10,000 participant-level percentile-bootstrap CIs were added for the CDRS coefficient. Sensitivity analyses additionally adjusted for smoking, alcohol use, chronic medical illness, and academic-year/clerkship repetition; a second sensitivity analysis treated socioeconomic status as three categories rather than a linear ordinal covariate.

Multiplicity was addressed using Holm adjustment within the following clinically coherent analysis families: the two CDRS–outcome correlations; the CDRS coefficients in the two adjusted models; the three direct-regret group comparisons; two year-related clinical indicators;

seven year-related scale outcomes; and five year-related regret indicators. Pairwise tests were interpreted only when the corresponding family-adjusted global test was significant. All tests were two-sided. Reanalyses were conducted in Python 3.12 with pandas 2.2.3, NumPy 2.3.5, and SciPy 1.17.0; original analyses had used SPSS 22.0 and MedCalc 20.022.

Ethics

The study was approved by the Bursa Uludağ University Faculty of Medicine Clinical Research Ethics Committee (decision nos. 2023-1/49, 11 January 2023; and 2023-9/10, 25 April 2023). All participants received written and verbal study information and provided written informed consent. Participation was voluntary.

Use of generative AI-assisted technologies

During manuscript preparation, an AI large language model was used solely for English-language editing. The authors reviewed and approved all language edits and take full responsibility for the final manuscript. The tool was not used for data analysis, statistical coding, interpretation, reference generation, or manuscript content generation, and is not listed as an author.

Table 1 Participant characteristics ($N = 208$)

Characteristic	Value
Age, years	22 [19–23]; range 18–40
Women	133 (63.9)
Year 1 / year 4 / year 6	83 (39.9) / 65 (31.3) / 60 (28.8)
Clerkship or academic-year repetition	42 (20.2)
Living with family/relatives / friends / alone	60 (28.8) / 91 (43.8) / 57 (27.4)
Socioeconomic status: very poor / poor / middle / good / very good	1 (0.5) / 12 (5.8) / 135 (64.9) / 55 (26.4) / 5 (2.4)
Self-reported psychiatric diagnosis	55 (26.4); 95% CI 20.9–32.8
Regular psychiatric medication	39 (18.8); 95% CI 14.0–24.6
Lifetime previous suicide attempt	23 (11.1); 95% CI 7.5–16.0
Chronic medical condition	28 (13.5)
Current smoking	33 (15.9)
Alcohol use	75 (36.1)
Past or current substance use	4 (1.9)
Physician in family	63 (30.3)
Directly reported career regret	149 (71.6); 95% CI 65.2–77.3
Reason: academic workload	117 (56.3)
Reason: working conditions	124 (59.6)
Reason: economic concerns	67 (32.2)
Reason: declining professional prestige	95 (45.7)

Note. Values are n (%) or median [IQR]. Wilson 95% CIs are reported for selected key proportions. Regret reasons were non-mutually exclusive, and percentages use N = 208 as the denominator

Results

Participant characteristics and data completeness

All 208 records were complete and included in every analysis. Participants had a median age of 22 years [IQR 19–23; range 18–40], and 133 (63.9%) were women. Fifty-five students reported a psychiatric diagnosis (26.4%, Wilson 95% CI 20.9%–32.8%), 39 reported regular psychiatric medication use (18.8%, 95% CI 14.0%–24.6%), and 23 reported a lifetime suicide attempt (11.1%, 95% CI 7.5%–16.0%). Overall, 149 students selected at least one regret reason (sample proportion 71.6%, 95% CI 65.2%–77.3%). Working conditions and academic workload were the most frequently endorsed reasons (Table 1).

Comparisons by year of study

Direct regret increased from 59.0% in year 1 (Wilson 95% CI 48.3%–69.0%) to 73.8% in year 4 (62.0%–83.0%) and 86.7% in year 6 (75.8%–93.1%); the family-adjusted global p value was 0.004 (Cramér's V = 0.253). The year-1 versus year-6 pairwise contrast remained significant after Holm adjustment ($p = 0.001$), whereas the other pairwise contrasts did not. CDRS scores differed across years after family adjustment (Holm $p < 0.001$; $\varepsilon^2 = 0.087$); year 1 was lower than years 4 and 6, while years 4 and 6 did not differ.

The global BDI comparison was not statistically significant ($H = 5.81$, raw $p = 0.055$, Holm-adjusted $p = 0.273$; $\varepsilon^2 = 0.019$). This is not evidence of equivalence. Year-specific BDI medians and percentile-bootstrap 95% CIs for the medians were 14 (12–17) in year 1, 17 (15–18) in year 4, and 12 (9.5–15) in year 6. The global anger/impulsivity comparison yielded a raw p value of 0.026, but the result did not remain statistically significant after Holm adjustment (adjusted $p = 0.156$) and was therefore not interpreted as a reliable year-group difference. Psychiatric diagnosis and medication use varied by year within their two-test family. Working-conditions, economic, and declining-prestige reasons also varied by year after Holm adjustment, whereas the academic-workload reason did not (Table 2). These cross-sectional contrasts describe different cohorts and do not establish within-person change.

Unadjusted associations and direct-regret contrasts

CDRS score correlated with BDI score ($\rho = 0.421$, bootstrap 95% CI 0.292–0.536) and SPS total score ($\rho = 0.415$, 95% CI 0.285–0.527; Holm-adjusted $p < 0.001$ for both). The number of endorsed regret reasons correlated with BDI ($\rho = 0.340$, 95% CI 0.213–0.455) and SPS total score ($\rho = 0.286$, 95% CI 0.151–0.407; Holm-adjusted $p < 0.001$ for both secondary correlations).

Students directly reporting regret had higher BDI, SPS total, and CDRS scores after Holm adjustment across these three contrasts. For SPS total, the mean difference

Table 2 Outcomes by year of medical school

Outcome	Year 1 (*n* = 83)	Year 4 (*n* = 65)	Year 6 (*n* = 60)	Raw *p*	Holm *p*	Effect
Psychiatric diagnosis, n (%)	13 (15.7)	19 (29.2)	23 (38.3)	0.008	0.017	V = 0.215
Psychiatric medication, n (%)	8 (9.6)	17 (26.2)	14 (23.3)	0.021	0.021	V = 0.192
BDI, median [IQR]	14 [10–23]	17 [13–21]	12 [7–21]	0.055	0.273	$\varepsilon^2 = 0.019$
SPS self-evaluation/social support, mean ± SD	38.11 ± 7.56	39.14 ± 8.11	37.77 ± 7.46	0.576	1.000	$\eta^2 = 0.005$
SPS anger/impulsivity, median [IQR]	12 [9–15]	11 [9–14]	10 [8–13]	0.026	0.156	$\varepsilon^2 = 0.026$
SPS hopelessness, mean ± SD	17.47 ± 4.28	17.69 ± 3.96	16.93 ± 3.80	0.561	1.000	$\eta^2 = 0.006$
SPS suicidal thoughts, median [IQR]	14 [10–18]	14 [11–18]	12 [9–16]	0.137	0.548	$\varepsilon^2 = 0.010$
SPS total, mean ± SD	81.89 ± 17.03	83.11 ± 17.13	78.33 ± 16.84	0.267	0.801	$\eta^2 = 0.013$
CDRS, median [IQR]	25 [15–40]	35 [25–50]	40 [30–55]	< 0.001	< 0.001	$\varepsilon^2 = 0.087$
Direct career regret, n (%)	49 (59.0)	48 (73.8)	52 (86.7)	0.001	0.004	V = 0.253
Reason: academic workload, n (%)	44 (53.0)	43 (66.2)	30 (50.0)	0.143	0.143	V = 0.137
Reason: working conditions, n (%)	37 (44.6)	43 (66.2)	44 (73.3)	0.001	0.004	V = 0.256
Reason: economic concerns, n (%)	16 (19.3)	22 (33.8)	29 (48.3)	0.001	0.004	V = 0.256
Reason: declining professional prestige, n (%)	27 (32.5)	25 (38.5)	43 (71.7)	< 0.001	< 0.001	V = 0.336

Note. BDI, Beck Depression Inventory; CDRS, Career Decision Regret Scale; IQR, interquartile range; SD, standard deviation; SPS, Suicide Probability Scale. Raw p values are from Pearson χ^2, one-way analysis of variance, or Kruskal–Wallis tests. Holm adjustment was applied within three clinically coherent year-comparison families defined before revised testing: clinical indicators (2 tests), scale outcomes (7 tests), and regret indicators (5 tests). V = Cramér's V; η^2 = eta-squared; ε^2 = epsilon-squared

Table 3 Unadjusted mental-health and career-regret associations

Measure	No regret (*n* = 59)	Regret (*n* = 149)	Between-group estimate	Spearman association with CDRS
BDI	11 [5.5–16]	16 [11–24]	Rank-biserial *r* = 0.440 (95% CI 0.278–0.581); Holm *p* < 0.001	ρ = 0.421 (95% CI 0.292–0.536); Holm *p* < 0.001
SPS total	73.41 ± 15.39	84.35 ± 16.70	Mean difference 10.94 (95% CI 6.08–15.60); g = 0.67 (0.36–0.96); Holm *p* < 0.001	ρ = 0.415 (95% CI 0.285–0.527); Holm *p* < 0.001
CDRS	15 [2.5–25]	40 [30–55]	Rank-biserial *r* = 0.757 (95% CI 0.634–0.845); Holm *p* < 0.001	—

Note. Values are median [IQR] except SPS total, which is mean ± SD. Groups were defined by the direct regret checklist item. Correlation and effect-size CIs were estimated using 10,000 bootstrap resamples. Holm adjustment was applied within the two-correlation family and the three direct-regret contrasts. BDI, Beck Depression Inventory; CDRS, Career Decision Regret Scale; SPS, Suicide Probability Scale

was 10.94 points (bootstrap 95% CI 6.08–15.60), with Hedges' g = 0.67 (95% CI 0.36–0.96). The rank-biserial effects were 0.440 for BDI and 0.757 for CDRS (Table 3).

Covariate-adjusted associations

In the BDI model, each 10-point higher CDRS score was associated with a 1.98-point higher BDI score (HC3 95% CI 1.40–2.56; standardized β = 0.430; $p < 0.001$). Adding CDRS increased R^2 by 0.164 (F change (1, 200) = 51.78, $p < 0.001$); the full model adjusted R^2 was 0.343. The 10,000-resample bootstrap CI for the CDRS coefficient was 1.40–2.51.

In the SPS model, each 10-point higher CDRS score was associated with a 1.43-point higher SPS total score after adjustment for BDI and the other covariates (HC3 95% CI 0.56–2.30; standardized β = 0.173; Holm-adjusted $p = 0.001$). Each 5-point higher BDI score was associated with a 5.78-point higher SPS score (95% CI 4.81–6.76; standardized β = 0.643; $p < 0.001$). CDRS added 0.021 to R^2 beyond BDI and the other covariates (F change (1, 199) = 13.45, $p < 0.001$); the full model adjusted R^2 was 0.676. The bootstrap CI for the CDRS coefficient was 0.61–2.25.The results of the covariate-adjusted regression models are presented in Table 4.

Maximum VIFs were 1.40 and 1.57 in the BDI and SPS models, respectively. SPS residuals were compatible with normality; BDI residuals were non-normal, supporting use of HC3 standard errors and bootstrap CIs. Expanded sensitivity models additionally adjusting for smoking, alcohol use, chronic illness, and academic repetition yielded CDRS coefficients of 1.97 (95% CI 1.36–2.59) for BDI and 1.53 (95% CI 0.66–2.40) for SPS. Treating socioeconomic status categorically also gave similar CDRS estimates (2.01 and 1.45, respectively).

Discussion

This study provides a more analytically stringent evaluation of the relationship between career decision regret and mental-health symptom burden in medical students. The central finding was not merely that regret correlated

Table 4 Covariate-adjusted linear regression models (*N* = 208)

Outcome / term	B (HC3 SE)	95% CI	Standardized β	*p*
BDI model: R^2 = 0.365; adjusted R^2 = 0.343; CDRS ΔR^2 = 0.164				
Intercept	11.77 (3.35)	5.17 to 18.37	—	< 0.001
CDRS, per 10 points	1.98 (0.30)	1.40 to 2.56	0.430	< 0.001
Female vs. male	0.79 (1.10)	-1.37 to 2.95	0.040	0.471
Year 4 vs. year 1	-0.89 (1.24)	-3.34 to 1.55	-0.044	0.473
Year 6 vs. year 1	-5.24 (1.45)	-8.10 to -2.38	-0.251	< 0.001
SES, per one-category improvement	-0.99 (0.90)	-2.77 to 0.79	-0.064	0.274
Psychiatric diagnosis, yes vs. no	3.28 (1.61)	0.10 to 6.45	0.153	0.043
Lifetime previous attempt, yes vs. no	9.05 (2.12)	4.87 to 13.23	0.301	< 0.001
SPS model: R^2 = 0.689; adjusted R^2 = 0.676; CDRS ΔR^2 = 0.021				
Intercept	60.31 (5.21)	50.05 to 70.58	—	< 0.001
CDRS, per 10 points	1.43 (0.44)	0.56 to 2.30	0.173	0.001
BDI, per 5 points	5.78 (0.50)	4.81 to 6.76	0.643	< 0.001
Female vs. male	-0.75 (1.43)	-3.57 to 2.07	-0.021	0.603
Year 4 vs. year 1	-1.04 (1.69)	-4.37 to 2.29	-0.028	0.539
Year 6 vs. year 1	-3.10 (1.88)	-6.81 to 0.61	-0.083	0.101
SES, per one-category improvement	-0.87 (1.39)	-3.62 to 1.88	-0.032	0.532
Psychiatric diagnosis, yes vs. no	2.64 (1.74)	-0.78 to 6.07	0.069	0.130
Lifetime previous attempt, yes vs. no	8.94 (2.73)	3.57 to 14.31	0.165	0.001

Note. B is the unstandardised coefficient. HC3 heteroscedasticity-consistent SEs and CIs are shown. SES was coded from very poor to very good. Year 1 and male sex were reference categories. Holm-adjusted p values for the CDRS term across the two co-primary models were < 0.001 (BDI) and 0.001 (SPS). BDI, Beck Depression Inventory; CDRS, Career Decision Regret Scale; CI, confidence interval; SES, socioeconomic status; SPS, Suicide Probability Scale

with depressive and suicide-related symptom scores. In the covariate-adjusted model, each 10-point higher Career Decision Regret Scale (CDRS) score was associated with a 1.98-point higher Beck Depression Inventory (BDI) score (standardized β = 0.430), and CDRS accounted for an additional 16.4% of the variance in BDI beyond the measured covariates. In the Suicide Probability Scale (SPS) model, each 10-point higher CDRS score remained associated with a 1.43-point higher SPS total score after adjustment for BDI and the same demographic and clinical covariates; however, the standardized association was smaller (β = 0.173), and the incremental variance explained by CDRS was 2.1%. Taken together, these findings indicate that career regret carried substantial cross-sectional information about depressive symptom burden, whereas its additional association with suicide-related symptom scores beyond depression was statistically supported but quantitatively modest. This distinction directly addresses whether regret contributes information beyond depression while avoiding causal or predictive interpretation.

The unadjusted analyses converged with the adjusted models. CDRS scores showed moderate correlations with both BDI (ρ = 0.421, bootstrap 95% CI 0.292–0.536) and SPS total scores (ρ = 0.415, 95% CI 0.285–0.527), and students who directly reported regret had a 10.94-point higher mean SPS score, corresponding to a moderate standardized difference (Hedges' g = 0.67). Convergence across a continuous scale, a direct regret report, correlation estimates, and covariate-adjusted models strengthens the internal coherence of the observed pattern. Nevertheless, the large CDRS difference between direct-regret groups is partly expected because the two measures assess closely related formulations of the same construct; it should not be interpreted as independent validation. For this reason, the direct item is retained only as a descriptive indicator, the CDRS is analysed continuously, and neither an internally derived cut-off nor screening-performance claims are proposed.

Depressive symptoms remained the dominant correlate of SPS total scores. A 5-point higher BDI score was associated with a 5.78-point higher SPS score (standardized β = 0.643), whereas the independent CDRS contribution was much smaller. This attenuation after adjustment for BDI is clinically and conceptually important. It suggests that much of the bivariate relationship between career regret and SPS scores may be shared with depressive symptom burden, while a smaller residual association may reflect professional disappointment, hopeless appraisal of future work, overlapping affective content, or unmeasured common determinants. The present data cannot distinguish among these explanations. Nor do they establish that regret precedes suicide-related symptoms, functions as a mediator, or improves individual risk prediction. SPS scores represent dimensional self-reported cognitive and affective symptom burden and must not be equated with a clinical assessment of suicidal intent, imminence, or lethality [23, 27].

The direct-regret sample proportion of 71.6% was similar to the 76.3% reported in a nationwide Jordanian survey [15], but published estimates from Kazakhstan, India, China, and Sudan vary considerably [13, 17, 24, 29]. Such variation is unsurprising because studies differ in sampling frames, year-group composition, sociocultural expectations, health-system conditions, measurement instruments, and the wording used to define regret. The present figure therefore should be positioned as a characteristic of the participating sample rather than as a prevalence estimate for the faculty or for Turkish medical students. Cross-country numerical comparisons

are useful for demonstrating that career regret is not confined to one setting, but they cannot by themselves establish that the underlying construct, threshold, or determinants are equivalent across educational systems.

The association between career regret and depressive symptoms is consistent with evidence linking adverse learning environments, mistreatment, burnout, and professional dissatisfaction with subsequent regret or poorer psychological health. In a longitudinal study of United States medical students, characteristics of the learning environment were associated with later career regret [7]. Among resident physicians in Türkiye, occupational decision regret has likewise been associated with depression, anxiety, and stress [9], while Turkish medical-student studies have connected psychological symptoms with educational stress and expectations of the medical profession [1, 14, 30]. The present analysis extends this literature by quantifying the continuous regret–depression relationship after adjustment for selected demographic and clinical factors. It does not, however, determine directionality: depressive cognition may make career experiences appear more negative; persistent mismatch between expectations and training may contribute to distress; and both may arise from shared educational, financial, interpersonal, or premorbid factors.

Career regret showed a clearer gradient across study years than the mental-health scales. Directly reported regret increased from 59.0% in year 1 to 86.7% in year 6, and CDRS scores were higher in years 4 and 6 than in year 1. By contrast, the global BDI comparison was inconclusive rather than evidence of equivalence (raw $p = 0.055$; Holm-adjusted $p = 0.273$), and neither SPS total nor its subscales showed a reliable parallel year gradient after multiplicity adjustment. This divergence may indicate that career regret captures a stage-sensitive appraisal of training and anticipated professional life that is related to, but not reducible to, generalized symptom burden. Senior students may have more direct exposure to clinical workload, institutional culture, workplace violence, employment expectations, and the practical consequences of a medical career. However, the study compares different cohorts at one time point; it does not demonstrate that regret increases within the same individuals as training progresses. Longitudinal studies have shown that psychological health can change during medical education, underscoring the need to separate developmental change from cohort and period effects [20, 32].

The reported reasons for regret provide contextual detail but should remain descriptive. Working conditions, economic concerns, and declining professional prestige were endorsed more often in later years, whereas the academic-workload reason did not show a robust year difference after multiplicity control. These patterns are compatible with increasing awareness of professional realities near graduation, but the reasons overlap conceptually with regret and cannot be treated as independent explanatory causes. Because the direct regret item overlaps conceptually with the CDRS and is not a validated external reference standard, the present data do not support a diagnostic threshold or screening-performance claims. Interpretation therefore focuses on the associations of continuous CDRS scores with BDI and SPS outcomes.

Interpretation of the year-group differences should also consider the timing of data collection. Recruitment began on 1 February 2023, five days before the 6 February earthquakes, and continued through 1 May. Although Bursa was outside the provinces most severely affected by physical destruction, the disaster generated substantial psychological and health-system consequences across Türkiye. Subsequent nationwide evidence also demonstrated associations between earthquake exposure, socioeconomic vulnerability, and symptoms of depression, anxiety, and post-traumatic stress [12, 16]. The same period was characterized by documented concerns among Turkish physicians regarding financial difficulties, healthcare violence, limited consultation time, working conditions, and emigration [31]. Because individual survey dates and participants' direct or indirect exposure to these contextual stressors were not recorded, pre- and post-earthquake responses cannot be distinguished, and the potential effects of training stage cannot be separated from those of contemporaneous national circumstances.

Implications and strengths

The findings support a combined educational and mental-health perspective. Career regret should not automatically be individualized as a maladaptive attitude or treated as a proxy diagnosis. It may instead function as a sentinel indicator of mismatch among expectations, the learning environment, perceived professional prospects, and psychological well-being. Medical schools could periodically assess career expectations and learning-climate concerns; strengthen mentorship at transitions into clinical training and internship; provide confidential, non-stigmatizing access to mental-health care; and maintain explicit pathways for urgent assessment when current suicidal thoughts or intent are disclosed. Structural concerns—including workload, mistreatment, financial insecurity, safety, and anticipated working conditions—should be evaluated alongside individual support. Although comprehensive wellness programmes are feasible, prospective evaluations are needed to determine which components improve both mental health and professional commitment [5, 26].

Several features strengthen the study. It simultaneously examined career regret, depressive symptoms, and suicide-related symptom scores using Turkish-validated

instruments with good-to-excellent internal consistency; included students at entry, transition-to-clinical training, and internship stages; and retained complete participant-level data for all 208 analysed questionnaires. The analytical approach incorporated clinically selected covariates, HC3 robust standard errors, bootstrap confidence intervals, effect sizes, model diagnostics, sensitivity analyses, and family-wise Holm correction. Treating the CDRS as a continuous construct avoided unsupported screening interpretations and improved the transparency of the magnitude and uncertainty of the principal associations. These choices do not eliminate the limitations of the design, but they make the magnitude and uncertainty of the principal associations more transparent.

Limitations

First, the single-centre, voluntary convenience sample substantially limits representativeness and generalizability. The retained records did not include the numbers of eligible or invited students, refusals, or questionnaires initiated but not returned; therefore, a response rate and a conventional participant-flow denominator cannot be reconstructed. Students experiencing greater distress or stronger career concerns may have been more motivated to participate, potentially increasing the observed regret proportion, whereas stigma or fear of disclosure may have reduced participation among other distressed students. The net direction and magnitude of selection bias are unknown. No a priori sample-size calculation was performed, only three study years were included, and participants could not be compared with non-participants or with the entire faculty using identically defined measures. Accordingly, the 71.6% value is a sample proportion and must not be interpreted as faculty-wide or national prevalence.

Second, all principal variables were self-reported. Psychiatric diagnosis was not verified against clinical records and had no timing or diagnostic-detail component; psychiatric medication represented regular current use; and previous suicide attempt was measured by a single lifetime yes/no item without information on recency, intent, method, medical severity, or lethality. The relatively high proportions of self-reported diagnosis, medication use, and lifetime previous attempt may indicate a particularly vulnerable subgroup, differential help-seeking, selective participation, or some combination of these factors. Without a response denominator or faculty-level benchmark collected using the same definitions, the sample cannot be assumed to represent the wider student body. The SPS is a dimensional research instrument rather than a substitute for a clinician-administered suicide-risk assessment. In addition, retained study documentation did not establish whether elevated responses triggered individual follow-up or referral, so no such procedure is claimed. Future survey protocols addressing suicide-related content should prespecify confidential support information, immediate clinical assessment when current intent is disclosed, and referral procedures that do not depend on a scale cut-off.

Third, the cross-sectional design precludes temporal, causal, and mediational inference. The analyses cannot determine whether career regret preceded depressive or suicide-related symptoms, emerged as a consequence of those symptoms, or reflected shared determinants. Although the adjusted models included previous suicide attempt, psychiatric diagnosis, sex, study year, and socioeconomic status—and the SPS model additionally included BDI—residual and unmeasured confounding remains likely. Burnout, mistreatment, sleep disturbance, academic performance, social support, current suicidal ideation and intent, baseline mental health before medical school, autonomy in choosing medicine, earthquake exposure, financial strain, and migration intentions were not measured. Statistical adjustment cannot compensate for variables that were not collected, and the observed coefficients should therefore be interpreted as conditional associations rather than independent causal effects.

Fourth, several analytical constraints warrant caution. The BDI residual distribution was non-normal; HC3 standard errors and bootstrap confidence intervals reduced reliance on conventional distributional assumptions but cannot guarantee model adequacy. Sensitivity analyses supported the main CDRS coefficients, yet all models were developed and evaluated in the same modest sample and have not been externally validated. Holm adjustment reduced false-positive risk within prespecified test families, but it does not eliminate the possibility of chance findings across a broad secondary analysis set. The anger/impulsivity year comparison illustrates this point: its raw p value of 0.026 did not remain significant after correction and is not interpreted as a reliable year difference. Similarly, the BDI year comparison with $p = 0.055$ is inconclusive and cannot be used as evidence of equivalence. Finally, the direct regret item is not a validated reference standard and overlaps conceptually with CDRS; no diagnostic or screening threshold can be inferred from this dataset.

Fifth, the recruitment window overlapped with major national stressors, including the February 2023 earthquakes, high inflation, and public debate about physician working conditions and emigration. Because individual completion dates and relevant exposures were not recorded, period effects cannot be separated from educational-stage or cohort effects. The meaning and salience of career regret are also likely to depend on the organisation of medical education, labour-market conditions, and professional culture. Replication is therefore needed

across institutions, regions, and time periods before the magnitude of these associations is generalized.

Conclusions

These findings do not establish population prevalence, within-person progression, causality, or individual suicide risk, and they do not justify a CDRS screening threshold. Their principal contribution is to identify career regret as a potentially informative correlate of student well-being that merits attention alongside depression and the learning environment. Multicentre longitudinal studies with known sampling frames and response denominators, repeated assessment across training, direct measurement of contextual exposures, prespecified analytical models, and explicit participant-safety procedures are required. Intervention research should then test whether confidential mental-health services, structured mentorship, improvements in the learning climate, and responses to structural professional concerns can reduce distress and support more sustainable professional commitment.

Abbreviations

BDI	Beck depression inventory
CDRS	Career decision regret scale
CI	Confidence interval
HC3	Heteroscedasticity-consistent covariance estimator
IQR	Interquartile range
SD	Standard deviation
SPS	Suicide probability scale
STROBE	Strengthening the reporting of observational studies in epidemiology
VIF	Variance-inflation factor

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Author contributions

ETC contributed to study conception and design, participant recruitment, data collection, interpretation, and drafting of the manuscript. SK supervised the study, contributed to methodology and interpretation, and critically revised the manuscript. HBC actively contributed to the writing stage, English translation, and statistical analysis. All authors are responsible for verifying the final submitted version and approving it before submission.

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Data availability

The data that support the findings of this study are not publicly available due to institutional confidentiality restrictions and the retrospective nature of the clinical records used in the study. The dataset contains information derived from hospital medical records and consultation records; therefore, it cannot be shared openly in order to protect patient privacy and confidentiality. De-identified data may be made available from the corresponding author upon reasonable request and subject to approval by the relevant institutional authorities.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and its later amendments. The study was approved by the Bursa Uludağ University Faculty of Medicine Clinical Research Ethics Committee (decision nos. 2023-1/49 and 2023-9/10). All participants provided written informed consent.

Consent for publication

Not applicable. The manuscript contains no identifiable individual-level information.

Thesis declaration

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Competing interests

The authors declare no competing interests.

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