

RESEARCH ARTICLE

Factors associated with self-reported burnout level in allied healthcare professionals in a tertiary hospital in Singapore

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Abstract

Background

Burnout has adverse implications in healthcare settings, compromising patient care. Allied health professionals (AHPs) are defined as individuals who work collaboratively to deliver routine and essential healthcare services, excluding physicians and nurses. There is a lack of studies on burnout among AHPs in Singapore. This study explored factors associated with a self-reported burnout level and barriers to seeking psychological help among AHPs in Singapore.

Methods

We conducted a cross-sectional study in a sample of AHPs in a tertiary hospital from October to December 2019. We emailed a four-component survey to 1127 eligible participants. The survey comprised four components: (1) sociodemographic characteristics, (2) Maslach Burnout Inventory (MBI-HSS), (3) Areas of Worklife Survey, and (4) Perceived Barriers to Psychological Treatment (PBPT). We performed a multiple logistic regression analysis to identify factors associated with burnout. Adjusted odds ratios (AORs) and associated 95% confidence intervals (CIs) were computed.

Results

In total, 328 participants completed the questionnaire. The self-reported burnout level (emotional exhaustion >27 and/or depersonalization >10) was 67.4%. The majority of the respondents were female (83.9%), Singaporean (73.5%), aged 40 years and below (84.2%), and Chinese ethnicity (79.9%). In the multiple logistic regression model, high burnout level was negatively associated with being in the age groups of 31 to 40 (AOR 0.39, 95% CI 0.16–

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0.93) and 40 years and older (AOR 0.30, 95% CI 0.10–0.87) and a low self-reported workload (AOR 0.35, 95% CI 0.23–0.52). High burnout level was positively associated with a work experience of three to five years (AOR 5.27, 95% CI 1.44–20.93) and more than five years (AOR 4.24; 95% CI 1.16–16.79). One hundred and ninety participants completed the PBPT component. The most frequently cited barriers to seeking psychological help by participants with burnout ($n = 130$) were ‘negative evaluation of therapy’ and ‘time constraints.’

Conclusions

This study shows a high self-reported burnout level and identifies its associated factors among AHPs in a tertiary hospital. The findings revealed the urgency of addressing burnout in AHPs and the need for effective interventions to reduce burnout. Concurrently, proper consideration of the barriers to seeking help is warranted to improve AHPs’ mental well-being.

Introduction

Burnout is a prolonged response to chronic emotional and interpersonal stressors on the job, comprising three dimensions: exhaustion, cynicism, and inefficiency [1]. These dimensions are further defined as follows: exhaustion of emotional or physical capacity due to stress, a degree of indifference or detachment from various aspects of work, and a sense of inadequacy or reduced personal accomplishment, respectively [1].

In healthcare settings, burnout negatively impacts outcomes at the individual, interpersonal, and institutional levels. At the individual level, burnout is associated with reduced job satisfaction, increased absenteeism, medical errors, sickness, injury, and accidents among healthcare providers [2, 3]. These individual-level impacts may lead to reduced care quality and higher mortality among patients [4, 5]. From an interpersonal perspective, burnout is associated with emotional dissonance due to chronic exhaustion and cynicism [6]. Emotional dissonance is described as a conflict between personal emotions and organizational demands. On an institutional level, burnout is linked to a higher turnover of healthcare workers [7, 8] and decreased workforce efficiency [9], posing a substantial economic burden on the healthcare system [10].

The pernicious nature of burnout in healthcare settings has prompted numerous studies on its prevalence in physicians and nurses in Singapore and internationally. For example, high burnout levels and their associated factors among physicians and nurses have been reported in Singapore [11, 12]. Extensive research involves the barriers to seeking help for doctors, such as fear of stigma, lack of available time, and lack of convenient access [13, 14].

Allied health professionals (AHPs) are defined as individuals who work collaboratively to deliver routine and essential healthcare services, excluding physicians and nurses [15, 16]. AHPs include, but are not limited to, occupational therapists, physiotherapists, pharmacists, medical social workers, and radiographers [17]. This system is similarly adopted in the United Kingdom [18] and the United States [19] and plays an essential role in improving hospital efficiencies and access to care [19]. In Singapore, the Allied Health Professions Council (AHPC) defines and classifies allied health occupations similar to other countries [20].

Studies in other countries have reported a high prevalence of burnout in AHPs. In the United States, physiotherapists and occupational therapists reported high rates of emotional exhaustion (58%), negative feelings about their work and their clients (94%), and an almost

non-existent sense of personal accomplishment (1%) [21]. However, there are currently no studies examining burnout levels and their associated risk factors among AHPs in Singapore.

This study aims to identify the self-reported burnout levels and explore their associations with sociodemographic factors and the work environment among AHPs in Singapore. Based on the evidence from studies on doctors and nurses [11, 12, 22], we hypothesized that burnout levels among AHPs in Singapore would be similarly high, and age and work experience would be significantly associated with burnout levels. Our secondary objective is to identify significant barriers in seeking psychological help among AHPs with a high burnout level.

Materials and methods

Study design and sampling

We conducted a cross-sectional study among AHPs working in a tertiary acute care hospital between October 2019 to December 2019. Based on previous studies looking at the prevalence of burnout in AHPs and the total number of AHPs in Singapore [23, 24], we determined the sample size through the application of a single proportion formula with the assumption of 60% prevalence, 5% marginal error, and 95% confidence level (CI). The minimum required sample size for the study was 348.

Inclusion and exclusion criteria

We defined AHPs according to the definition recommended by Singapore's AHPC—all healthcare professionals who work collaboratively to deliver routine and essential healthcare services, excluding physicians and nurses [15, 16]. AHPs in a tertiary hospital of all seniority levels were included in this study [16].

Questionnaire design and measurement

We developed an electronic survey and emailed all AHP staff working for the tertiary hospital to request their participation. The survey comprised four components: (1) sociodemographic characteristics, (2) Maslach Burnout Inventory (MBI-HSS), (3) Areas of Worklife Survey (AWS), and (4) Perceived Barriers to Psychological Treatment (PBPT).

Sociodemographic questions were adapted from the Singapore National Health Survey 2010 [25], covering residency status, age, gender, ethnicity, income levels, caregiver status, occupation, employment history, physical activity levels, and mental health.

We assessed burnout by using the Maslach Burnout Inventory (MBI), in particular, the MBI-Human Services Survey for Medical Personnel MBI-HSS(MP) [26]. MBI has been widely used in different settings [27] and is the best-known questionnaire used in most clinical studies assessing burnout [28]. The questionnaire consisted of nine questions under emotional exhaustion (EE), five questions under depersonalization (DP), and eight questions under personal accomplishment (PA). Participants were asked to rate on a Likert scale of 0 (never) to 6 (every day) on how often they experienced the symptoms, and the total scores for each subsection were tallied. Higher EE and DP scores correspond to a higher burnout level, while, conversely, lower PA scores signify a higher burnout level. The scale's validity has previously been demonstrated in similar studies in Japan and China, countries with strong Asian cultural influence [29–31]. It has also been used to evaluate burnout levels in studies in Singapore [11, 32].

The maximum score was 54 points for EE, 30 points for DP, and 48 points for PA. No universal cut-off score has been recommended to define burnout. In a systematic review of burnout among healthcare professionals, burnout was defined using the cut-offs of $EE > 27$ or $DP > 10$, with PA excluded in the majority of the included studies [27]. PA was also excluded

from previous studies because its association with burnout has been more variable and complex [1]. It has been postulated that PA may be a function of EE and DP because a work situation with overwhelming demands may also erode one's PA [1]. Hence, we defined a high burnout level as experiences of a high level of EE ($EE > 27$), DP ($DP > 10$), or both [33]. We also included an analysis of a high burnout level defined according to $EE > 27$, $DP > 10$, or $PA < 33$ (Appendix 1).

The AWS is a 28-item scale that is part of the MBI toolkit [34]. The scale examines the dimensions of an individual's work life and predicts their relationship with burnout [35]. The six dimensions assessed in the survey were: workload, control, reward, community, fairness, and values. "Workload" (five items) refers to the employee's ability to cope with work demands. "Control" (four items) refers to the level of active involvement of an employee in work decisions. "Reward" (four items) refers to rewards that place higher value and recognition on an employee's work. "Community" (five items) refers to the overall quality of social interaction at work. "Fairness" (six items) refers to the general equity of decisions made at the workplace. Furthermore, "Values" (four items) refers to the dissonance between personal and organizational values [36]. Respondents were asked to rate on a Likert scale of 1 (strongly disagree) to 5 (strongly agree) on their perceptions of work setting qualities that play a role in burnout. The item scores in each domain are then averaged. A higher AWS score indicates a more balanced relationship, rather than a conflicted one [35], between the respondent and their work [37].

The last component of the survey comprised the 27-item PBPT questionnaire [38]. Items are classified into nine domains: stigma, lack of motivation, emotional concerns, negative evaluations of therapy, misfit of therapy to needs, time constraints, participation restriction, availability of services, and cost [38]. We asked participants to rate on a 5-point Likert scale the degree to which each item hindered them from seeing a counselor or a therapist. A score of four to five was deemed as "substantial barriers." A domain is deemed to represent a "substantial barrier" if at least one item within that domain was reflected as a "substantial barrier." Given the lengthy questionnaire and to improve the overall response rate [39], we made the PBPT questionnaire component optional for participants in this study.

Data analyses

We used R Commander version 2.7.11 to perform all statistical analyses. We computed Cronbach's alpha for each MBI subscale and AWS domain to assess reliability. We performed bivariate analyses of the demographic factors and the AWS dimensions to examine their association with burnout level using Pearson's Chi-square test or Fisher's exact tests (when a cell count was smaller than five). We identified factors associated with burnout levels by using multiple logistic regression analysis. We entered variables with statistical significance ($p < 0.05$) in bivariate analyses simultaneously in the multiple logistic regression model. For respondents who completed the optional component on PBPT, we recorded the incidence of expressing a variable as a "substantial barrier" among participants who experienced a high burnout level.

Ethical considerations

The National Healthcare Group Domain Specific Review Board approved this study (2019/00477). No identifiable information of participants was collected. We stored all data on RED-Cap, a secure, Health Insurance Portability, and Accountability Act compliant, web-based server. We included a participant information sheet in the email, providing all relevant information on participant anonymity and consent for voluntary participation.

Results

Sociodemographic characteristics

Among the 1127 eligible AHPs invited, 345 participated in the survey. However, we excluded 17 questionnaires due to incomplete entries. We included a total of 328 respondents in the analyses, providing a response rate of 29.1%. Compared to those who did not participate, our participants were more likely to be female, non-Singaporeans/non-SPR, 21 to 30 years old, and had more than three years of working experience.

[Table 1](#) shows the sociodemographic characteristics of the respondents. The majority of the respondents were Singaporean (73.5%), aged 40 years and below (84.2%), female (83.9%), and Chinese ethnicity (79.9%). Almost all respondents were working full time (94.2%). More than half of the respondents had worked for more than five years in the same organization. Approximately half of the respondents worked as frontline staff and reported low levels of physical activity. Only a small proportion of the respondents reported a history of mental illness or had sought help from a professional within the past year for mental illness. The Cronbach's alpha coefficients for EE, DP, and PA in MBI-HSS in this study were 0.93, 0.81, and 0.85, respectively, suggesting that the overall measurement was reliable.

Burnout level and associated sociodemographic factors

The self-reported burnout level among AHPs in this study was 67.4%. A majority of the respondents reported a high burnout level on EE ($n = 203$, 61.9%), less than half reported a high level on DP ($n = 139$, 42.4%), and more than one-third had both high EE and DP ($n = 122$, 37.1%). Among the occupational groups, dieticians (94.7%) and pharmacists (82.5%) had the highest burnout levels.

[Table 2](#) shows the sociodemographic characteristics of AHPs stratified by burnout levels. Full-time workers were significantly more likely to experience a high burnout level than part-time workers. Respondents with more than one year of work experience were significantly more likely to experience a high burnout level than those with less than one year of work experience. Respondents who had sought professional mental help in the past year were significantly more likely to have a high burnout level than those who did not.

AWS domains and association with burnout levels

The Cronbach's alpha coefficients for workload, control, reward, community, fairness, and values were 0.78, 0.77, 0.89, 0.86, 0.82, and 0.78, respectively. As shown in [Fig 1](#), all AWS domains were significantly associated with a higher burnout level ($p \leq 0.01$), with workload, control, and reward showing the most significant differences in the mean scores between participants with a low and high burnout level.

AWS individual statements and association with burnout levels

[Fig 2](#) presents the absolute mean score differences of responses to individual AWS statements between participants with a high and low burnout level. The majority of the mean score differences in all domains were significant. The workload domain had the highest absolute difference compared to the other domains. In particular, the statements "I have so much work to do on the job that it takes me away from my personal interests" (question 3) and "I do not have time to do the work that must be done" (question 1) in the workload domain scored the highest absolute difference in mean scores among all questions.

Table 1. Sociodemographic characteristics of allied health professionals in a tertiary hospital in Singapore.

Variables		Number (n = 328)
		n (%)
Residency status		
	Singaporean	241 (73.5)
	Permanent resident	59 (18.0)
	Foreigner	28 (8.5)
Age group		
	21 to 30	137 (41.8)
	31 to 40	139 (42.4)
	41 years and above	52 (15.9)
Sex		
	Male	53 (16.1)
	Female	275 (83.9)
Ethnic group		
	Chinese	262 (79.9)
	Non-Chinese	66 (20.1)
Average monthly household income		
	Less than S\$5000	25 (7.6)
	S\$5000 to S\$9000	118 (36.0)
	S\$9000 and above	109 (33.2)
	Not disclosed	76 (23.2)
Caregiver status		
	Yes	72 (22.0)
	No	229 (69.8)
	Do not wish to disclose	27 (8.2)
Occupation		
	Clinical psychologist	5 (1.5)
	Radiographer	32 (9.8)
	Dietician	19 (5.8)
	Medical technologist	96 (29.3)
	Medical social worker	19 (5.8)
	Occupational therapist	33 (10.0)
	Pharmacist	40 (12.2)
	Physiotherapist	28 (8.5)
	Podiatrist	5 (1.5)
	Respiratory therapist	5 (1.5)
	Speech therapist	17 (5.2)
	Others	29 (8.8)
Duration working at the current organization		
	<1 year	24 (7.3)
	1–2 years	47 (14.3)
	3–5 years	64 (19.5)
	>5 years	193 (58.8)
Nature of work		
	Front line staff	175 (53.4)
	Administrator	11 (3.3)
	Junior management	55 (16.8)
	Senior management	20 (6.1)

(Continued)

Table 1. (Continued)

Variables		Number (n = 328)
		n (%)
	Others	67 (20.4)
Employment status		
	Full time	309 (94.2)
	Part-time	19 (5.8)
Average number of night shifts per month		
	1–3 times	33 (10.0)
	4–6 times	18 (5.5)
	7 or more times	4 (1.2)
	Not applicable	273 (83.2)
Level of physical activity†		
	Low	185 (56.6)
	Moderate	74 (22.6)
	High	68 (20.8)
Previous history of mental illness*		
	Yes	7 (2.2)
	No	311 (97.8)
Sough medical help in the past year		
	Yes	15 (4.7)
	No	305 (95.3)

*Mental illness refers to a behavioral or psychological syndrome or pattern in an individual that causes clinically significant distress. It warrants diagnosis and management by a medical professional [40, 41].

† Low physical activity refers to sedentary, little, or no exercise. Moderate physical activity refers to a low level of exertion or aerobic exercises for 20–60 min per week. High physical activity refers to aerobic exercises for > 1 h per week.

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Factors associated with burnout levels

In the multiple logistic regression model (Table 3), AHPs who had lower mean scores in the workload subdomain of the AWS, indicative of a high workload burden, were almost three times more likely to have a high burnout level than those who had higher mean scores. Compared to respondents aged 30 years and below, older AHPs aged 31 and above were significantly less likely to have a high burnout level. Moreover, respondents who had worked in the current organization for more than three years were approximately five times more likely to experience a higher burnout level than respondents who had worked in the current organization for less than one year.

Perceived barriers to seeking psychological help

Of the total, 57.9% ($n = 190$) of participants completed the optional component on PBPT, of which 130 had a high burnout level. Table 4 shows that, among the participants with a high burnout level, the most frequently cited barriers to seeking psychological help were ‘negative evaluation of therapy’ (60%) and ‘time constraints’ (50%).

Discussion

This study is the first to investigate the self-reported burnout level and its related factors among AHPs in Singapore. We found a high burnout level at 67.4% among AHPs in a tertiary

Table 2. Sociodemographic characteristics of allied health professionals stratified by burnout levels.

Variables		Low burnout (n = 221)	High burnout (n = 107)	p-value
		n (%)	n (%)	
Residency status				0.10
	Singaporean	164 (68.0)	77 (32.0)	
	Permanent Resident	43 (72.9)	16 (27.1)	
	Foreigner	14 (50.0)	14 (50.0)	
Age group				<0.01
	21 to 30	101 (73.7)	36 (26.3)	
	31 to 40	94 (67.6)	45 (32.4)	
	41 years and above	26 (50.0)	26 (50.0)	
Gender				1.00
	Male	36 (67.9)	17 (32.1)	
	Female	185 (67.3)	90 (32.7)	
Ethnic group				0.14
	Chinese	182 (69.5)	80 (30.5)	
	Non-Chinese	39 (59.1)	27 (40.9)	
Average monthly household income				0.14
	Less than S\$5000	18 (72.0)	7 (28.0)	
	S\$5000 to S\$9000	85 (72.0)	33 (28.0)	
	S\$9000 and above	64 (58.7)	45 (41.3)	
	Not disclosed	54 (71.1)	22 (28.9)	
Caregiver status				0.96
	Yes	48 (66.7)	24 (33.3)	
	No	154 (67.2)	75 (32.8)	
	Do not wish to disclose	19 (70.4)	8 (29.6)	
Occupation				0.07
	Clinical psychologist	2 (40.0)	3 (60.0)	
	Radiographer	19 (59.4)	13 (40.6)	
	Dietician	18 (94.7)	1 (5.3)	
	Medical technologist	64 (66.7)	32 (33.3)	
	Medical social worker	15 (78.9)	4 (21.1)	
	Occupational therapist	21 (63.6)	12 (36.4)	
	Pharmacist	33 (82.5)	7 (17.5)	
	Physiotherapist	17 (60.7)	11 (39.3)	
	Podiatrist	3 (60.0)	2 (40.0)	
	Respiratory therapist	2 (40.0)	3 (60.0)	
	Speech therapist	10 (58.8)	7 (41.2)	
	Others	17 (58.6)	12 (41.4)	
Duration working at the current organization				<0.01
	<1 year	9 (37.5)	15 (62.5)	
	1–2 years	31 (66.0)	16 (34.0)	
	3–5 years	53 (82.8)	11 (17.2)	
	>5 years	128 (66.3)	65 (33.7)	
Nature of work				0.98
	Front line staff	116 (66.3)	59 (33.7)	
	Administrator	7 (63.6)	4 (36.4)	
	Junior management	38 (69.1)	17 (30.9)	
	Senior management	14 (70.0)	6 (30.0)	

(Continued)

Table 2. (Continued)

Variables		Low burnout (n = 221)	High burnout (n = 107)	
		n (%)	n (%)	p-value
	Others	46 (68.7)	21 (31.3)	
Employment status				<0.01
	Full time	214 (69.3)	95 (30.7)	
	Part time	7 (36.8)	12 (63.2)	
Average number of night shifts per month				0.24
	1–3 times	25 (75.8)	8 (24.2)	
	4–6 times	12 (66.7)	6 (33.3)	
	7 or more times	1 (25.0)	3 (75.0)	
	Not applicable	183 (67.0)	90 (33.0)	
Level of physical activity†				0.58
	Low	129 (69.7)	56 (30.3)	
	Moderate	49 (66.2)	25 (33.8)	
	High	43 (63.2)	25 (36.8)	
Previous history of mental illness*				0.43
	Yes	6 (85.7)	1 (14.3)	
	No	206 (66.2)	105 (33.8)	
Sought medical help in the past year				<0.01
	Yes	15 (100.0)	0 (0.0)	
	No	198 (64.9)	107 (35.1)	

*Mental illness refers to a behavioral or psychological syndrome or pattern in an individual that causes clinically significant distress. It warrants diagnosis and management by a medical professional [40, 41].

† Low physical activity refers to sedentary, little, or no exercise. Moderate physical activity refers to a low level of exertion or aerobic exercises for 20–60 min per week. High physical activity refers to aerobic exercises for >1 h per week.

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hospital. Based on the job demands-resources model of burnout, high EE and DP scores in our study demonstrates a high probability of resource conservation by AHPs. AHPs may spend less time with patients, resulting in increased clinical errors [42] and negatively impacting

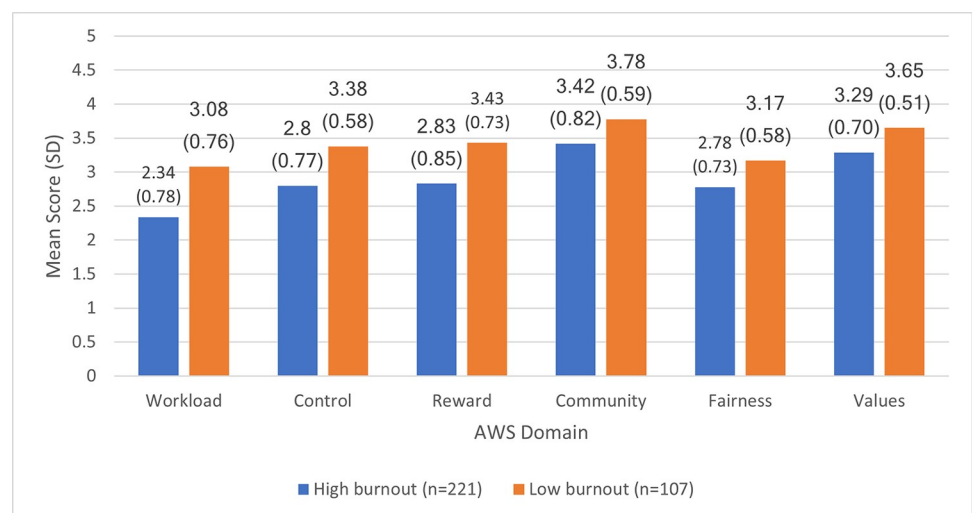


Fig 1. Comparisons of the mean scores of the Areas of Worklife Survey domains stratified by burnout levels (n = 328).

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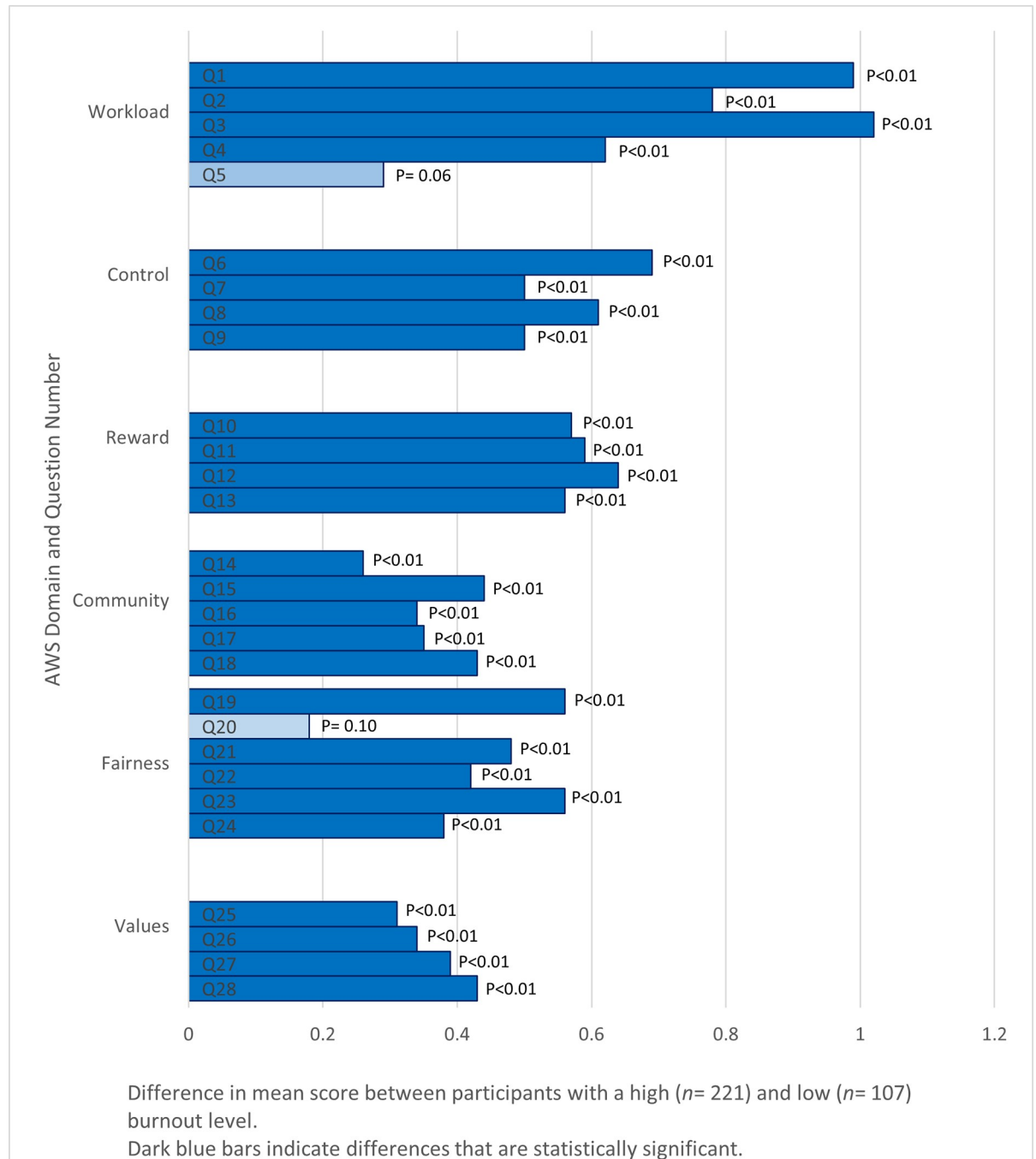


Fig 2. Comparisons of difference in mean scores of Areas of Worklife Survey statements in all domains between participants with a high (n = 221) and low (n = 107) burnout level.

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patient care. However, compared to a study conducted among physical and occupational therapists in the United States, while the EE scores were similar (58% vs. 62% in our study), the DP scores in our study were significantly lower (94% vs. 42% in our study) [21]. The relatively lower depersonalization scores may be attributed to the participants’ organizational factors, such as different healthcare systems and attitudes towards work between AHPs in Asian and

Table 3. Factors associated with burnout levels in a multiple logistic regression analysis.

		Coefficient (SE)	AOR (95% CI)	p-value
AWS domain				
	Workload	-1.05 (0.21)	0.35 (0.23, 0.52)	<0.01
	Control	-0.46 (0.29)	0.63 (0.35, 1.10)	0.11
	Reward	-0.34 (0.25)	0.71 (0.43, 1.17)	0.18
	Community	-0.39 (0.26)	0.68 (0.40, 1.12)	0.13
	Fairness	-0.18 (0.32)	0.83 (0.45, 1.54)	0.56
	Values	-0.10 (0.30)	0.90 (0.50, 1.63)	0.74
Age group				
	21 to 30	Reference	1.00	-
	31 to 40	-0.93 (0.45)	0.39 (0.16, 0.94)	0.04
	41 years and above	-1.20 (0.55)	0.30 (0.10, 0.87)	0.03
Duration working at the current organization				
	<1 year	Reference	1.00	-
	1–2 years	0.61 (0.68)	1.84 (0.50, 7.23)	0.37
	3–5 years	1.66 (0.68)	5.27 (1.44, 20.91)	0.01
	>5 years	1.44 (0.68)	4.23 (1.16, 16.76)	0.03
Employment status				
	Part-time	Reference	1.00	-
	Full-time	0.62 (0.60)	1.86 (0.58–6.42)	0.30
Sought medical help in the past year				
	No	Reference	1.00	-
	Yes	17.13 (854.15)	27398446.44 (NA)	0.98

Abbreviations: AWS, Areas of Worklife Survey; SE, standard error; CI, confidence interval; AOR, adjusted odds ratio.

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Western societies [43]. The lower level could be culturally equivalent to the United State's higher levels due to differences in the participants' attitudes towards surveys and response patterns [44–46].

Of note, the high self-reported burnout level in pharmacists (82.5%) and dieticians (94.7%) is concerning. We postulate that pharmacists may be prone to experiencing burnout and lower job satisfaction than other occupations, with more job variety reported in previous studies [47]. However, similar studies have shown that dieticians score lower EE than comparison groups of doctors, nurses, and social workers [23], indicating lower burnout. Hence, the high burnout level among dieticians may be due to other organizational or demographic factors. As

Table 4. Perceived barriers to seeking psychological help among participants with a high burnout level (n = 130).

	n (%)
Stigma	29 (48.3)
Lack of motivation	16 (26.7)
Emotional concerns	16 (26.7)
Negative evaluation of therapy	36 (60.0)
Misfit of therapy to needs	27 (45.0)
Time constraints	30 (50.0)
Participation restriction	27 (45.0)
Availability of services	25 (41.7)
Cost	21 (35.0)

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the sample size of pharmacists and dieticians in this study was small, these associations were not statistically significant. Further studies will be warranted to identify the associated factors of burnout.

In the multiple regression analysis, we found a higher burnout level in the younger group of 21 to 30 than in AHPs aged 31 years and above. Previous studies have supported this trend of burnout affecting younger employees [2, 3]. The lower burnout level in older participants may be explained by their better coping or occupational handling stress [48, 49]. Work experience may play an essential role in burnout. Employees who have worked for a longer duration (three years and above) in the same organization were more likely to have a high burnout level than those working for less than a year. We postulate that this could be due to long-term exposure to the patient suffering at the workplace, resulting in emotional exhaustion [50, 51].

We found that heavier self-reported workloads are associated with a higher burnout level among the AHPs. It was the only subdomain of the AWS significantly associated with burnout after adjusting for covariates. Previous studies have shown the adverse effects of increased workloads among healthcare workers, manifesting burnout [52, 53]. In our study, we demonstrated that this association holds for AHPs in Singapore. In particular, the association of heavier workload among AHPs with a high burnout level is most apparent when the workload interferes with their “personal interests” and “work that must be done.”

Hence, the identified associated factors of burnout levels highlight the need to address potential stressors at work. Concurrently, given that heavy self-reported workload and more extended work experience is associated with a high burnout level, workplace interventions are crucial. Based on this study, the association of heavier self-reported workload among AHPs with a high burnout level is most apparent when the workload becomes excessive or interferes with their interests. We propose that future studies look at interventions conducted at both personal and workplace levels [54].

Evidence-based strategies have shown the effectiveness of interventions that target personal coping skills such as mindfulness and stress management training [55, 56], and cognitive-behavioral interventions in reducing occupational stress levels [57].

Workplace strategies could be explored in future studies. Protected time, proper shift allocations, flexibility in working structure, and adequate workforce distribution could be highly beneficial [58, 59]. A case example will be the United Kingdom-commissioned review [60]. The review proposes a whole-system workplace intervention, from understanding local staff requirements, multi-level staff engagement, strong visible leadership, support for well-being at board level, and a focus on management capability to improve mental well-being and lower burnout.

Lastly, among participants who completed the PBPT questionnaire and experienced a high burnout level, ‘negative evaluation of therapy’ and ‘time constraints’ were identified as the most frequently cited barriers to seeking psychological help. Firstly, negative evaluation of therapy may be attributed to the high prevalence of negative attitudes towards mental illnesses in Asian societies such as Singapore [61, 62]. Participants may experience similar negative perceptions of therapy for mental health. Hence, interventions in improving the public perception towards mental health and therapy may reduce barriers to seeking help. Secondly, time constraints highlight that the daily responsibilities of AHPs may contribute to burnout and compete for time, hence a barrier in undergoing therapy. Daily responsibilities include formal duties to their patients and adjunct activities such as documentation, communication, following up on treatment, performing roll calls, or handing over. These auxiliary activities underestimate the time spent on the job [63]. Accounting for the adjunct activities and enforcing stricter regulations in total work hours may be essential to improve uptake of AHPs in seeking help for their burnout.

Study limitations

There are a few limitations to this study. First, the response rate to the survey was only 29.1%. The low response rate may translate to a significant non-response bias for the study. Despite utilizing approaches to increase the response rate, such as through the engagement of respective departmental heads and email reminders, the survey response remained low. The low response rate may be due to hospital privacy protocols that limited the survey administration to emails and prevented physical surveys. Second, burnout is multi-factorial, and this study may not capture the full spectrum of variables. Factors that were not covered in this study include the increasing computerization of practice [64] and the participants' personality traits [65]. Third, this study's cross-sectional nature does not allow the authors to determine causal relationships between the risk factors and burnout. Further longitudinal studies will be needed. Fourth, other inventories such as the Copenhagen Burnout Inventory can be explored in future studies to offer new insights into burnout [66]. Fifth, as there are limited validation studies of MBI in Asian countries, MBI may have limited validity in characterizing burnout as a self-reported tool. Lastly, participant response could have been influenced by social desirability bias due to the highly stigmatized perception of burnout in the workplace.

Conclusions

This study is the first to show a high burnout level and identify its associated factors among AHPs in Singapore. The self-reported burnout level among AHPs in this study was 67.4%. The identified risk factors included increased self-reported workload, lesser work experience, and younger age. Besides, respondents with a high burnout level reported the lack of motivation and time constraints as significant barriers to seeking psychological help for burnout. The findings revealed the significance and urgency of addressing burnout in these vulnerable target groups. There is also a potential need to implement individual and organizational interventions such as mindfulness and stress management training, cognitive-behavioral interventions, or workplace interventions that target organizational, cultural, social, and physical aspects of staff health. These interventions should be implemented with proper consideration of the barriers to reduce burnout risk effectively. Further longitudinal studies will help explore the causal relationship between the risk factors and burnout to characterize burnout's nature better.

Supporting information

S1 Data.
(XLSX)

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References

1. Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annual review of psychology*. 2001; 52:397–422. <https://doi.org/10.1146/annurev.psych.52.1.397> PMID: 11148311
2. Silva SC, Nunes MA, Santana VR, Reis FP, Machado Neto J, Lima SO. Burnout syndrome in professionals of the primary healthcare network in Aracaju, Brazil. *Cien Saude Colet*. 2015; 20(10):3011–20.
3. Bartosiewicz A, Januszewicz P. Readiness of Polish Nurses for Prescribing and the Level of Professional Burnout. *Int J Environ Res Public Health*. 2018; 16(1):35. <https://doi.org/10.3390/ijerph16010035> PMID: 30586884

4. Welp A, Meier LL, Manser T. Emotional exhaustion and workload predict clinician-rated and objective patient safety. *Frontiers in psychology*. 2014; 5:1573. <https://doi.org/10.3389/fpsyg.2014.01573> PMID: [25657627](https://pubmed.ncbi.nlm.nih.gov/25657627/)
5. Cimiotti JP, Aiken LH, Sloane DM, Wu ES. Nurse staffing, burnout, and health care-associated infection. *American journal of infection control*. 2012; 40(6):486–90. <https://doi.org/10.1016/j.ajic.2012.02.029> PMID: [22854376](https://pubmed.ncbi.nlm.nih.gov/22854376/)
6. Consiglio C. Interpersonal strain at work: A new burnout facet relevant for the health of hospital staff. *Burnout Research*. 2014; 1(2):69–75.
7. Leiter MP, Maslach C. Nurse turnover: the mediating role of burnout. *Journal of nursing management*. 2009; 17(3):331–9. <https://doi.org/10.1111/j.1365-2834.2009.01004.x> PMID: [19426369](https://pubmed.ncbi.nlm.nih.gov/19426369/)
8. Shanafelt T, Sloan J, Satele D, Balch C. Why do surgeons consider leaving practice? *Journal of the American College of Surgeons*. 2011; 212(3):421–2. <https://doi.org/10.1016/j.jamcollsurg.2010.11.006> PMID: [21356491](https://pubmed.ncbi.nlm.nih.gov/21356491/)
9. Shanafelt TD, Dyrbye LN, West CP, Sinsky CA. Potential Impact of Burnout on the US Physician Workforce. *Mayo Clinic proceedings*. 2016; 91(11):1667–8. <https://doi.org/10.1016/j.mayocp.2016.08.016> PMID: [27814840](https://pubmed.ncbi.nlm.nih.gov/27814840/)
10. Han S, Shanafelt TD, Sinsky CA, Awad KM, Dyrbye LN, Fiscus LC, et al. Estimating the Attributable Cost of Physician Burnout in the United States. *Ann Intern Med*. 2019; 170(11):784–90. <https://doi.org/10.7326/M18-1422> PMID: [31132791](https://pubmed.ncbi.nlm.nih.gov/31132791/)
11. Lee PT, Loh J, Sng G, Tung J, Yeo KK. Empathy and burnout: a study on residents from a Singapore institution. *Singapore Med J*. 2018; 59(1):50–4. <https://doi.org/10.11622/smedj.2017096> PMID: [29022041](https://pubmed.ncbi.nlm.nih.gov/29022041/)
12. Tay WY, Earnest A, Tan SY, Ng MJM. Prevalence of Burnout among Nurses in a Community Hospital in Singapore: A Cross-Sectional Study. 2014; 23(2):93–9.
13. Clough BA, March S, Leane S, Ireland MJ. What prevents doctors from seeking help for stress and burnout? A mixed-methods investigation among metropolitan and regional-based Australian doctors. *Journal of clinical psychology*. 2019; 75(3):418–32. <https://doi.org/10.1002/jclp.22707> PMID: [30431644](https://pubmed.ncbi.nlm.nih.gov/30431644/)
14. Guille C, Speller H, Laff R, Epperson CN, Sen S. Utilization and barriers to mental health services among depressed medical interns: a prospective multisite study. *Journal of graduate medical education*. 2010; 2(2):210–4. <https://doi.org/10.4300/JGME-D-09-00086.1> PMID: [21975622](https://pubmed.ncbi.nlm.nih.gov/21975622/)
15. (ASAHP) AoSoAHP. What is Allied Health? 2015 [Available from: <http://www.asahp.org/what-is>].
16. K M. Jobs to Careers: Transforming the Front Lines of Health Care: Robert Wood Johnson Foundation; December 2012.
17. SingHealth. The Heartbeat of Healthcare: Allied Health Professionals; Many Talents, One Passion. 2019.
18. Davis SF, Enderby P, Harrop D, Hindle L. Mapping the contribution of Allied Health Professions to the wider public health workforce: a rapid review of evidence-based interventions. *J Public Health (Oxf)*. 2017; 39(1):177–83. <https://doi.org/10.1093/pubmed/fdw023> PMID: [26989160](https://pubmed.ncbi.nlm.nih.gov/26989160/)
19. Committee CW. Allied Health: The Hidden Health Care Workforce: California Hospital Association Leadership in Health Policy and Advocacy; 2009 [Available from: <https://www.calhospital.org/general-information/allied-health-hidden-health-care-workforce>].
20. Welcome to the AHPC Singapore government agency website 2020 [Available from: <https://www.healthprofessionals.gov.sg/ahpc>].
21. Balogun JA, Titiloye V, Balogun A, Oyeyemi A, Katz J. Prevalence and determinants of burnout among physical and occupational therapists. *J Allied Health*. 2002; 31(3):131–9. PMID: [12227263](https://pubmed.ncbi.nlm.nih.gov/12227263/)
22. Ang SY, Dhaliwal SS, Ayre TC, Uthaman T, Fong KY, Tien CE, et al. Demographics and Personality Factors Associated with Burnout among Nurses in a Singapore Tertiary Hospital. *Biomed Res Int*. 2016; 2016:6960184–. <https://doi.org/10.1155/2016/6960184> PMID: [27478835](https://pubmed.ncbi.nlm.nih.gov/27478835/)
23. Gingras J, De Jonge LA, Purdy N. Prevalence of dietitian burnout. *Journal of Human Nutrition and Dietetics*. 2010; 23(3):238–43. <https://doi.org/10.1111/j.1365-277X.2010.01062.x> PMID: [20642639](https://pubmed.ncbi.nlm.nih.gov/20642639/)
24. Annual Report 2019: Allied Health Professions Council; 2019 [Available from: https://www.healthprofessionals.gov.sg/docs/librariesprovider5/forms-and-downloads/ahpc-annual-report-2019_final.pdf].
25. Ministry of Health S. National Health Survey 2010. In: Statistics R, editor. 2011.
26. Jackson CMSE. MBI: Human Services Survey for Medical Personnel. Maslach Burnout Inventory. 2019.
27. Rotenstein LS, Torre M, Ramos MA, Rosales RC, Guille C, Sen S, et al. Prevalence of Burnout Among Physicians: A Systematic Review. *JAMA*. 2018; 320(11):1131–50. <https://doi.org/10.1001/jama.2018.12777> PMID: [30326495](https://pubmed.ncbi.nlm.nih.gov/30326495/)

28. Kurzthaler I, Kemmler G, Fleischhacker WW. [Burnout in physicians]. *Neuropsychiatr.* 2017; 31(2):56–62. <https://doi.org/10.1007/s40211-017-0225-2> PMID: 28537002
29. Nishimura K, Nakamura F, Takegami M, Fukuhara S, Nakagawara J, Ogasawara K, et al. Cross-sectional survey of workload and burnout among Japanese physicians working in stroke care: the nationwide survey of acute stroke care capacity for proper designation of comprehensive stroke center in Japan (J-ASPECT) study. *Circ Cardiovasc Qual Outcomes.* 2014; 7(3):414–22. <https://doi.org/10.1161/CIRCOUTCOMES.113.000159> PMID: 24823957
30. Wang Z, Xie Z, Dai J, Zhang L, Huang Y, Chen B. Physician burnout and its associated factors: a cross-sectional study in Shanghai. *J Occup Health.* 2014; 56(1):73–83. <https://doi.org/10.1539/joh.13-0108-0a> PMID: 24430838
31. Wu H, Liu L, Wang Y, Gao F, Zhao X, Wang L. Factors associated with burnout among Chinese hospital doctors: a cross-sectional study. *BMC Public Health.* 2013; 13:786. <https://doi.org/10.1186/1471-2458-13-786> PMID: 23985038
32. See KC, Lim TK, Kua EH, Phua J, Chua GS, Ho KY. Stress and Burnout among Physicians: Prevalence and Risk Factors in a Singaporean Internal Medicine Programme. *Ann Acad Med Singap.* 2016; 45(10):471–4. PMID: 27832222
33. Dyrbye West, Shanafelt. Defining burnout as a dichotomous variable. *Journal of General Internal Medicine.* 2009; 24:440. <https://doi.org/10.1007/s11606-008-0876-6> PMID: 19130150
34. Leiter MP, Maslach C. SIX AREAS OF WORKLIFE: A MODEL OF THE ORGANIZATIONAL CONTEXT OF BURNOUT. *Journal of Health and Human Services Administration.* 1999; 21(4):472–89. PMID: 10621016
35. Leiter M, Maslach C. Areas of Worklife: A Structured Approach to Organizational Predictors of Job Burnout. 3 2004. p. 91–134.
36. Lourel M, Gueguen N. [A meta-analysis of job burnout using the MBI scale]. *Encephale.* 2007; 33(6):947–53. <https://doi.org/10.1016/j.encep.2006.10.001> PMID: 18789787
37. Gascón S, Leiter MP, Stright N, Santed MA, Montero-Marín J, Andrés E, et al. A factor confirmation and convergent validity of the "areas of worklife scale" (AWS) to Spanish translation. *Health Qual Life Outcomes.* 2013; 11:63–. <https://doi.org/10.1186/1477-7525-11-63> PMID: 23596987
38. Mohr DC, Ho J, Duffecy J, Baron KG, Lehman KA, Jin L, et al. Perceived barriers to psychological treatments and their relationship to depression. *Journal of clinical psychology.* 2010; 66(4):394–409. <https://doi.org/10.1002/jclp.20659> PMID: 20127795
39. Sahlqvist S, Song Y, Bull F, Adams E, Preston J, Ogilvie D, et al. Effect of questionnaire length, personalisation and reminder type on response rate to a complex postal survey: randomised controlled trial. *BMC Med Res Methodol.* 2011; 11:62–. <https://doi.org/10.1186/1471-2288-11-62> PMID: 21548947
40. Stein DJ, Phillips KA, Bolton D, Fulford KWM, Sadler JZ, Kendler KS. What is a mental/psychiatric disorder? From DSM-IV to DSM-V. *Psychol Med.* 2010; 40(11):1759–65. <https://doi.org/10.1017/S0033291709992261> PMID: 20624327
41. Ashraf F, Ahmad H, Shakeel M, Aftab S, Masood A. Mental health problems and psychological burnout in Medical Health Practitioners: A study of associations and triadic comorbidity. *Pak J Med Sci.* 2019; 35(6):1558–64. <https://doi.org/10.12669/pjms.35.6.444> PMID: 31777493
42. Linden DVD, Keijsers GPJ, Eling P, Schaijk RV. Work stress and attentional difficulties: An initial study on burnout and cognitive failures. *Work & Stress.* 2005; 19(1):23–36.
43. Yao Y, Yao W, Wang W, Li H, Lan Y. Investigation of risk factors of psychological acceptance and burnout syndrome among nurses in China. *Int J Nurs Pract.* 2013; 19(5):530–8. <https://doi.org/10.1111/ijn.12103> PMID: 24093745
44. Dolnicar S, Grün B. Cross-cultural differences in survey response patterns. *International Marketing Review.* 2007; 24(2):127–43.
45. Sanchez-Burks J, Lee F, Choi I, Nisbett R, Zhao S, Koo J. Conversing across cultures: East-West communication styles in work and nonwork contexts. *Journal of Personality and Social Psychology.* 2003; 85(2):363–72. <https://doi.org/10.1037/0022-3514.85.2.363> PMID: 12916576
46. Fila M, Wilson M. Understanding Cross-Cultural Differences in the Work Stress Process: A Review and Theoretical Model. 2018.
47. Kang K, Absher R, Granko RP. Evaluation of burnout among hospital and health-system pharmacists in North Carolina. *American Journal of Health-System Pharmacy.* 2020; 77(6):441–8. <https://doi.org/10.1093/ajhp/zxz339> PMID: 31950988
48. Scheibe S, Spieler I, Kuba K. An Older-Age Advantage? Emotion Regulation and Emotional Experience After a Day of Work. *Work, Aging and Retirement.* 2016; 2. <https://doi.org/10.1093/workar/waw004> PMID: 31456884

49. Hsu H-C. Age Differences in Work Stress, Exhaustion, Well-Being, and Related Factors From an Ecological Perspective. *Int J Environ Res Public Health*. 2018; 16(1):50. <https://doi.org/10.3390/ijerph16010050> PMID: 30585250
50. Yu H, Jiang A, Shen J. Prevalence and predictors of compassion fatigue, burnout and compassion satisfaction among oncology nurses: A cross-sectional survey. *Int J Nurs Stud*. 2016; 57:28–38. <https://doi.org/10.1016/j.ijnurstu.2016.01.012> PMID: 27045562
51. Mason VM, Leslie G, Clark K, Lyons P, Walke E, Butler C, et al. Compassion fatigue, moral distress, and work engagement in surgical intensive care unit trauma nurses: a pilot study. *Dimens Crit Care Nurs*. 2014; 33(4):215–25. <https://doi.org/10.1097/DCC.000000000000056> PMID: 24895952
52. Salyers MP, Bonfils KA, Luther L, Firmin RL, White DA, Adams EL, et al. The Relationship Between Professional Burnout and Quality and Safety in Healthcare: A Meta-Analysis. *J Gen Intern Med*. 2017; 32(4):475–82. <https://doi.org/10.1007/s11606-016-3886-9> PMID: 27785668
53. Navarro-González D, Ayechu-Díaz A, Huarte-Labiano I. [Prevalence of burnout syndrome and its associated factors in Primary Care staff]. *Semergen*. 2015; 41(4):191–8. <https://doi.org/10.1016/j.semerg.2014.03.008> PMID: 24857630
54. Dewa CS, Jacobs P, Thanh NX, Loong D. An estimate of the cost of burnout on early retirement and reduction in clinical hours of practicing physicians in Canada. *BMC Health Serv Res*. 2014; 14:254. <https://doi.org/10.1186/1472-6963-14-254> PMID: 24927847
55. Chiesa A, Serretti A. Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. *J Altern Complement Med*. 2009; 15(5):593–600. <https://doi.org/10.1089/acm.2008.0495> PMID: 19432513
56. Grossman P, Niemann L, Schmidt S, Walach H. Mindfulness-based stress reduction and health benefits. A meta-analysis. *J Psychosom Res*. 2004; 57(1):35–43. [https://doi.org/10.1016/S0022-3999\(03\)00573-7](https://doi.org/10.1016/S0022-3999(03)00573-7) PMID: 15256293
57. West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences and solutions. *Journal of Internal Medicine*. 2018; 283(6):516–29. <https://doi.org/10.1111/joim.12752> PMID: 29505159
58. Panigrahi A. Managing Stress at Workplace. *Journal of Management Research and Analysis*. 2017; 3:154–60.
59. Bhui K, Dinos S, Galant-Miecznikowska M, de Jongh B, Stansfeld S. Perceptions of work stress causes and effective interventions in employees working in public, private and non-governmental organisations: a qualitative study. *BJPsych Bull*. 2016; 40(6):318–25. <https://doi.org/10.1192/pb.bp.115.050823> PMID: 28377811
60. Brand SL, Thompson Coon J, Fleming LE, Carroll L, Bethel A, Wyatt K. Whole-system approaches to improving the health and wellbeing of healthcare workers: A systematic review. *PLoS One*. 2017; 12(12):e0188418. <https://doi.org/10.1371/journal.pone.0188418> PMID: 29200422
61. Pang S, Liu J, Mahesh M, Chua BY, Shahwan S, Lee SP, et al. Stigma among Singaporean youth: a cross-sectional study on adolescent attitudes towards serious mental illness and social tolerance in a multiethnic population. *BMJ Open*. 2017; 7(10):e016432–e. <https://doi.org/10.1136/bmjopen-2017-016432> PMID: 29042379
62. Zhang Z, Sun K, Jatchavala C, Koh J, Chia Y, Bose J, et al. Overview of Stigma against Psychiatric Illnesses and Advancements of Anti-Stigma Activities in Six Asian Societies. *Int J Environ Res Public Health*. 2019; 17(1):280. <https://doi.org/10.3390/ijerph17010280> PMID: 31906068
63. Hoi SY, Ismail N, Ong LC, Kang J. Determining nurse staffing needs: the workload intensity measurement system. *Journal of Nursing Management*. 2010; 18(1):44–53. <https://doi.org/10.1111/j.1365-2834.2009.01045.x> PMID: 20465728
64. MA LK. Medscape National Physician Burnout, Depression & Suicide Report 2019. Medscape Business of Medicine, Medicine MBo; 2019 January 16, 2019.
65. Bakker AB, Van der Zee KI, Lewig KA, Dollard MF. The relationship between the Big Five personality factors and burnout: a study among volunteer counselors. *J Soc Psychol*. 2006; 146(1):31–50. <https://doi.org/10.3200/SOCP.146.1.31-50> PMID: 16480120
66. Kristensen TS, Borritz M, Villadsen E, Christensen KB. The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*. 2005; 19(3):192–207.