

# Prevalence of stress and its determinants among residents in Saudi Arabia

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## ABSTRACT

**الأهداف:** دراسة مستويات التوتر المحسوسة بين الأطباء المقيمين، وتحليل العوامل التي تزيد من خطر الإصابة به في المملكة العربية السعودية.

**الطريقة:** شملت هذه الدراسة المقطعية الأطباء المقيمين التابعين للهيئة السعودية للتخصصات الصحية. وقد أجريت خلال الفترة من مايو إلى أكتوبر 2012م. ولقد قمنا بتقييم مستوى التوتر وذلك باستخدام مقياس التوتر المحسوس.

**النتائج:** لقد تجاوب مع الدراسة 1035 وذلك من أصل 4000 طبيب مقيم تم التواصل معهم، وبعدها تم ضم 938 لعينة الدراسة. وكان متوسط نتائج مقياس التوتر المحسوس ( $\pm$  الانحراف المعياري):  $22.0 \pm 5.1$  (الوسيط: 22، والمجال الربيعي: 18-25). وباستثناء الجنس والجنسية، لم يكن هناك أي ارتباط يُعَدُّ به إحصائياً بين التوتر والعوامل الديموغرافية الاجتماعية أو السلوكية. وقد ارتبط حصول التوتر بارتفاع حجم العمل، والحرمان من النوم، والاستياء من زملاء العمل والبرنامج التدريبي، والأفكار السلبية. وقد شملت الضغوط ما كان مرتبطاً بالعمل، والجانب الأكاديمي، والحنين للوطن. وبعد إجراء التحليل اللوجستي الانحداري المتنوع، ظهر أن العوامل التالية مرتبطة بشكل مستقل بحصول التوتر: الجنسية السعودية، مواجهة ضغوطات العمل والحنين للوطن، والاستياء من سوء العلاقة بزملاء العمل، والرغبة المتكررة في ترك مهنة الطب بالكلية.

**الخاتمة:** يتعرض الأطباء المقيمين في السعودية لخطر الإصابة بالتوتر، بنسبة مقارنة أو تزيد قليلاً عما يحصل للأطباء المقيمين في مناطق مختلفة من العالم. وللأسف الشديد، فإن أغلب المشاركين بهذه الدراسة لم يتلقوا قط أي تدريبات حول إدارة الضغوط مما يبرز أهمية اعتماد برامج تدريبية في مجال إدارة الضغوط أثناء مرحلة التدريب للتخصصات الطبية.

**Objectives:** To examine perceived stress among residents in Saudi Arabia and its associated risk factors.

**Methods:** A cross-sectional study of all residents registered at the Saudi Commission for Health

Specialties, Riyadh, Saudi Arabia, was conducted between May and October 2012. We assessed the likelihood of stress using the perceived stress scale (PSS).

**Results:** Out of the 4000 residents contacted, 1035 responded and 938 were included. The mean ( $\pm$ standard deviation) PSS score was  $22.0 \pm 5.1$  (median 22 and inter-quartile range of 18-25). With the exception of gender and nationality, no significant associations were found between stress and socio-demographic or behavioral factors. Stress was associated with higher workload, sleep deprivation, dissatisfaction with colleagues and the program, and harmful ideations. Stressors included work-related, academic, and homesickness stressors. In multivariate analysis, the following were independently associated with stress: Saudi nationality, facing homesick stressor, facing work-related stressor, dissatisfaction with relationships with colleagues, and frequent thoughts of quitting the medical profession.

**Conclusion:** Residents in Saudi Arabia are at comparable or slightly higher risk of perceived stress than that reported among residents worldwide. Unfortunately, most of the participants never received stress management, which highlights the need for stress management programs during residency.

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The healthcare profession needs adequate medical residency training programs to increase its members' professional qualifications and to maintain patient safety. However, residency training is a difficult and stressful stage of development in a professional career.<sup>1</sup> Residents are often subject to prolonged working hours, prolonged sleep deprivation, uncontrolled schedules, high job demands, and inadequate personal time.<sup>2</sup> High job demands are combined with poor job resources, such as poor opportunities for professional development and low supervisor support. These factors may cause burnout, which is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>3,4</sup> Additionally, residency may impact the residents' quality of life<sup>5</sup> and cause them to experience sleep disorders,<sup>6</sup> family problems,<sup>7</sup> and even psychiatric disorders.<sup>8</sup> These stress symptoms may in turn negatively impact patient care and result in frequent medical errors<sup>9</sup> and suboptimal care practices.<sup>10</sup> Some countries have implemented mandatory work hour limitations to improve residents' quality of life with promising results, but this approach may diminish patient care and educational outcomes.<sup>11,12</sup> We categorized the stressors that residents face into the following categories: institutional stressors, such as heavy workload, sleep deprivation, and poor learning environments; personal stressors, such as social problems, family problems, and financial difficulties; and professional stressors, such as career planning issues and information overload.<sup>13</sup> Several studies from various parts of the world have already evaluated the presence of stress symptoms or their risk factors among medical residents in different programs.<sup>14-18</sup> However, we struggled to compare the findings from these studies, because they employed different tools to assess the presence of stress. The study populations also varied considerably. In recent years, universities, and other major healthcare providers have been implementing additional recognized residency programs and have been enrolling more residents in Saudi Arabia to fix the huge deficiency in the number of Saudi-National practicing physicians.<sup>19</sup> Yet no data pertaining to the stress among residents in Saudi Arabia exists. This information is a critical step toward occupational stress management, so the objective of the present study is to examine perceived stress among residents in Saudi Arabia and its associated risk factors, including personal and work-related stressors.

**Disclosure.** Authors have no conflict of interests, and the work was not supported or funded by any drug company.

**Methods.** We recruited the study population from a pool of residents registered at the Saudi Commission for Health Specialties (SCHS). The SCHS is responsible for registering and professionally certifying all healthcare practitioners, supervising and assessing training programs, and evaluating and recognizing health institutions for the purposes of medical training and specialization. The SCHS currently recognizes 37 residency and fellowship training programs in multiple health specialties.

**Population.** We conducted our study on medical residents trained in different residency programs in Saudi Arabia. All residents who enrolled in single-hospital or joint multiple-hospital programs in any of the 5 Saudi regions (Central, Eastern, Western, Northern, and Southern regions) were eligible to be included in the study, but we excluded interns and fellows.

**Study design.** This study was cross-sectional, and it was carried out between May and October 2012. The study obtained all the necessary ethical approvals from the institutional review board of the Faculty of Medicine at King Saud University, Riyadh, Saudi Arabia.

**Recruitment.** We obtained a list of all residents registered at SCHS, which was up-to-date at the beginning of the study. We sent 3 successive e-mails to the members on this list explaining our study objectives. Each e-mail included the study questionnaires in the body of the message, and an informed consent form as an attachment. Out of the 4000 members on the list, 1035 returned the e-mail with the forms completed, representing a 25.9% response rate. Subsequently, 57 participants were excluded because they identified themselves as fellows, and another 40 participants were excluded because they did not complete the answers to the perceived stress scale (PSS).

**Data collection tool.** We developed a self-administrated questionnaire specifically for the present study, and it included socio-demographic characteristics (such as age, gender, nationality, marital status, and income), clinical history (major medical illnesses and psychiatric disorders), residency characteristics (specialty and year), workload (such as number of patients served, serving on calls, covering weekend, and sleep duration and quality), recently faced stressors (work-related and non-work related), harmful ideations (wishes to die or thoughts of self-harm), job satisfaction (including program and colleagues), awareness of burnout phenomena, and education or training in stress management. The face and content validity of the study questionnaire were evaluated by experts in psychiatry, ethics, and epidemiology before piloting with a small number of participants (n=20). The wording and the

suggested answers for some of the questions have been modified based on the feedback from the pilot sample. In addition, we assessed the participants' likelihood of stress with the PSS, which is a 10-question tool for measuring a person's perception of stress over the past month.<sup>20,21</sup> The respondents answered each PSS question on a Likert-type scale (never, almost never, sometimes, fairly often, or very often). We scored the answers to questions 1, 2, 3, 6, 9, and 10 such that "never" corresponds to zero and "very often" corresponds to 4. We scored the answers to questions 4, 5, 7, and 8 with "never" as 4 and "very often" as zero. The PSS score is calculated by summing up the scores of all the individual questions, and higher scores indicate higher levels of stress. The PSS had good internal consistency among its items, as indicated by an overall Cronbach's Alpha value of 0.743.

**Statistical analysis.** We presented the data in the form of frequencies and percentages for the categorical data and as the mean and standard deviation (SD) for continuous data. As of yet, there is a lack of studies proposing a standard cut-off score to diagnose or to grade stress,<sup>21</sup> so we categorized the PSS scores into 3 tertiles. The lower tertile includes scores that are less

than 20, the middle tertile ranges from 20 to 24, and the upper tertile includes scores that are higher than 24.

To examine the determinants of stress, we examined the differences between the 3 tertiles with regard to socio-demographic characteristics, clinical history, residency characteristics, workload and stressors, harmful ideations, job satisfaction, and stress management. A chi-square test or Fisher's exact test was used (as appropriate) for the categorical data. We also used one-way analysis of variance or the Kruskal-Wallis test (as appropriate) to assess the continuous data. Factors that were significantly associated with perceived stress in univariate analysis were entered into multivariate logistic regression analysis to detect independent associations, using backward elimination. The outcome was highest tertile of PSS scores compared with other tertiles. All *P*-values were 2-tailed, and a *P*-values of <0.05 was considered significant. Statistical analysis was performed by the IBM SPSS Statistics for Windows version 20.0 (IBMC Corp, Armonk, NY, USA).

**Results.** Table 1 shows the socio-demographic characteristics of the study participants. The residents had an average age of 28.4±3.0 years, and approximately

**Table 1** - Socio-demographic characteristics of medical residents in Saudi Arabia (N=938).

Characteristics	Total	Lower	Middle	Upper	P-value
Overall	938 (100.0)	289 (30.8)	345 (36.8)	304 (32.4)	-
<b>Gender</b>					
Male	517 (55.4)	196 (37.9)	174 (33.7)	147 (28.4)	<0.001
Female	416 (44.6)	91 (21.9)	169 (40.6)	156 (37.5)	
<b>Age (years)</b>					
Mean±SD	28.4±3.0	28.4±3.1		28.3±2.7	0.899
<27	264 (28.7)	89 (33.7)	96 (36.4)	79 (29.9)	0.684
27-29	395 (42.9)	120 (30.4)	145 (36.7)	130 (32.9)	
>29	262 (28.4)	74 (28.2)	97 (37.0)	91 (34.7)	
<b>Nationality</b>					
Saudi	821 (87.9)	241 (29.4)	301 (36.7)	279 (34.0)	0.007
Non-Saudi	113 (12.1)	47 (41.6)	42 (37.2)	24 (21.2)	
<b>Marital status</b>					
Single	366 (39.1)	113 (30.9)	141 (38.5)	112 (30.6)	0.585
Married	543 (58.0)	167 (30.8)	197 (36.3)	179 (33.0)	
Divorced or widowed	27 (2.9)	8 (29.6)	7 (25.9)	12 (44.4)	
<b>Monthly income (SAR)</b>					
<15,000	137 (14.9)	43 (31.4)	60 (43.8)	34 (24.8)	0.083
15,000-19,999	627 (68.1)	186 (29.7)	221 (35.2)	220 (35.1)	
≥20,000	157 (17.0)	56 (35.7)	56 (35.7)	45 (28.7)	
<b>Income satisfaction</b>					
Satisfied	427 (46.0)	134 (31.4)	169 (39.6)	124 (29.0)	0.226
Dissatisfied	335 (36.1)	101 (30.1)	111 (33.1)	123 (36.7)	
Not sure	166 (17.9)	52 (31.3)	61 (36.7)	53 (31.9)	
<b>Saudi region</b>					
Central	256 (31.4)	78 (30.5)	94 (36.7)	84 (32.8)	0.556
Eastern	143 (17.5)	39 (27.3)	55 (38.5)	49 (34.3)	
Western	288 (35.3)	82 (28.5)	107 (37.2)	99 (34.4)	
Northern	21 (2.6)	9 (42.9)	8 (38.1)	4 (19.0)	
Southern	107 (13.1)	34 (31.8)	30 (28.0)	43 (40.2)	

SAR - Saudi Riyals

55.4% were males, 87.9% were of Saudi nationality, and 58% were married. Mostly had an income that fell within SAR15,000 to SAR19,999. Forty-six percent of all respondents were satisfied with their income, and 36% were dissatisfied. Of the 5 regions of Saudi Arabia, most of the respondents were working in the Western and Central regions. Of all the socio-demographic characteristics, only female gender ( $p<0.001$ ) and Saudi nationality ( $p=0.007$ ) had significant associations with the upper tertile of the PSS score.

Nine percent of the residents had one or more major medical illnesses, such as diabetes, hypertension, or hyperlipidemia (data not shown). Fifteen percent had a family history of psychiatric disorders, and 16% had a personal history of psychiatric disorders. These disorders include depression, anxiety, and bipolar disorder (data not shown). Eighteen percent of the respondents were smokers, whereas only 2% (often/sometimes) drank alcohol or took illicit drugs. The upper tertile of the PSS score is not significantly associated with the presence of major medical illnesses, personal or family history of psychiatric disorders, smoking, or alcohol/drug intake.

The responses to the 10 items on the PSS appear in Table 2. During the 30 days preceding the survey, 68.2% of the residents often (namely "fairly" or "very") felt nervous and stressed, 44.7% of them often felt upset because of unexpected events, and 47.5% often felt angered by circumstances that were beyond their control. In addition, 45.8% of the respondents often felt unable to control important things in their life, and 29.9% often felt that difficulties were piling up too high to overcome. In contrast, 23.6% of the residents often felt that things were going their way, 27.5% often felt that they were on top of things, 43.4% often felt confident in their ability to handle their personal

problems, and 34.7% had often been able to control irritations in their life. The mean (and standard deviation) of the PSS scores was  $22.0\pm5.1$ , with an absolute range of 7-38, median of 22, and inter-quartile range of 18-25. The PSS data was normally distributed with kurtosis of -0.209 and skewness of 0.031.

Table 3 shows the residency and workload characteristics of the study participants. Approximately 52.2% of the residents joined multi-hospital programs, while the remaining 47.8% joined single-hospital programs. The respondents were distributed into 29 specialties, with the most common being internal medicine, pediatrics, family medicine, surgery, radiology, obstetrics and gynecology, and orthopedics. Most of the participants were still in their early years of residency. During the 30 days preceding the survey, 84% were serving on call (with an average of 6 calls per month), and 85% were covering weekends (averaging 2 weekends per month). Approximately 72% was sleeping 2-6 hours per day, and only 22% were feeling refreshed after sleep. Among the residency and workload characteristics, covering more weekends ( $p=0.013$ ), dealing with more inpatients ( $p=0.020$ ) or outpatients per clinic ( $p=0.011$ ), sleeping fewer hours ( $p=0.006$ ), and feeling un-refreshed after sleep ( $p<0.001$ ) were significantly associated with the upper tertile of the PSS score.

Table 4 shows stressors, job satisfaction, and ideations among the study participants. Most (84%) of the residents considered the job environment stressful. The most commonly reported stressors include work-related, academic, family, and financial stressors. Seventy-six percent were satisfied with their relationship with colleagues, whereas 9% were dissatisfied. Thirty-three percent were satisfied with the training program,

**Table 2** - Responses to the perceived stress scale from medical residents in Saudi Arabia (N=938).

Perceived stress scale	Never	Almost never	Sometimes	Fairly often	Very often
1. How often have you been upset because of something that happened unexpectedly?	8 (0.9)	60 (6.4)	450 (48.1)	281 (30.0)	137 (14.6)
2. How often have you felt that you were unable to control the important things in your life?	26 (2.8)	132 (14.1)	350 (37.3)	253 (27.0)	177 (18.9)
3. How often have you felt nervous and "stressed"?	6 (0.6)	46 (4.9)	246 (26.3)	336 (35.9)	302 (32.3)
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	26 (2.8)	123 (13.2)	380 (40.6)	293 (31.3)	113 (12.1)
5. How often have you felt that things were going your way?	31 (3.3)	149 (16.0)	532 (57.1)	194 (20.8)	26 (2.8)
6. How often have you found that you could not cope with all the things that you had to do?	22 (2.4)	136 (14.6)	429 (46.0)	234 (25.1)	112 (12.0)
7. In the last month, how often have you been able to control irritations in your life?	22 (2.4)	145 (15.5)	444 (47.4)	257 (27.5)	68 (7.3)
8. How often have you felt that you were on top of things?	47 (5.1)	176 (19.0)	447 (48.4)	209 (22.6)	45 (4.9)
9. How often have you been angered because of things that were outside of your control?	15 (1.6)	125 (13.3)	352 (37.5)	293 (31.2)	153 (16.3)
10. How often have you felt difficulties were piling up so high that you could not overcome them?	30 (3.2)	205 (22.0)	418 (44.8)	201 (21.6)	78 (8.4)



and 35% were dissatisfied. The main satisfying item was trainers (42%), and the main dissatisfying item was exams (51%). Seventeen percent frequently considered changing specialties, and 18% had frequent thoughts of quitting the medical profession entirely. During the 30 days preceding the survey, 8% had frequent wishes (at least several times) to die, and 4% had frequent thoughts of harming themselves. The upper tertile of the PSS scores was significantly associated with considering the job environment stressful and with certain reported stressors, such as work-related and academic stressors and the presence of homesickness. The upper tertile was also significantly associated with dissatisfaction with their relationship with colleagues, the training program, and their trainers, as well as very frequent thoughts of

changing specialty, quitting the medical profession entirely, incidence of wishing to die, or thoughts of harming themselves.

Approximately two thirds (67%) of the residents had never heard of burnout phenomena, and only 8% reported receiving education or training in stress management, with no association of either with the upper tertile of the PSS score. Approximately 56% of the residents preferred receiving stress management help in resident wellness centers (data not shown). In univariate analysis, the following factors were found to be significantly associated with perceived stress: age, gender, nationality, number of weekends covered per month, number of inpatients seen in wards, number of patients seen per clinic, sleep duration, feeling refreshed

**Table 3** - Residency and workload characteristics of medical residents in Saudi Arabia (N=938).

Characteristics	Total	Lower	Middle	Upper	P-value
<i>Type of training program</i>					0.172
Joint multi-hospital program	479 (52.2)	162 (33.8)	169 (35.3)	148 (30.9)	
Single hospital program	438 (47.8)	123 (28.1)	169 (38.6)	146 (33.3)	
<i>Specialty</i>					0.735
Internal Medicine	137 (14.7)	37 (27.0)	53 (38.7)	47 (34.3)	
Pediatrics	121 (12.9)	34 (28.1)	45 (37.2)	42 (34.7)	
Family Medicine	106 (11.3)	31 (29.2)	44 (41.5)	31 (29.2)	
Surgery	100 (10.7)	32 (32.0)	42 (42.0)	26 (26.0)	
Radiology	66 (7.1)	21 (31.8)	26 (39.4)	19 (28.8)	
Obstetrics & Gynecology	52 (5.6)	15 (28.8)	19 (36.5)	18 (34.6)	
Orthopedics	44 (4.7)	19 (43.2)	14 (31.8)	11 (25.0)	
Others	309 (33.0)	98 (31.7)	102 (33.0)	109 (35.3)	
<i>Residency year</i>					0.281
First	294 (32.0)	101 (34.4)	102 (34.7)	91 (31.0)	
Second	240 (26.1)	77 (32.1)	80 (33.3)	83 (34.6)	
Third	190 (20.7)	58 (30.5)	75 (39.5)	57 (30.0)	
Fourth or more	195 (21.2)	48 (24.6)	81 (41.5)	66 (33.8)	
<i>Serving on call</i>					0.380
No	142 (16.0)	49 (34.5)	53 (37.3)	40 (28.2)	
Yes	746 (84.0)	222 (29.8)	274 (36.7)	250 (33.5)	
Number of on calls per month	6 (5-7)	6 (5-6)	6 (5-7)	6 (5-7)	0.806
<i>Type of on calls</i>					0.129
Home on call	10 (8.9)	3 (30.0)	4 (40.0)	3 (30.0)	
Hospital on call	99 (88.4)	47 (47.5)	32 (32.3)	20 (20.2)	
Home and hospital on call	3 (2.7)	0 (0.0)	3 (100.0)	0 (0.0)	
<i>Covering weekends</i>					0.850
No	135 (14.6)	44 (32.6)	49 (36.3)	42 (31.1)	
Yes	791 (85.4)	239 (30.2)	293 (37.0)	259 (32.7)	
Number of weekends per month	2 (2-3)	2 (2-2)	2 (2-3)	2 (2-3)	0.013
<i>Managing life-threatening cases</i>					0.801
No	317 (34.0)	101 (31.9)	112 (35.3)	104 (32.8)	
Yes	614 (66.0)	186 (30.3)	230 (37.5)	198 (32.2)	
Duration of break time (minutes)	30(15-60)	30 (20-60)	30 (15-60)	30(15-60)	0.587
Number of inpatients seen in wards	6 (4-10)	6 (4-10)	5 (4-10)	7 (4-10)	0.020
Number of outpatient clinics per week	3 (1-16)	2 (0-15)	3 (1-15)	4 (1-20)	0.137
Number of patients seen per clinic	10 (4-20)	9 (2-16)	10 (5-20)	10 (4-20)	0.011
<i>Sleep duration (hours)</i>					0.006
<4	71 (7.6)	17 (23.9)	23 (32.4)	31 (43.7)	
4-6	665 (71.6)	194 (29.2)	245 (36.8)	226 (34.0)	
≥7	193 (20.8)	74 (38.3)	75 (38.9)	44 (22.8)	
<i>Feeling refreshed after sleep</i>					<0.001
No	721 (77.9)	195 (27.0)	274 (38.0)	252 (35.0)	
Yes	205 (22.1)	88 (42.9)	69 (33.7)	48 (23.4)	

after sleep, considering job environment stressful, facing work-related, academic, and homesickness stressors, satisfaction with relationships with colleagues, satisfaction with training program, satisfying items of training program (trainers and departments/hospitals), dissatisfying items of training program (trainers and exams), thoughts of changing specialty, thoughts of

quitting medical profession, thoughts of harming self, and wishes to die; as shown in Tables 1, 3, & 4. However, when these factors were entered into multivariate logistic regression analysis (Table 5), the following factors remained in the model and were found to be independently associated with (highest tertile) of perceived stress: Saudi nationality, facing homesickness

**Table 4** - Stressors, job satisfaction, and ideations experienced by medical residents in Saudi Arabia (N=938).

Characteristics	Total	Lower	Middle	Upper	P-value
<i>Considering job environment stressful</i>					
Agree	745 (84.1)	195 (26.2)	286 (38.4)	264 (35.4)	<0.001
Disagree	62 (7.0)	31 (50.0)	19 (30.6)	12 (19.4)	
Not sure	79 (8.9)	39 (49.4)	25 (31.6)	15 (19.0)	
<i>Facing any stressor in the last month</i>					
Work-related	653 (74.0)	168 (25.7)	239 (36.6)	246 (37.7)	<0.001
Academic	453 (51.4)	121 (26.7)	156 (34.4)	176 (38.9)	
Financial	275 (31.2)	84 (30.5)	97 (35.3)	94 (34.2)	0.806
Family	383 (43.4)	103 (26.9)	141 (36.8)	139 (36.3)	0.279
Marital	206 (23.4)	53 (25.7)	74 (35.9)	79 (38.3)	0.243
Homesickness	148 (16.8)	35 (23.6)	40 (27.0)	73 (49.3)	<0.001
Divorce	8 (0.9)	3 (37.5)	2 (25.0)	3 (37.5)	0.825
Death of loved ones	46 (5.2)	10 (21.7)	20 (43.5)	16 (34.8)	0.455
Others	6 (0.7)	3 (50.0)	2 (33.3)	1 (16.7)	0.523
<i>Satisfaction with relationships with colleagues</i>					
Satisfied	711 (76.0)	246 (34.6)	270 (38.0)	195 (27.4)	<0.001
Dissatisfied	88 (9.4)	15 (17.0)	23 (26.1)	50 (56.8)	
Not sure	137 (14.6)	26 (19.0)	52 (38.0)	59 (43.1)	
<i>Satisfaction with training program</i>					
Satisfied	311 (33.3)	136 (43.7)	104 (33.4)	71 (22.8)	<0.001
Dissatisfied	330 (35.3)	73 (22.1)	124 (37.6)	133 (40.3)	
Not sure	294 (31.4)	78 (26.5)	117 (39.8)	99 (33.7)	
<i>Satisfying items of training program</i>					
Trainers	366 (41.7)	130 (35.5)	127 (34.7)	109 (29.8)	0.010
Exams	77 (8.8)	29 (37.7)	28 (36.4)	20 (26.0)	
Departments/hospitals	304 (34.7)	110 (36.2)	107 (35.2)	87 (28.6)	
Directors/board	250 (28.5)	82 (32.8)	87 (34.8)	81 (32.4)	
Others	38 (4.3)	18 (47.4)	10 (26.3)	10 (26.3)	
<i>Dissatisfying items of training program</i>					
Trainers	232 (26.6)	52 (22.4)	85 (36.6)	95 (40.9)	0.002
Exams	447 (51.2)	117 (26.2)	171 (38.3)	159 (35.6)	
Departments/hospitals	399 (45.7)	109 (27.3)	148 (37.1)	142 (35.6)	
Directors/board	316 (36.2)	83 (26.3)	123 (38.9)	110 (34.8)	
Others	33 (3.8)	12 (36.4)	7 (21.2)	14 (42.4)	
<i>Thoughts of changing specialty</i>					
Very often	150 (16.9)	22 (14.7)	57 (38.0)	71 (47.3)	<0.001
Sometimes	279 (31.5)	67 (24.0)	108 (38.7)	104 (37.3)	
Rarely	201 (22.7)	60 (29.9)	92 (45.8)	49 (24.4)	
Never	256 (28.9)	116 (45.3)	73 (28.5)	67 (26.2)	
<i>Thoughts of quitting medical profession</i>					
Very often	155 (17.5)	21 (13.5)	55 (35.5)	79 (51.0)	<0.001
Sometimes	302 (34.1)	73 (24.2)	133 (44.0)	96 (31.8)	
Rarely	216 (24.4)	74 (34.3)	75 (34.7)	67 (31.0)	
Never	212 (24.0)	97 (45.8)	66 (31.1)	49 (23.1)	
<i>Wishes to die</i>					
Nearly every day	10 (1.1)	3 (30.0)	5 (50.0)	2 (20.0)	<0.001
Several times	68 (7.3)	7 (10.3)	26 (38.2)	35 (51.5)	
Rarely	137 (14.7)	23 (16.8)	53 (38.7)	61 (44.5)	
Never	720 (77.0)	256 (35.6)	259 (36.0)	205 (28.5)	
<i>Thoughts of harming self</i>					
Nearly every day	4 (0.4)	1 (25.0)	2 (50.0)	1 (25.0)	0.027
Several times	31 (3.3)	6 (19.4)	12 (38.7)	13 (41.9)	
Rarely	72 (7.7)	11 (15.3)	28 (38.9)	33 (45.8)	
Never	828 (88.6)	270 (32.6)	302 (36.5)	256 (30.9)	

**Table 5** - Multivariate logistic regression for factors that potentially can predict higher perceived stress in medical residents in Saudi Arabia (N=938).

Variables	Odds ratio	95% confidence interval		P-value
		Lower	Upper	
Saudi nationality	2.35	1.29	4.29	0.005
Facing homesick stressor	1.92	1.21	3.03	0.005
Dissatisfaction with relationships with colleagues	2.55	1.47	4.43	0.001
<i>Thoughts of quitting medical profession (reference: never)</i>				
Very often	2.77	1.61	4.78	<0.001
Sometimes	1.23	0.76	1.99	0.409
Rarely	1.66	0.99	2.77	0.053

stressor, facing work-related stressors, dissatisfaction with relationships with colleagues, and frequent thoughts of quitting medical profession.

**Discussion.** This study is the first to examine the magnitude of perceived stress among medical residents in Saudi Arabia. We covered residents of various specialties, and an extensive list of potentially associated risk factors. The perceived stress among residents in the current study appeared to be comparable to or slightly higher than the perceived stress reported among residents in other parts of the world. The mean PSS score in the current study was 22, whereas the PSS score was estimated as 21.7 in 106 cardiology residents in Argentina,<sup>14</sup> 19.9 in 159 anesthesia residents in Turkey,<sup>15</sup> and 16.1 in 168 family medicine residents in the United States of America (USA).<sup>16</sup> Unfortunately, there is a lack of stress data among residents in Saudi Arabia, but our findings are also comparable to the perceived stress in dental students (22.8) and medical students (21.0) in Saudi Arabia.<sup>22,23</sup> Moreover, the perceived stress among the residents in the current study was considerably higher than that of the general population. For example, the normative data from the PSS based on a representative U.S. sample showed a PSS score of  $12.0 \pm 5.9$  in males and  $13.7 \pm 6.6$  in females.<sup>21</sup> Although this normative data is old and may not reflect the current situation in Saudi Arabia, the comparison reaffirms the higher risk of stress among residents compared with the general population.<sup>14,24</sup> With the exceptions of female gender and Saudi nationality, we did not detect any significant associations between stress and personal characteristics, including socio-demographic characteristics, medical history, and behavioral factors. These observations are similar to previous observations not detecting any association between resident stress and demographic characteristics.<sup>13,15-17,24</sup> We attribute this difference to the low use of alcohol in our sample compared with

Western samples. Residents in the current study who shouldered higher workloads (dealing with more patients and working more weekends) and who suffered from sleep deprivation (sleeping few hours and feeling un-refreshed after sleep) were at higher risk of stress. The current findings replicate those from previous studies that used various stress measurement tools to identify the parameters associated with higher stress in residents, such as prolonged working hours, high patient load, critical patients assigned, night duty, poor sleep duration, and quality, poor work environment, and process failure.<sup>16-18,25</sup> The importance of prolonged working hours in causing fatigue and sleep deprivation and consequently stress led to the legal restriction of residents' weekly working hours in the USA in 2003.<sup>24</sup> This restriction probably had a positive impact on resident well-being.<sup>11,12</sup>

The stressors associated with stress in the current study covered the 3 groups of stressors described earlier: institutional, professional, and personal stressors.<sup>13</sup> Although we associated our respondents' stress with dissatisfaction with colleagues and frequent thoughts of quitting the medical profession, we are uncertain of whether this dissatisfaction or these thoughts caused the stress or vice versa. Nevertheless, another study has shown that prolonged working hours may be responsible for both stress and decreased job satisfaction among residents.<sup>26</sup> Additionally, we noted an association between stress and harmful ideation. Experiencing stress without conflict resolution may lead to burnout, which may contribute to increasing the risk of suicide.<sup>27</sup> Unfortunately, most of the residents were unaware of such burnout and had never received stress management, which indicates a need for stress management programs during residency.

The current study contributed to knowledge on stress by adding data to the void of information on stress among residents in Saudi Arabia, surveying a relatively large number of residents across several specialties and locations, using a well-validated tool to examine stress, and using a national database for recruitment. Nevertheless, we acknowledge some limitations: the study's cross-sectional design precluded the detection of any causal association, and we cannot avoid the possibility of reporting bias from self-reported data. Additionally, the response rate was 26%, which may negatively impact the generalizability of the current findings. However, our response rate was comparable to similar studies that used email as a recruitment tool.<sup>17,28</sup>

In conclusion, residents in Saudi Arabia are at a risk of perceived stress that is comparable to or slightly

higher than the perceived stress reported by residents in other parts of the world. Their stress seems connected to higher workloads and to sleep deprivation, not to socio-demographic characteristics. We identified institutional, professional, and personal stressors in the questionnaire responses. Unfortunately, most of the participants never received stress management, which points to the need for stress management programs during residency.

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