

Stress and burnout in postgraduate dental education

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Abstract

Introduction: High levels of stress and burnout have been documented among dental students and practicing dentists, but evidence among dental residents and postgraduate students is lacking.

Materials and methods: Ninety-nine postgraduate students enrolled in clinical, non-clinical and PhD programmes in the Athens University School of Dentistry completed the Graduate Dental Environment Stress (GDES) questionnaire and the Maslach Burnout Inventory. Perceived stress was measured in two domains, academic (GDES-A) and clinical (GDES-C) and burnout was measured using the scales of emotional exhaustion (EE), depersonalisation (DP) and personal accomplishment (PA). Analyses relied on descriptive, univariate and multivariate methods based on ANOVA and generalised linear models.

Results: Participants' mean age was 30 years; two-thirds were women and practised dentistry independently of their graduate studies. Residents in clinical programmes reported significantly higher levels of perceived stress compared to non-clinical and PhD students ($P < 0.05$). There were no gender differences in perceived stress. Forty per cent of respondents were burnout 'cases' on the EE scale, while this proportion was 38% for reduced PA and smaller, 13% for DP. Perceived stress was positively correlated with all burnout dimensions, whereas independent dental practice and higher age had a protective effect.

Conclusions: High rates of burnout manifestations were detected among this sample of Greek postgraduate dental students. Perceived stress correlated with burnout and was more pronounced among those enrolled in clinical residency compared to non-clinical and PhD programmes.

Introduction

The examination of sources, correlates and consequences of stress has become a popular area of research in dental education and has been the focus of numerous recent investigations (1). It is now well established that both dental students and practitioners perceive and experience high levels of stress. Although some stress is inherent in dentistry and education and is likely beneficial as a learning stimulus (2), there is a concern that high levels of stress and prolonged stress exposure

may precipitate burnout, a term that describes the experience of long-term work-related exhaustion and diminished interest (3). Although burnout among practicing dentists is typically considered a 'professional syndrome' (4–10), some evidence indicates that manifestations of burnout may be prevalent and can be detected among dental students (11–15).

Postgraduate dental studies are a defining career stage for many dental practitioners and academicians and are becoming increasingly popular and available in all areas of the world (16–18). Graduate-level dental programmes are typically

divided into the areas of specialty training, research degrees (i.e. Masters Degrees or PhDs) or a combination of the two. Dental residents are required to participate in a wide and variable spectrum of assignments such as patient care, teaching and research (19–21), and associated rigorous and strenuous activities. Similar or even more diverse tasks are required by those enrolled in PhD-track programmes (22, 23). Although we are not aware of a report in this domain, postgraduate dental students, while facing the challenging nature of these curricula, are often faced with additional pressures that may be related to extra-curricular factors such as increasing age, family issues, financial constraints and possibly running an independent practice simultaneously.

Existing data on perceived stress and burnout among medical residents are alarming (24–26). Medical residents have been shown to exhibit high levels of perceived stress, whereas aspects of burnout have been linked to an impact on residents' well-being, as well as reduced performance and decreased patient satisfaction (26–28). In a recent investigation among Greek medical residents, an alarmingly high proportion (50%) of those interviewed met the criteria for 'overall burnout', and 32% were 'cases' on all the different burnout dimensions considered (29). Noteworthy, several reports indicate that stress and burnout may be more pronounced in dental vs. medical settings (30, 31). Currently, evidence in the dental literature is limited to only two studies: Alemany Martinez et al. (32) conducted among 56 residents in three university-based residency programmes at the Dental School of Barcelona, Spain, and Humphris et al. (33) performed in a sample of 52 junior hospital dental residents in the United Kingdom. Along these lines, the motivation for the present investigation was to add to the knowledge base of perceived stress and burnout in postgraduate dental education. To this end, our objectives were to (i) determine the levels of perceived stress and burnout among a group of postgraduate students/residents, (ii) explore the role of programme type as a correlate of stress and burnout and (iii) quantify the impact of perceived stress and independent dental practice on burnout.

Materials and methods

Study population

All graduate (post-DDS) students officially enrolled in the Athens University School of Dentistry and attending mandatory classes during the fall semester of 2010 comprised our target population ($n = 101$) and were invited to participate in the study. Contact rate was 100%. The study sample included residents in six clinical programmes (Endodontics, Operative dentistry, Orthodontics, Paediatrics, Periodontics and Prosthodontics) and six non-clinical programmes (Community and Preventive dentistry, Dental materials, Oral biology, Oral pathology, Orofacial pain and Radiology), as well as PhD students. Although some clinical exposure is part of the Oral pathology, Orofacial pain and Radiology programmes, we considered its nature as distinct from the intense clinical–surgical involvement of the other six clinical programmes, and thus, we grouped them with the three programmes that have no clinical exposure. All of these residency or specialty programmes have a

research requirement that leads to a Masters in Science (MS) degree. English language proficiency is a prerequisite for admission into postgraduate studies in that University. Clinical programmes have 3-year duration and purely non-clinical programmes have 2-year duration. PhD students taking classes and included in this study were in their first 2 years of training. The anonymous nature and the purpose of the study were explained to all participants, and participation was voluntary.

Instruments and variables

To measure perceived stress, the investigators relied upon stress items derived and modified from Garbee's (34) and Grandy's (35) early work on the Dental Environment Stress (DES) questionnaire. For purposes of previous research, the original DES inventory was revised to create a 30-item modified DES questionnaire (36–38). Because residents and PhD students are faced with stressors unique to their career stage and programme type, stress items were accordingly modified (i.e. DES item: 'Lack of confidence to be a successful student' vs. modified item: 'Lack of confidence to be a successful resident') and categorised as 'clinical' or 'academic'. Accordingly, the Graduate Dental Environment Stress questionnaire (GDES) was partitioned to 'GDES-Clinical' (GDES-C; 10 items) and 'GDES-Academic' (GDES-A; 20 items) scale. The GDES-A was applicable and administered to all participants, whereas the GDES-C was completed only by those enrolled in the six clinical specialty programmes.

The GDES 30-items were classified by participants on a four-point Likert scale as 1 = 'not stressful at all', 2 = 'somewhat stressful', 3 = 'quite stressful' or 4 = 'very stressful', while a fifth option of 'prefer not to answer/non-applicable' was available. For descriptive purposes, the mean score of non-missing items of GDES-C and GDES-A was used as measure of perceived stress. For subsequent analyses, item mean substitution (IMS) (39) was employed to impute missing values for the 30 stressors. Data missingness was infrequent, with most items having less than two missing values and only item no. 16 had 9 (10%) missing responses. After imputation, the re-calculated GDES-A and GDES-C were entered in multivariate models. Of note, IMS does not result in any change in mean item scores; however, it increases the estimation precision because it allows the use of the complete set of observations. Although 'DES factors' such as 'self-efficacy beliefs' and 'workload' have been identified and used for analytical purposes in previous investigations (12, 40), identification of principal components or GDES factors was not within the scope of this study.

Burnout was measured using the three dimensions of the 22-item Maslach Burnout Inventory (MBI), as in the investigation by Gorter et al. (12). These were emotional exhaustion (EE; nine items), depersonalisation (DP; five items) and personal accomplishment (PA; eight items). The items were ranked by respondents according to their reported frequency on a seven-point Likert scale where 0 = 'never', 1 = 'a few times a year', 2 = 'monthly', 3 = 'a few times a month', 4 = 'weekly', 5 = 'a few times a week' and 6 = 'every day'. In addition to the mean MBI subscale scores that measure burnout on a continuous scale, this study used the thresholds recommended by the MBI manual (41) that were also used by Gorter et al. (12) to iden-

tify burnout 'cases' in EE (>26) and DP (>12) as well as those with 'reduced' PA (<32). Based on these cut-offs, high scoring subjects on the EE and DP scale and low scoring subjects on the PA scale were considered as burnout 'cases'.

Additional socio-demographic variables were also collected via the survey questionnaire. These included programme type, gender, age and whether the individual worked as a dentist in a non-university setting. All study instruments were administered in print, in the English language. Residents were invited to complete the questionnaires with pen or pencil at the beginning of certain classes, and completion required approximately 20 min.

Analytical approach

Descriptive, univariate and multivariate methods were employed for data presentation and analysis. Descriptive statistics were used to describe the sample's covariate characteristics (gender, age, independent practice status) and the responses to the stress items. The normality assumption for the stress and burnout scales was tested with a combined skewness and kurtosis test (42) and a $P < 0.05$ criterion. Cronbach's *alphas* were computed as measures of scale internal consistency. These *alphas* were GDES-A: 0.87 and GDES-C: 0.82, whereas the total GDES scale (data not shown) had an *alpha* of 0.90. Both scales were normally distributed (D'Agostino χ^2 $P > 0.05$). With regard to burnout scales, *alphas* were EE: 0.91, DP: 0.64, PA: 0.84. EE and PA were normally distributed, whereas DP was not.

Overall and covariate-stratified mean scores and SD were calculated for the GDES-A, GDES-C, MBI EE, DP and PA scales. Overall and stratified proportions of burnout 'cases' for each subscale were also computed. Chi-square tests and associated *P*-values were obtained for the differences in the prevalence of 'cases' between strata of gender and independent practice. To determine whether the programme type (clinical, non-clinical, PhD) was associated with differences in perceived stress or burnout subscale scores adjusting for gender, analysis of variance (ANOVA) and *post hoc* tests using a Sidak correction for multiple comparisons with a $P < 0.05$ criterion was used. In this adjustment method, *P*-values are upward (conservatively), adjusted as a function of the (*n*) number of tests using the formula $P_{\text{corrected}} = 1 - (1 - P_{\text{crude}})^n$.

The analytical strategy in further exploring the relationship between stress, burnout and covariates was based on effect estimation rather than hypothesis testing (43). To this end and to quantify the impact of perceived stress (GDES-A and -C) and independent practice on burnout (EE, DP and PA), corresponding *beta* coefficients and 95% confidence limits (CL) were derived from generalised linear models (GLM) using an identity function and robust standard errors. Because gender and age have been previously examined as correlates of perceived stress and burnout (12, 13, 29), the multivariate linear models developed in the present analysis included gender and age (binary variable coded as 1: ≤ 30 years, 2: ≥ 30 years) as *a priori* confounders. The reported coefficients can be interpreted as the gender- and age-adjusted change in burnout subscale score corresponding to a 1-unit increase in GDES scores. All analyses were conducted with the statistical package Stata® 11.2 (StataCorp LP, College Station, TX, USA).

TABLE 1. Demographic and programme type information among the 99 Greek postgraduate dental students

	N (per cent ¹)
Demographic	
Gender	
Female	64 (65)
Male	35 (35)
Age (years; mean, standard deviation)	30.4 (4.2)
<30 years	50 (53)
≥ 30 years	45 (47)
Missing	4
Independent practice	
Yes	65 (71)
No	26 (29)
Missing	8
Programme type	
Clinical	49 (49)
Endodontics	12 (12)
Operative	8 (8)
Orthodontics	7 (7)
Paediatrics	10 (10)
Periodontics	7 (7)
Prosthodontics	12 (12)
Non-clinical	33 (33)
Community Dentistry	1 (1)
Dental materials	6 (6)
Oral biology	6 (6)
Oral pathology	10 (10)
Orofacial pain	6 (6)
Radiology	4 (4)
PhD	17 (17)

¹Calculated among respondents with non-missing information.

Results

Of the 101 postgraduate students who were administered the survey, 99 agreed to participate resulting in a response rate of 98%. There were 49 clinical residents, 33 non-clinical postgraduates and 17 PhD students. The participants' descriptive information is presented in Table 1. Their mean age was 30 years and about two-thirds of the respondents were women and maintained an independent dental practice. Because there was only one respondent enrolled in Community Dentistry, we do not present results for that programme in stratified analyses.

Responses to the 30 stress items and their overall and programme type-stratified mean scores are presented in Table 2. The vast majority of means were in the range between 2 (somewhat stressful) and 3 (quite stressful). For clinical residents, 'lack of time for leisure activities' emerged as the top stressor, with a mean score of 3.3, followed by 'presentations in seminar activities', 'neglect for personal life' and 'lack of adequate staff in the clinics'. Among non-clinical postgraduates 'lack of time for leisure activities' and 'difficulty of assigned readings' were the top stressors with a mean of 2.8, followed by 'insecurity regarding professional future'. PhD students were most concerned with 'financial issues', 'insecurity for professional future' and 'neglect for personal life'. Noteworthy, 'lack of time for

TABLE 2. Distribution of responses to the 30 items of the Graduate Dental Environment Stress (GDES) questionnaire, overall and programme type-stratified mean (standard deviation, SD) scores among the 99 Greek postgraduate dental students

Stress Items ¹	N	Per cent ² of responses				GDES item score mean (SD) (range: 1–4)			
		1	2	3	4	Programme type			
		Clinical	Non-clinical	PhD	Overall				
1. Amount of assigned readings	99	8	42	37	12	2.8 (0.8)	2.3 (0.7)	2.3 (0.8)	2.5 (0.8)
2. Difficulty of assigned readings	98	5	47	38	10	2.5 (0.6)	2.8 (0.9)	2.1 (0.8)	2.5 (0.7)
3. Competition for higher performance	99	22	37	30	10	2.4 (1.0)	2.2 (0.9)	2.1 (0.9)	2.3 (0.9)
4. Patients being late or breaking their appointments	48	8	48	19	25	2.6 (1.0)	–	–	2.6 (1.0)
5. Examinations/assessments	99	11	32	35	21	2.7 (0.9)	2.8 (0.9)	2.4 (1.1)	2.7 (0.9)
6. Collaboration with full-time faculty	95	18	38	32	13	2.6 (0.9)	2.3 (1.0)	1.9 (0.8)	2.4 (0.9)
7. Learning laboratory techniques	45	29	42	22	7	2.1 (0.9)	–	–	2.1 (0.9)
8. Learning clinical/surgical techniques	48	17	33	31	19	2.5 (1.0)	–	–	2.5 (1.0)
9. Lack of adequate staff in the clinics	49	6	22	27	35	3.0 (0.9)	–	–	3.0 (0.9)
10. Lack of confidence to be a successful resident	97	28	33	28	11	2.5 (1.0)	2.1 (0.8)	1.8 (1.0)	2.2 (1.0)
11. Lack of confidence to become a successful specialist	96	30	33	24	13	2.4 (1.0)	2.2 (1.0)	1.7 (0.9)	2.2 (1.0)
12. Meeting research requirement of the programme	96	15	46	26	14	2.5 (0.9)	2.3 (1.0)	2.2 (0.9)	2.4 (0.9)
13. Policies and regulations of the programme	96	27	42	19	12	2.4 (1.0)	1.9 (0.9)	1.9 (0.8)	2.2 (1.0)
14. Obtaining adequate clinical experience	49	14	24	31	31	2.8 (1.0)	–	–	2.8 (1.0)
15. Completing graduation requirements	99	6	41	37	15	2.8 (0.8)	2.5 (0.9)	2.4 (0.7)	2.6 (0.8)
16. Lack of input in administrative issues of the programme	90	14	54	23	8	2.3 (0.8)	2.0 (0.7)	2.4 (0.8)	2.2 (0.8)
17. Insecurity regarding professional future	99	12	22	40	25	2.9 (0.9)	2.7 (1.0)	2.8 (1.1)	2.8 (1.0)
18. Financial issues	98	12	33	32	23	2.7 (0.9)	2.4 (0.9)	3.0 (1.1)	2.7 (1.0)
19. Lack of time for leisure activities	96	7	21	33	39	3.3 (0.9)	2.8 (1.0)	2.7 (0.9)	3.0 (0.9)
20. Inconsistency of feedback between different instructors	96	5	40	41	15	2.8 (0.9)	2.5 (0.7)	2.6 (0.6)	2.6 (0.8)
21. Availability of faculty to work-up cases	48	13	35	35	17	2.6 (0.9)	–	–	2.6 (0.9)
22. Lack of compliance/communication with patients	49	18	43	35	4	2.2 (0.8)	–	–	2.2 (0.8)
23. Leave of absence and holiday days allowed	97	28	35	23	14	2.5 (1.1)	2.0 (1.0)	2.1 (0.9)	2.2 (1.0)
24. Fear of failure when treating complex cases	49	8	45	27	20	2.6 (0.9)	–	–	2.6 (0.9)
25. Neglect for personal life	98	10	33	31	27	3.0 (1.0)	2.4 (0.9)	2.8 (0.9)	2.7 (1.0)
26. Awareness of own competences and limitations	91	10	52	25	13	2.6 (0.9)	2.3 (0.7)	1.9 (0.7)	2.4 (0.8)
27. Collaboration with part-time (clinical) faculty	46	20	50	20	11	2.2 (0.9)	–	–	2.2 (0.9)
28. Doing case presentations to patients	48	27	37	19	17	2.2 (1.0)	–	–	2.2 (1.0)
29. Doing presentations in seminar activities	95	15	29	29	26	3.1 (1.0)	2.5 (0.9)	1.8 (0.7)	2.7 (1.0)
30. Collaboration with other specialties/services	95	39	32	24	5	2.2 (1.0)	1.8 (0.8)	1.6 (0.7)	2.0 (0.9)

¹Items 4, 7, 8, 9, 14, 21, 22, 24, 27 and 28 were administered only to those enrolled in clinical programmes ($N = 49$).

²Per cent calculated among non-missing responses where 1: not stressful at all, 2: somewhat stressful, 3: quite stressful, 4: very stressful.

leisure activities' was the top-ranked stress item among the entire sample, with a mean of 3.0.

Considering the GDES subscales presented in Table 3, clinical residents had the highest mean 'academic stress' score (GDES-A) confirmed by ANOVA ($P < 0.05$), followed by non-clinical and PhDs (2.6, 2.3 and 2.2, respectively). Some variation between the programmes was noted with Prosthodontics residents having a high 2.9 mean score vs. Orthodontic residents who had 2.4. These differences were similar for the 'clinical stressors' (GDES-C), with Prosthodontics residents exhibiting the highest score and Orthodontics exhibiting the lowest score. Among those enrolled in non-clinical programmes, Dental materials postgraduates perceived the most stress whereas those in oral biology perceived the least (2.6 vs. 1.9). No important differences were noted for the academic stress between genders or those with and without an independent practice. Some differences were evident in the clinical domain where women and those without an

independent practice perceived slightly higher scores (2.4 vs. 2.2).

With regard to the three burnout dimensions, 40% of the respondents were classified as burnout 'cases' in EE, while this proportion was 38% for reduced PA and 13% for DP. Postgraduates enrolled in clinical programmes were more likely to be considered burnout 'cases' in all three burnout scales compared to those in non-clinical ones: EE: 53% vs. 39%; reduced PA: 39% vs. 29%; DP: 18% vs. 4%. With regard to specific programmes, Endodontics, Prosthodontics and Orthodontics residents had mean EE scores >30 , in contrast to the Operative dentistry ones, who exhibited the lowest (22.4). Endodontists also had, by far, the highest DP score (13.2), while Orthodontists the lowest (4.9). In the domain of PA, Endodontists exhibited the second lowest score (33.2), whereas Prosthodontists had the lowest (31.7) and Periodontists the highest (36.9). Among non-clinical students, those enrolled in the Radiology programme showed the highest EE score, while Dental

TABLE 3. Distribution of perceived stress (GDES-A: 'academic' domain; GDES-C: 'clinical' domain) and burnout [mean scores (standard deviation, SD) and percentage of burnout 'cases'] among the entire sample, and stratified by programme, gender, age and independent clinical practice status, among the 99 Greek postgraduate dental students

	Perceived stress		Burnout					
	GDES-A	GDES-C	Emotional exhaustion (range: 0–54)		Depersonalisation (range: 0–30)		Personal accomplishment (range: 0–48)	
	Mean (SD)	Mean (SD)	Mean (SD)	% High ¹	Mean (SD)	% High ²	Mean (SD)	% Reduced ³
Overall	2.5 (0.5)	2.5 (0.5)	24.3 (11.8)	40	6.1 (4.7)	13	34.2 (8.4)	38
Programme type								
Clinical	2.6 (0.5)	2.5 (0.5)	29.1 (10.2)	53	6.7 (5.0)	18	33.7 (7.9)	39
Endodontics	2.5 (0.6)	2.4 (0.5)	34.4 (14.4)	80	13.2 (6.3)	80	33.2 (3.1)	40
Operative	2.7 (0.5)	2.4 (0.6)	22.4 (7.7)	38	7.9 (5.7)	25	33.9 (10.5)	38
Orthodontics	2.4 (0.6)	2.3 (0.6)	30.7 (11.3)	43	4.9 (4.7)	29	34.1 (5.9)	29
Paediatrics	2.6 (0.6)	2.5 (0.6)	29.2 (12.0)	40	6.5 (4.7)	30	33.8 (7.0)	50
Periodontics	2.6 (0.4)	2.4 (0.4)	27.9 (7.9)	57	6.1 (2.4)	14	36.9 (5.1)	14
Prosthodontics	2.9 (0.2)	2.7 (0.5)	31.1 (8.1)	67	6.1 (3.9)	25	31.7 (10.6)	50
Non-clinical	2.3 (0.4)		21.7 (12.6)	39	5.0 (4.0)	4	35.5 (8.2)	29
Dental materials	2.6 (0.4)		21.6 (12.7)	40	9.0 (1.7)	100	24.3 (9.1)	100
Oral biology	1.9 (0.2)		15.8 (13.2)	40	1.8 (2.2)	0	37.5 (8.6)	25
Oral pathology	2.5 (0.5)		26.0 (11.7)	40	5.7 (4.0)	30	37.8 (8.3)	20
Orofacial pain	2.3 (0.4)		14.6 (9.0)	17	4.0 (4.1)	33	37.0 (3.9)	0
Radiology	2.4 (0.3)		33.0 (10.7)	75	5.8 (4.5)	50	37.0 (5.4)	25
PhD	2.2 (0.4)		15.0 (7.4)	0	6.1 (5.0)	13	33.6 (10.3)	50
Age								
<30 years	2.5 (0.5)	2.4 (0.6)	28.1 (10.6)	54	6.8 (4.4)	15	33.9 (7.8)	35
≥30 years	2.4 (0.5)	2.2 (0.6)	20.9 (11.7)	25	5.4 (4.8)	9	35.2 (8.4)	37
Gender								
Female	2.5 (0.5)	2.4 (0.6)	25.3 (11.8)	46	5.5 (4.0)	7	34.1 (8.6)	39
Male	2.4 (0.5)	2.2 (0.6)	22.6 (11.9)	29	7.1 (5.6)	24	34.5 (8.1)	35
Independent practice								
Yes	2.5 (0.5)	2.2 (0.6)	23.0 (11.6)	32	5.7 (4.3)	8	35.4 (8.3)	32
No	2.5 (0.4)	2.4 (0.5)	28.9 (11.9)	58	7.3 (5.7)	28	32.3 (8.0)	48

¹Proportions were calculated using the thresholds used in the Maslach Burnout Inventory – high emotional exhaustion score: >26.

²High depersonalisation score: >12.

³Reduced personal accomplishment score: <32.

materials students showed the highest DP and the lowest PA. Among the PhD students, none was classified as burnout 'case' in EE and their mean of 15.0 was the lowest recorded in tandem with Orofacial pain students. On the other hand, PhD students had the highest proportion of burnout 'cases' in the dimension of PA, with 50% scoring below the cut-off of 32 for that scale. When considering gender differences, burnout 'cases' were 60% more prevalent among women compared to men in the EE domain (46% vs. 29%, $\chi^2 = 2.8$, $P = 0.09$). Contrary, burnout 'cases' in the DP dimension were more prevalent among men (24% vs. 7%, $\chi^2 = 5.4$, $P = 0.02$). Furthermore, those reporting independent practice showed favourable score differences and lower prevalence of burnout 'cases' in all dimensions when compared with those who did not work: EE (32% vs. 58%, $\chi^2 = 5.2$, $P = 0.02$), DP (8% vs. 28%, $\chi^2 = 6.1$, $P = 0.01$) and PA (32% vs. 48%, $\chi^2 = 2.0$, $P = 0.15$).

Multivariate analysis results are presented in Table 4. It was evident that both the academic and the clinical dimensions of perceived stress were associated with increased EE and DP, and reduced PA, independent of gender, age and the existence of an

independent practice. Noteworthy, the latter variable showed favourable associations with all three burnout dimensions, although some estimates were imprecise. Increased age (30 years or older) was associated with decreased EE scores, while weaker effects were noted for DP and PA. A gender difference was noted only for DP, with females exhibiting decreased scores compared to men.

Discussion

The present study examined perceived stress and burnout among a group of 99 postgraduate dental residents and found high levels of burnout, with those enrolled in clinical programmes being more likely to be affected. Both clinical and academic perceived stress was positively associated with burnout. Independent private practice and older age emerged as burnout-protective factors, whereas women exhibited less burnout in the dimension of depersonalisation compared to men. These findings add to the knowledge base of stress and burnout in the dental field and provide new information

TABLE 4. Results of multivariate linear regression of burnout [emotional exhaustion (EE), depersonalisation (DP) and personal accomplishment (PA)] on perceived stress, independent dental practice, gender and age among the 99 Greek postgraduate dental students

	EE	DP	PA		EE	DP	PA
	β (95% CL)	β (95% CL)	β (95% CL)		β (95% CL)	β (95% CL)	β (95% CL)
GDES-A	8.6 (3.3, 13.9)	1.9 (-0.6, 3.8)	-3.7 (-7.5, 0.2)	GDES-C	6.7 (1.9, 11.6)	1.8 (0.2, 3.5)	-4.8 (-7.4, -2.2)
Independent practice				Independent practice			
No	Referent			No	Referent		
Yes	-4.4 (-9.6, 0.7)	-1.8 (-4.4, 0.7)	3.4 (0.0, 6.9)	Yes	-5.5 (-10.5, -0.6)	-2.2 (-4.8, 0.4)	1.9 (-1.3, 5.1)
Gender				Gender			
Male	Referent			Male	Referent		
Female	0.2 (-4.4, 4.8)	-2.0 (-4.2, 0.3)	1.1 (-2.2, 4.4)	Female	-0.6 (-5.6, 4.4)	-2.8 (-5.2, -0.5)	-0.3 (-3.4, 2.9)
Age				Age			
<30 years	Referent			<30 years	Referent		
≥30 years	-4.9 (-9.6, -0.9)	-0.9 (-3.1, 1.2)	0.1 (-3.1, 3.2)	≥30 years	-4.1 (-9.4, 1.1)	-1.3 (-3.6, 0.9)	-0.9 (-3.8, 2.1)

CL, confidence limits.

about this area of postgraduate dental education that has been less studied.

This investigation addresses a novel question and benefits from a moderate-sized sample of respondents for this type of study. The authors acknowledge, however, that our study was not adequately powered to test hypotheses and make inferences with regard to specific programme types, as the sample size for each programme was typically <10. Moreover, despite the modification of a previously used stress questionnaire, more research among larger and more diverse student populations is needed to establish the psychometric properties of the GDES and investigate its principal components or stress factors. The recent introduction of biomarkers in quantifying stress among dental students (44) may offer gains in validity that are not possible with instruments that assesses stress perceptions.

Both clinical and non-clinical postgraduates reported 'lack of time for leisure activities' as their top stressor, which is consistent with the intensity of work and long hours of these programmes. Of note is that in the study by Schwartz et al. (45) lack of sleep was reported as the primary reason of stress among a large group of medical residents. In the present study, PhD students were mostly concerned about 'financial issues' and 'insecurity regarding professional future' both of which may be a reflection of uncertainty regarding their current and future career. In a previous investigation among dental undergraduates, self-efficacy beliefs and workload had emerged as the top stressors (38), but these varied as the students progressed in their course of studies (36). In this regard, a longitudinal examination of entry and exit burnout levels among postgraduate residents would provide additional insights into the changes occurring during this period of dental education. Ripp et al. (46) recently reported that one-third of medical residents were already classified as 'burnout cases' at the start of their programme.

Residents enrolled in clinical programmes reported higher levels of perceived stress compared to non-clinical and PhD students. This contrast was based only on 'non-clinical' stressors but is a likely reflection of the challenging curricula that can be found in clinical, didactic and research components. Between-programme differences, as mentioned above, should be interpreted with caution, as they are based on small sample

sizes and it is likely that student profiles and personalities differ as well. In this respect, a recent report by Dahan and Bedos (47) used qualitative methodology to offer valuable insights and shed light on the relation between students' personalities and coping styles relative to perceived stress. It can be suggested, however, that the nature of clinical work may correlate with stress, and this is consistent with our finding of Prosthodontics and Operative residents having the highest and Orthodontics residents having the lowest perceived stress. Orthodontics residents also had lower prevalence of burnout when compared with Oral surgery residents in earlier studies in Spain (32) and the UK (33).

The finding of no gender differences in stress is in contrast with previous investigations among dental undergraduates among various countries (36, 38, 48, 49), but is in agreement with other studies (40, 50). Possible reasons behind this phenomenon are that the perceptions of stress may become more homogeneous because of 'chronic exposure' to the dental setting, or even that postgraduate students are a selected non-random subset of the entire body of undergraduates. Noteworthy, in the study of Pani et al. (44) that used a biomarker (salivary cortisol) to measure dental students' stress, there was no gender difference at the baseline and in clinical settings.

A cardinal finding of this study was the detection of a relatively high prevalence of burnout manifestations, particularly emotional exhaustion and reduced personal accomplishment. Estimates reported here are markedly higher than the 10% prevalence reported among Spanish university residents (32) and British junior hospital residents (33) but are lower compared to the 76% prevalence among American internal medicine residents (26). Humphris et al. (14) had reported a 22% prevalence of EE burnout 'cases' among European dental students, this proportion, however, ranged from 3% in Finland to 46% in Germany. Pöhlmann et al. (13), in a study among German and Swiss dental students, found that 10% of respondents were 'cases' in the domain of EE, 28% in DP and 17% in reduced PA. Direct comparisons between studies should be made with caution, because a network of personal, curricular, extra-curricular and socio-cultural factors may interplay with the respondents' development and report of burnout symptoms. In the medical arena, however, it has been documented

that high levels of stress and burnout are associated with impacts on residents' well-being (51), as well as negative educational and patient care outcomes (26, 27).

With regard to correlates of burnout, this study's findings are in agreement with a recent study among university teaching staff that revealed higher EE scores among women and higher DP scores among men (52). In that study, similar to the results presented here, younger individuals were more vulnerable to EE compared to older ones. An interesting and relevant perspective has been offered by Rutter et al. (53), who suggested that although dentists and physicians exhibit higher levels of stress and burnout compared to the general population, the addition of a teaching role could be protective against the experienced stress. These authors hypothesised that this could be due to increased self-esteem, empowerment, decreased isolation and a sense of helping others that comes with a teaching assignment. In the case of the Athens Dental School, this benefit may be non-existent, because the teaching role of postgraduate students is minimal and confined to a few clinic-attending opportunities and mostly the grading of exams. Along these lines, independent clinical practice reported by participants may have an analogous role, as it emerged as a 'protective' factor against burnout.

Addressing the problem of postgraduates' emotional well-being and risk of burnout cannot be overemphasised. These young professionals often serve as 'role models' for dental undergraduates (33). Satterfield and Becerra (54) summarise that 'developmentally informed programmatic adaptations can better support the emotional growth and personal and professional development of postgraduate medical trainees', which implies that the programme-level interventions can be tailored to the addressed residents' concerns. Indeed, faculty and residents' perceptions of academic environment stressors are generally concordant (24), and comprehensive resident support programmes have been described and employed with success (55). Identification and provision of support to vulnerable individuals early during their training or professional career are likely to be the most promising strategy for improving their emotional and professional well-being (56).

Conclusions

This study found high rates of burnout among this sample of 99 postgraduate dental students. Perceived stress was positively associated with burnout and was more pronounced among those enrolled in clinical residency compared to non-clinical and PhD programmes. Burnout 'cases' were more prevalent among residents enrolled in clinical vs. non-clinical programmes, whereas independent private practice and older age emerged as burnout-protective factors. Implementation of resident support and well-being programmes in dentistry is warranted to ensure residents', future professionals' and academicians' emotional and professional well-being.

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