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Occupational Burnout and Depressive Symptoms among Resident Physicians at Shanghai Tenth People's Hospital in the Early Post-COVID-19 Period: A Cross-Sectional Study

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Abstract: Background: Resident physicians may experience persistent occupational and psychological strain during the early post-COVID-19 period. Burnout and depressive symptoms can overlap, but they represent different aspects of psychological burden and should be assessed using standardized instruments. **Objective:** To estimate the prevalence of occupational burnout and SDS-defined depressive symptoms among resident physicians undergoing standardized residency training at Shanghai Tenth People's Hospital and to examine the association between burnout scores and depressive-symptom severity. **Methods:** This single-center cross-sectional anonymous questionnaire study was conducted at Shanghai Tenth People's Hospital, Shanghai, China, from January to June 2023. A total of 132 eligible resident physicians were invited through hospital residency-training coordination, and all 132 returned questionnaires (response rate, 100.0%). Occupational burnout was assessed using a Chinese burnout questionnaire structured around the MBI-GS dimensions, and depressive symptoms were assessed using the validated Chinese Self-Rating Depression Scale (SDS). Internal consistency was assessed using Cronbach's alpha. Prevalence estimates were reported with Wilson 95% confidence intervals (CIs). Pearson correlation and multivariable linear regression were used to examine the association between burnout score and SDS standard score. **Results:** Overall, 102/132 (77.3%; 95% CI, 69.4 to 83.6) residents met the predefined burnout criterion. In complete valid SDS responses, 81/124 (65.3%; 95% CI, 56.6 to 73.1) residents had SDS-defined depressive symptoms. Cronbach's alpha was 0.887 for the burnout questionnaire and 0.861 for the SDS. Burnout score was positively correlated with SDS standard score ($n = 124$; $r = 0.64$, 95% CI, 0.52 to 0.73; $p < 0.001$). In multivariable linear regression, burnout score remained positively associated with SDS standard score after adjustment for sex, age group, training duration, and grouped specialty (adjusted beta = 0.35, 95% CI, 0.27 to 0.44; $p < 0.001$). **Conclusions:** Occupational burnout and SDS-defined depressive symptoms were common among resident physicians at Shanghai Tenth People's Hospital in the early post-COVID-19 period. The findings suggest that routine screening, workload management, mentorship, and accessible psychological support may be useful for residents at risk. Because this was a cross-sectional study, causality cannot be inferred.

Keywords: COVID-19; Burnout; Depressive Symptoms; Resident Physicians; Mental Health; Standardized Residency Training

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1. Introduction

Mental health problems have become a major contributor to disease burden, reduced productivity, and health-system costs worldwide [1,2]. In clinical settings, occupational burnout is particularly relevant because healthcare professionals are exposed to high workload, irregular working hours, emotional demands, professional competition, and responsibility for patient safety [3-6]. Burnout is generally characterized by emotional exhaustion, cynicism or depersonalization, and reduced professional efficacy [7]. Among physicians, burnout is associated with poorer quality of life, impaired work performance, reduced quality of care, and strained clinician-patient relationships [8]. Resident physicians undergoing standardized residency training may be especially vulnerable because they are still developing clinical competence while facing demanding schedules, frequent rotations, assessments, supervisor evaluation, and high expectations from patients and departments [9].

Unlike studies conducted during the acute outbreak period [10,11], research in the early post-COVID-19 period can capture accumulated psychological strain after the emergency phase. In early 2023, infection-control pressure, delayed clinical and training tasks, increased patient demand, and residual emotional exhaustion may have coexisted. These conditions are particularly relevant for resident physicians, whose professional identity and coping strategies are still developing.

Burnout and depressive symptoms are related but not interchangeable [12,13]. Burnout is primarily work-related and reflects exhaustion, detachment, and reduced professional efficacy, whereas depressive symptoms may involve a broader decline in mood, energy, interest, sleep, appetite, and daily functioning. Therefore, screening for burnout should not replace screening for depressive symptoms. This study investigated the prevalence of occupational burnout and SDS-defined depressive symptoms among resident physicians at Shanghai Tenth People's Hospital and examined whether burnout score was associated with SDS standard score after adjustment for basic demographic and training-related variables.

2. Methods

2.1 Study Design, Setting, and Participants

This was a single-center cross-sectional questionnaire study conducted at Shanghai Tenth People's Hospital, Shanghai, China, from January to June 2023. Resident physicians undergoing standardized residency training at the hospital during the survey period were invited to participate. The inclusion criteria were: (1) enrollment in standardized residency training at Shanghai Tenth People's Hospital during the study period; (2) ability to understand and complete the questionnaire independently; and (3) voluntary participation. The exclusion criteria were: (1) refusal to participate; (2) duplicate submission; (3) incomplete demographic information; (4) invalid or out-of-range item responses that prevented scale-specific scoring; and (5) inability to complete the questionnaire independently because of leave, rotation absence, or other reasons during the survey period.

A total of 132 eligible resident physicians were approached through hospital residency-training coordination and questionnaire-distribution procedures. The questionnaire was distributed through the residency-training coordination system, and residents completed it voluntarily and anonymously during the survey period. All 132 invited residents returned questionnaires, yielding a response rate of 100.0%. Duplicate submissions and invalid item codes were checked before analysis. Demographic and burnout analyses were based on all returned questionnaires when the relevant data were valid, whereas SDS analyses were restricted to participants with complete valid SDS item-level responses. One respondent had missing or invalid training-duration information and was excluded from training-duration subgroup summaries. The participant flow is shown in Figure 1.

2.2 Measures

Demographic and training-related variables included sex, age group, specialty, and duration of standardized residency training. Because several original specialty categories had very small cell counts, specialty was grouped into internal medicine, surgery-related specialties, general practice, and other specialties for adjusted analysis.

Occupational burnout was assessed using a Chinese burnout questionnaire structured around the dimensions of the Maslach Burnout Inventory-General Survey (MBI-GS) [7]. The version used in this survey contained 15 scorable items in the exported dataset; therefore, the instrument is described as an MBI-GS-structured burnout questionnaire rather than as the full original MBI-GS. The 15 scorable items covered emotional exhaustion (5 items), cynicism or detachment (4 items), and reduced professional efficacy (6 items). Response options were coded on a 7-point Likert-type scale in the exported dataset. Items in

the reduced-professional-efficacy dimension were directionally transformed so that higher total scores indicated more severe burnout. The transformed burnout score ranged from 12 to 132 in this dataset. According to the predefined Chinese scoring criteria used for this survey, scores of <50, 50-59, 60-74, and >=75 were classified as no burnout, mild burnout, moderate burnout, and severe burnout, respectively [14,15]. These severity bands were used for descriptive classification and should not be interpreted as clinical diagnoses. Internal consistency was good in the present sample, with Cronbach's alpha coefficients of 0.887 overall, 0.964 for emotional exhaustion, 0.954 for cynicism/detachment, and 0.864 for reduced professional efficacy.

Depressive symptoms were assessed using the validated Chinese version of the Self-Rating Depression Scale (SDS) [16,17]. The SDS contains 20 items scored from 1 to 4. After reverse scoring of positively worded items, the raw score ranges from 20 to 80. The standard score was calculated as the integer value of raw score x 1.25, yielding a standard-score range of 25 to 100. Chinese SDS standard-score cutoffs of <53, 53-62, 63-72, and >=73 were used to classify no depressive symptoms, mild depressive symptoms, moderate depressive symptoms, and severe depressive symptoms, respectively. The SDS is a screening instrument; therefore, results are reported as SDS-defined depressive symptoms rather than clinical depression diagnoses. Cronbach's alpha for the SDS in the present sample was 0.861.

2.3 Statistical Analysis

Data were analyzed using SPSS version 26.0 and independently checked from the original exported dataset. Categorical variables were summarized as frequencies and percentages, and continuous variables were summarized as means and standard deviations. Invalid item codes outside the valid response range were treated as missing for reliability analysis, SDS classification, correlation analysis, and regression analysis. Internal consistency was evaluated using Cronbach's alpha. Prevalence estimates were reported with Wilson 95% CIs. The overall reporting was prepared with reference to the STROBE statement for cross-sectional studies [18].

Between-group comparisons of scale scores were performed using Welch's t test for sex and one-way analysis of variance for age group, training duration, and grouped specialty. Pearson correlation analysis was used to examine the unadjusted linear association between burnout score and SDS standard score. Multivariable linear regression was then performed with SDS standard score as the dependent variable and burnout score as the main independent variable, adjusting for sex, age group, training duration, and grouped specialty. Sensitivity analysis compared demographic characteristics between participants with complete valid SDS data and those with incomplete SDS data. All statistical tests were two-sided, and $p < 0.05$ was considered statistically significant.

2.4 Ethical Considerations

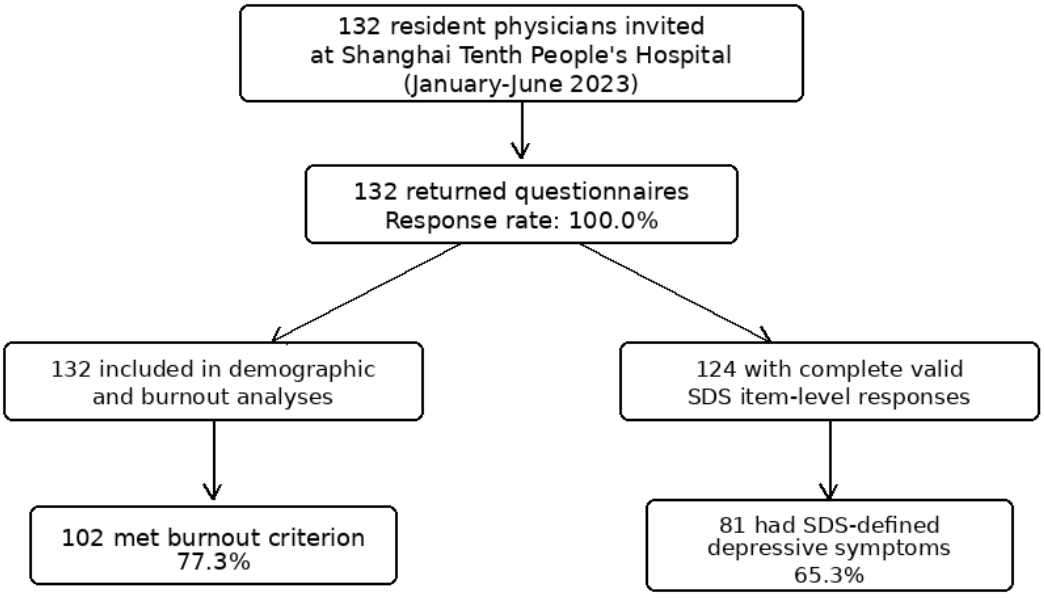
This study was performed in accordance with the principles of the Declaration of Helsinki. The study protocol was reviewed by the Ethics Committee of Shanghai Tenth People's Hospital and was determined to be exempt from full ethical review because the research used anonymous questionnaire data and involved no intervention. The requirement for written informed consent was waived. No formal approval number was issued for this exemption. Participation was voluntary, and completion of the anonymous questionnaire was considered confirmation of voluntary participation. All data were anonymized and analyzed in aggregate.

3. Results

3.1 Participant Characteristics

From January to June 2023, 132 resident physicians at Shanghai Tenth People's Hospital were invited to participate, and all 132 returned questionnaires. There were 65 male residents (49.24%) and 67 female residents (50.76%). Most participants were aged 25-30 years (78/132, 59.09%), followed by 20-25 years (47/132, 35.61%) and >=30 years (7/132, 5.30%). The most common specialty groups were general practice (48/132, 36.36%), internal medicine (32/132, 24.24%), surgery-related specialties (31/132, 23.48%), and other specialties (21/132, 15.91%). Participant characteristics and scale scores are summarized in Table 1.

Figure 1. Participant flow diagram.



3.2 Prevalence of Burnout and SDS-Defined Depressive Symptoms

Among the 132 respondents, 102 residents (77.27%; 95% CI, 69.4 to 83.6%) met the predefined criterion for occupational burnout. Using the descriptive score bands applied in this study, 30 residents (22.73%) had no burnout, 11 (8.33%) had mild burnout, 34 (25.76%) had moderate burnout, and 57 (43.18%) had severe burnout. Thus, 132 refers to the total number of respondents, whereas 102 refers to the number of respondents who met the burnout criterion.

SDS analyses were based on 124 residents with complete valid item-level SDS responses. SDS-defined depressive symptoms were identified in 81 residents (65.32%; 95% CI, 56.6 to 73.1%). Mild, moderate, and severe depressive symptoms were observed in 48 (38.71%), 22 (17.74%), and 11 (8.87%) residents, respectively. Severity distributions and 95% CIs are shown in Table 2.

3.3 Subgroup Patterns and Sensitivity Analysis

The mean burnout score was slightly higher among female residents than male residents (70.55 vs. 68.02), but the difference was not statistically significant ($p = 0.520$). Mean SDS standard scores were similar between female and male residents (55.94 vs. 56.36; $p = 0.850$). Differences in burnout score by age group ($p = 0.099$), grouped specialty ($p = 0.066$), and training duration ($p = 0.910$) did not reach statistical significance. SDS standard scores also did not differ significantly by age group ($p = 0.526$), grouped specialty ($p = 0.334$), or training duration ($p = 0.763$).

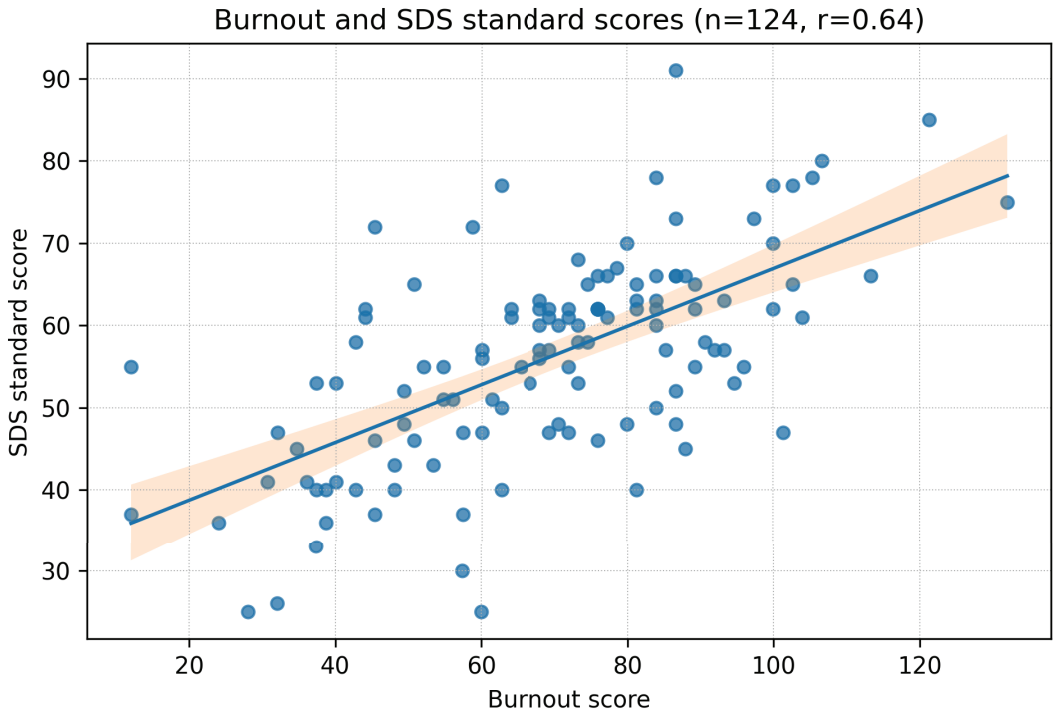
Eight respondents did not have complete valid SDS item-level responses. In sensitivity analysis, participants with complete and incomplete SDS data did not differ significantly by sex ($p = 1.000$) or training duration ($p = 0.132$), but the distribution of age group differed ($p = 0.037$). Therefore, SDS-based prevalence estimates should be interpreted with appropriate caution.

3.4 Association between Burnout and SDS Standard Score

Burnout score was positively correlated with SDS standard score in complete paired observations ($n = 124$; $r = 0.64$, 95% CI, 0.52 to 0.73; $p < 0.001$). A scatter plot with the fitted regression line is shown in Figure 2.

In multivariable linear regression, burnout score remained positively associated with SDS standard score after adjustment for sex, age group, training duration, and grouped specialty. Each one-point increase in burnout score was associated with a 0.35-point higher SDS standard score (95% CI, 0.27 to 0.44; $p < 0.001$). The adjusted model explained approximately 42.3% of the variance in SDS standard score (R-squared = 0.423). Regression results are presented in Table 4.

Figure 2. Association between burnout score and SDS standard score.



4. Discussion

This single-center cross-sectional study found a high burden of occupational burnout and SDS-defined depressive symptoms among resident physicians at Shanghai Tenth People's Hospital in the early post-COVID-19 period. More than three-quarters of respondents met the predefined burnout criterion, and approximately two-thirds of residents with complete valid SDS data had SDS-defined depressive symptoms. These findings indicate that psychological distress among resident physicians deserves sustained institutional attention beyond the emergency phase of the pandemic.

The timing of the survey is important. Compared with studies conducted during the acute outbreak period, this study focused on January to June 2023, when clinical services were recovering while accumulated workload, delayed training tasks, changing patient volumes, and residual psychological exhaustion may have coexisted. Resident physicians may be especially vulnerable in this context because they face clinical workload, rotation adaptation, examination pressure, supervisor evaluation, developing professional identity, and the tension between training demands and personal recovery.

The positive association between burnout and SDS standard score was consistent in both correlation and adjusted regression analyses. Burnout and depressive symptoms are not identical constructs, but they can overlap and reinforce each other. For example, a resident who experiences prolonged work-related exhaustion may gradually lose motivation and a sense of professional efficacy; at the same time, depressive symptoms such as low mood, fatigue, sleep disturbance, and reduced interest may make work demands feel even more difficult. Screening for burnout should therefore not replace screening for depressive symptoms, because the two constructs capture related but different dimensions of psychological burden.

The exploratory subgroup analysis did not identify statistically significant differences in burnout or SDS standard scores by sex, age group, grouped specialty, or training duration. This should not be interpreted as evidence that demographic or department-related risk differences are absent, because stress responses, care burden, and specialty-related work patterns may vary across populations and clinical settings [8,19,20]. The modest sample size, single-center setting, and small original specialty categories limited the ability to detect stable subgroup effects. Future multicenter studies with larger samples should use prespecified models to evaluate specialty-related and training-stage-related risks more robustly.

Several practical implications can be drawn. First, hospitals may consider routine screening for both burnout and depressive symptoms among resident physicians, especially during periods of increased clinical demand or training pressure. Second, workload management, protected rest time, mentorship, and peer support may help reduce accumulated occupational stress [2,21]. Third, residents with moderate or severe depressive symptoms should have confidential access to professional

psychological assessment and support [22]. Finally, system-level interventions are needed; relying only on individual coping strategies may be insufficient when distress is driven by workload, rotation structure, or department culture.

This study has limitations. First, the cross-sectional design prevents causal inference; burnout may contribute to depressive symptoms, depressive symptoms may increase perceived burnout, or both may be driven by shared work-related stressors. Second, the study relied on self-reported questionnaires, which may be affected by recall bias or social-desirability bias. Third, this was a single-center study at Shanghai Tenth People's Hospital, so the findings should not be generalized to all resident physicians in Shanghai or China without caution. Fourth, SDS analyses were based on complete valid item-level responses, resulting in a smaller valid sample for depressive-symptom classification than for demographic description. Fifth, the burnout severity bands used in this survey should be interpreted as descriptive score categories rather than clinical diagnostic categories.

5. Conclusions

Occupational burnout and SDS-defined depressive symptoms were common among resident physicians at Shanghai Tenth People's Hospital in the early post-COVID-19 period. Higher burnout scores were associated with higher SDS standard scores even after adjustment for basic demographic and training-related variables. These findings support early screening, systematic mental health support, workload optimization, and targeted interventions for residents at risk. Larger longitudinal and multicenter studies are needed to clarify causal pathways and evaluate effective intervention strategies.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Tables

Table 1. Participant characteristics and scale scores.

Characteristic	n (%)	Burnout score, mean ± SD	SDS standard score, mean ± SD
Sex			
Male	65 (49.24)	68.02 ± 22.23	56.36 ± 10.90
Female	67 (50.76)	70.55 ± 22.74	55.94 ± 13.86
Age group, years			
20-25	47 (35.61)	72.23 ± 23.66	56.16 ± 10.53
25-30	78 (59.09)	69.03 ± 20.97	56.55 ± 13.57
>=30	7 (5.30)	52.76 ± 25.92	50.00 ± 11.64
Grouped specialty			
Internal medicine	32 (24.24)	74.21 ± 16.93	59.03 ± 10.47
Surgery-related	31 (23.48)	73.68 ± 22.53	56.36 ± 11.99
General practice	48 (36.36)	62.56 ± 25.24	53.79 ± 14.32
Other specialties	21 (15.91)	70.79 ± 20.41	57.11 ± 10.61
Duration of standardized training			
<1 year	26 (19.70)	70.72 ± 20.60	57.27 ± 10.96
1-2 years	40 (30.30)	70.00 ± 22.91	56.67 ± 11.77
>=2 years	65 (49.24)	68.64 ± 23.17	55.31 ± 13.58
Missing/invalid	1 (0.76)	NA	NA

Note: One respondent had missing or invalid training-duration information; therefore, training-duration rows sum to 131 valid responses plus one missing/invalid response. SDS summaries are based on respondents with complete valid SDS item-level data.

Table 2. Severity distribution of occupational burnout and SDS-defined depressive symptoms.

Severity category	Occupational burnout, n/N (%)	Burnout 95% CI, %	SDS-defined depressive symptoms, n/N (%)	SDS 95% CI, %
None	30/132 (22.73)	16.4 to 30.6	43/124 (34.68)	26.9 to 43.4
Mild	11/132 (8.33)	4.7 to 14.3	48/124 (38.71)	30.6 to 47.5
Moderate	34/132 (25.76)	19.1 to 33.8	22/124 (17.74)	12.0 to 25.4
Severe	57/132 (43.18)	35.0 to 51.7	11/124 (8.87)	5.0 to 15.2
Any symptoms/burnout	102/132 (77.27)	69.4 to 83.6	81/124 (65.32)	56.6 to 73.1

Note: Burnout categories were based on transformed score bands of <50, 50-59, 60-74, and >=75. SDS categories were based on Chinese standard-score cutoffs of <53, 53-62, 63-72, and >=73.

Table 3. Measurement instruments, scoring, severity classification, and reliability.

Instrument	Items/dimensions	Score range used	Severity cutoffs	Cronbach alpha
MBI-GS-structured burnout questionnaire	15 scorable items: emotional exhaustion 5; cynicism/detachment 4; reduced professional efficacy 6	Transformed score: 12-132	<50 none; 50-59 mild; 60-74 moderate; >=75 severe	Overall 0.887; subscales 0.964, 0.954, 0.864
Self-Rating Depression Scale (SDS)	20 items; positively worded items reverse-scored	Raw 20-80; standard score 25-100	<53 none; 53-62 mild; 63-72 moderate; >=73 severe	0.861

Table 4. Multivariable linear regression for SDS standard score (n = 124; R-squared = 0.423).

Variable	Adjusted beta	95% CI	p value
Burnout score	0.35	0.27 to 0.44	<0.001
Male sex	0.90	-2.73 to 4.53	0.625
Age 25-30 years	2.21	-1.63 to 6.05	0.257
Age >=30 years	-0.24	-9.85 to 9.38	0.961
Training duration <1 year	0.34	-4.73 to 5.42	0.893
Training duration >=2 years	-1.61	-5.77 to 2.55	0.445
Internal medicine	1.36	-3.32 to 6.05	0.566
Surgery-related specialties	-1.71	-6.62 to 3.20	0.491
Other specialties	0.11	-5.27 to 5.48	0.968

Note: Reference categories were female sex, age 20-25 years, training duration 1-2 years, and general practice.