

Systematic Review

Determinants of stress on resident physicians: systematic review and meta-synthesis

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ABSTRACT

Stress/burnout on resident physicians is common. Various determinants can be related to resident stress. This systematic review was conducted to determine how situational, personal, or professional determinants influence resident stress. We identified an English and Indonesia articles using online database including PubMed, Wiley Online Library, Google Scholar, Garba Rujukan Digital (GARUDA), and manually searching bibliographies of the included studies from January 01, 2001 until April 30, 2021. Three main search terms included are resident physician, determinant, and stress/burnout. Study selection included was peer-reviewed literatures of observational studies that discuss about stress determinants on residents from various year of training and medical specialties. Methodological quality of studies was assessed using Newcastle-Ottawa Scale adopted for cross-sectional studies. Data extraction conducted by 3 authors. All pooled synthesis were summarized based on narrative methods. Fifty-three cross-sectional, 1 prospective, and 1 combination of cross-sectional and longitudinal studies meet our inclusion criteria (n=29.031). Fifty-one percent are male, and the average age of the participants was 29 years old. The most stress/burnout validated tool used are Maslach Burnout Inventory. The average quality of study was moderate for cross-sectional studies. The main identified determinant was situational, the second was personal, and the latter was professional. The most stressor identified was 'excessive working time per week, includes night shift, on-call, work on day off, and rotation more than 24 hours.' Stress/burnout on residents closely related mainly to situational, followed by personal, and less by professional determinants. There was needed for an intervention to the educational program from institution in the future for better accomplishment.

Keywords: Determinant, Resident physician, Stress, Burnout

INTRODUCTION

Residency training is an advanced professional program for medical doctor with independent and supervised learning methods to become a specialist doctor. It includes integration between theory and practice. In professional education, there must be an integration between health care services and educational processes. In this process, participant called resident physicians or residents, tend to be prone to stress/burnout. Residency training has been characterized as a period of sacrifice in personal life including family, social, physical, mental, spiritual, and financial. When stress/burnout exceeds a

critical level, it can turn into manifestation that result in physical, neurobehavioral, neuropsychiatric disorder, even the negative effect on work like drop out, alcohol and drug abuse, also medical errors that will harm the patients. Stress itself has been dubbed the "health epidemic of the 21st Century" by the world health organization.¹ The resident service committee of the association of program directors in internal medicine divided determinants of stress as situational, personal and professional.² The situational stress determinant include: (1) inordinate, inflexible time, fatigue, and sleep deprivation (2) excessive workload (3) burdensome clerical and administrative responsibilities (4) insufficient

allied health personnel (5) too many difficult patients, and (6) inadequate learning environment. The personal stress determinant include: (1) family problems, (2) financial problems (3) isolation; problems of relocating (4) lack of leisure time (5) psychosocial problems, and (6) inadequate coping skills. The professional stress determinant include: (1) responsibility for patient care (2) supervision of more junior residents and students; (3) difficult patients and difficult patient problems (4) information overload, and (5) career planning. The aimed of this research is to determine how situational, personal, and professional determinants influence resident's stress/burnout.

LITERATURE REVIEW

This systematic review evaluated with the guidelines of preferred reporting items for systematic reviews and meta-analysis (PRISMA). The collection of study articles by searching through database PubMed, Wiley Online Library, Google Scholar, GARUDA, and manually searching bibliographies from January 01, 2001 until April 30, 2021. The search strategy included combination of 3 main key terms based on population, exposure and outcome (PEO) criteria: resident physician, determinant, and resident physician. The final keywords utilized from database indexes or independently without indexes included: (resident or residency or medical residency or medical resident or medical resident physician or resident doctor or resident physician or trainee physician or trainee resident doctor or postgraduate trainee doctor or postgraduate residency training or postgraduate medical resident or residency training or internship residency) and (determinant or factor or cause or etiology or stressor or predictor or predisposition or risk or risk factor or association) and (stress or burnout or burnout syndrome). Studies were eligible for inclusion if they met the following criteria: (1) peer-reviewed observational studies (2) resident physician from various year of training and medical specialties (3) determinants of stress include situational, personal and professional (4) outcome of stress/burnout measured by validated tools (5) articles in English and Indonesia languages, and (6) publication from January 01, 2001 until April 30, 2021. We excluded grey literatures to avoid non-peer-reviewed articles. Literatures that passed filtering underwent methodological quality assessment before data extraction and data synthesis. Selection of studies carried out in two steps. First, we conducted a title and abstract screening. Second, the literature that corresponds to the research question will be collected and then filtered for full-text articles. Duplicate articles will be excluded. Quality appraisal was conducted based on Newcastle-Ottawa Scale adopted for cross-sectional studies, provides score from 0 to 10, with score of 0 to 4 as unsatisfactory study, score of 5 to 6 as satisfactory study, score of 7 to 8 as good study, and score of 9 to 10 as very good study. Low quality studies are included but with some consideration. Extracted data includes author name and year of publication, country of origin, study design, research time

conducted, sample size with response rate, resident physician characteristics such as age, gender, medical specialty, year of training; measurement of outcome with validated tools, and determinants of stress identified. Afterward, we summarized the results with narrative methods in order to answer the research question.

STUDY SELECTION

Overall, the full-text articles assessed for eligibility was 125 articles. Full-text articles then excluded with a consideration were 70 articles. The final included studies for narrative synthesis were 55 articles (Figure 1).

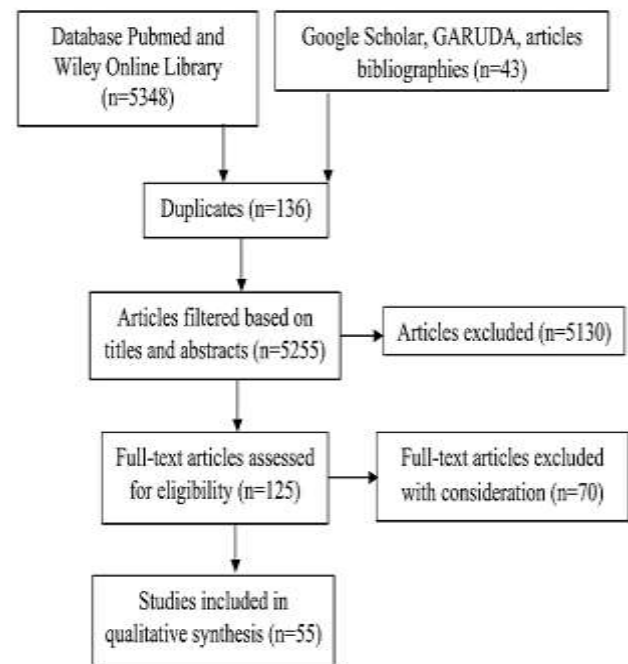


Figure 1: Literature selection process with PRISMA diagram.

CHARACTERISTICS OF STUDY RESPONDENTS

Fifty-five studies included for synthesis with total 29,031 residents were participated. There are 26 studies with high response rate ($\geq 50\%$) including 15,745 resident physicians (56.8%), 24 studies with lower response rate including 11,827 resident physicians, and 5 studies does not state response rate. Based on gender, revealed that the male gender was 51% and female gender was 49%. The average age of residents was 29 years old. There are 21 studies (38%) take samples from various medical specialties (multiple), and the remain 34 of the studies conduct on certain medical specialties (surgery and non-surgery fields, 17 studies (30.9%), respectively). Of these 55 studies, all residents have shift work, night shift, and on-call schedule on their programs. The situational stress determinants identified in 52 studies (94.5%), the personal stress determinants identified in 39 studies (70.9%), and the professional stress determinants identified in 14 studies (25.4%) (Table 1).

Table 1: Characteristics of studies, population, exposure and outcome.

Author/Study year	Country of origin	Study design	Research time	Sample size (response rate, %)	Age (mean) (Years)	Gender (male, %)	Medical specialty	Year of training	Validated outcome tools	Stress determinants identified
Khalafallah et al, 2020³	USA	Cross-sectional	May 2020	111 (12.2)	Not stated	65.8	Neurosurgery	1-7+	aMBI	Situational
Eckleberry-Hunt et al, 2006⁴	USA	Cross-sectional	October-November 2006	151 (38)	Not stated	51	Multiple	1-6	MBI	Situational, personal, professional
Ogboghodo and Edema, 2020⁵	Nigeria	Cross-sectional	November 15, 2019-January 15, 2020	448 (97)	33.9±0.4	62.3	Multiple	1-2	MBI-HSS-MP	Situational
Kemper and Schwartz, 2020⁶	USA	Cross-sectional	Spring 2019	1956 (66)	Not stated	30	Pediatrics	Not stated	MBI, PSS	Situational
Ogundipe et al, 2014⁷	Nigeria	Cross-sectional	Not stated	204 (74.5)	33.44±4.5	58.3	Multiple	Not stated	MBI	Personal
Treluyer and Touneux, 2021⁸	France	Cross-sectional	May 2020	340 (26.1)	27	16.2	Pediatrics	1-4	MBI-HSS	Situational, personal
Panse et al, 2020⁹	India	Cross-sectional	March-April 2019	185 (not stated)	Not stated	70.8	Plastic surgery	1-3	aMBI	Situational
Somerson et al, 2020¹⁰	USA	Cross-sectional	September 2018	203 (6)	Not stated	80	Orthopedics	1-5	MBI-HSS	Situational
Smeds et al, 2019¹¹	USA	Cross-sectional	Spring 2018	273 (42)	31±3.0	56	General surgery	Not stated	OLBI, PSS	Personal
Ferguson et al, 2020¹²	Canada	Prospective	February 6-March 7, 2018	144 (40.1)	Not stated	34.7	Radiology	2-5	MBI-HSS	Situational, personal, professional
Ringrose et al, 2009¹³	Netherlands	Cross-sectional and interview	February 1, 2007	47 (81)	30.3±3.3	48.9	Multiple	1-6	MBI	Situational, personal, professional
Zis[1] et al, 2014¹⁴	Greece	Cross-sectional	2012	263 (90.7)	33.5±3.3	53.6	Multiple	Not stated	MBI	Situational, personal, professional
Kemper et al, 2020¹⁵	USA	Cross-sectional and longitudinal	2016 2017 2018	1664 (61) 2153 (66) 2241 (61)	29	28 27 29	Pediatrics	1-3	MBI	Situational, personal, professional
Golub et al, 2007¹⁶	USA	Cross-sectional	September 2005	514 (50)	31	79	ENT	2-5	MBI-HSS	Situational, personal

Continued.

Author/Study year	Country of origin	Study design	Research time	Sample size (response rate, %)	Age (mean) (Years)	Gender (male, %)	Medical specialty	Year of training	Validated outcome tools	Stress determinants identified
Ji et al, 2020 ¹⁷	China	Cross-sectional	October 1, 2018-January 31, 2019	380 (81.1)	28.1±3.9	20.8	Pediatrics	1-5	MBI-HSS	Situational, personal
Bin Dahmash et al, 2019 ¹⁸	Saudi Arabia	Cross-sectional	February 2019	108 (49.7)	Not stated	53.7	Radiology	1-4	MBI-HSS	Situational, personal
Nimer et al, 2021 ¹⁹	Jordan	Cross-sectional	September-October 2020	481 (95.8)	Not stated	55.5	Multiple	1-4	CBI	Situational, personal
Janko and Smeds, 2018 ²⁰	USA	Cross-sectional	Not stated	177 (34)	32	64	Vascular surgery	Not stated	OLBI, PSS	Situational, personal
Kijima et al, 2020 ²¹	Japan	Cross-sectional	July-September 2014	97 (28.2)	27.1	64.9	Multiple	1-2	MBI-GS	Situational, personal
Zubairi and Noordin, 2016 ²²	Pakistan	Cross-sectional	May 1-31, 2013	82 (34)	Not stated	54	Multiple	1-3	MBI	Situational
Attenello et al, 2018 ²³	USA	Cross-sectional	June-November 2015	346 (21)	31	78	Neurosurgery	1-7	MBI	Situational, personal, professional
Takayesu et al, 2014 ²⁴	USA	Cross-sectional	Fall 2011	218 (75)	Not stated	59	Emergency medicine	1-4	MBI	Situational, personal
Reed et al, 2020 ²⁵	USA	Cross-sectional	Not stated	182 (12)	Not stated	Not stated	ENT	1-5	MBI	Situational, personal
Nishimura et al, 2019 ²⁶	Japan	Cross-sectional	April 2017 October 2017 March 2018	39 (51) 27 (36) 21 (28)	26±2.2 26.6±2.6 27.4±2.7	48.7 33.3 38	Multiple	1-2	MBI	Situational
Geng et al, 2020 ²⁷	China	Cross-sectional	June 2019	563 (73.3)	Not stated	39.3	Multiple	1-3	MBI-HSS	Situational, personal
Lee et al, 2020 ²⁸	Singapore	Cross-sectional	Not stated	50 (64.9)	30.7±3.0	46	Psychiatry	1-5	OLBI	Situational, personal
Hassan et al, 2020 ²⁹	Egypt	Cross-sectional	December 2016-Feb 2017	278 (89.4)	26.5±1.35	46.4	Multiple	1 above	HJSSQ	Situational, personal, professional
Ho and Kwek, 2021 ³⁰	Singapore	Cross-sectional	Not stated	44 (100)	31.4±2.3	90.9	Orthopedics	Not stated	MBI	Situational, personal
Raftopoulos et al, 2019 ³¹	Australia	Cross-sectional	July 2017	60 (89.6)	Not stated	66.7	ENT	1-5	MBI	Personal
Ebrahimi and Kargar, 2018 ³²	Iran	Cross-sectional	2015	311 (88.8)	Not stated	55	Multiple	1-4	OSI-R	Situational, personal, professional

Author/Study year	Country of origin	Study design	Research time	Sample size (response rate, %)	Age (mean) (Years)	Gender (male, %)	Medical specialty	Year of training	Validated outcome tools	Stress determinants identified
Choi et al, 2013 ³³	South Korea	Cross-sectional	April-2020 July 2010	150 (13.1)	29.9	46.7	Family medicine	1-3	KOSS-SF	Situational
Maswadi et al, 2019 ³⁴	Jordan	Cross-sectional	April-2017 July-2017	555 (84)	30.0±3.0	71.7	Multiple	1-5	PSS	Situational, personal
Aldubai et al, 2019 ³⁵	Saudi Arabia	Cross-sectional	Not stated	75 (71)	Not stated	45.3	Family medicine	1-4	MBI	Situational, personal, professional
Blanchard et al, 2010 ³⁶	France	Cross-sectional	2009	204 (60)	28	40	Oncology	Not stated	MBI	Situational, personal, professional
Charoentanyarak et al, 2020 ³⁷	Thailand	Cross-sectional	February 2019	149 (21)	28.29±2.9	30.8	Family medicine	1-3	MBI-HSS	Situational, personal, professional
Ramya et al, 2019 ³⁸	India	Cross-sectional	June 1- November 30, 2018	239 (58.2)	Not stated	57.6	Multiple	1-3	PSS	Situational
Alosaimi et al, 2015 ³⁹	Saudi Arabia	Cross-sectional	May-October 2012	938 (25.9)	28.4±3.0	55.4	Multiple	1-3	PSS	Situational, personal
Grover et al, 2018 ⁴⁰	India	Cross-sectional	April-2017 May 2017	445 (27.6)	28.93±3.0	69.2	Multiple	Not stated	PSS, MBI	Situational, personal
Sun et al, 2019 ⁴¹	USA	Cross-sectional	Not stated	5.296 (36)	32±3	63	Anesthesiology	1-3	MBI-HSS	Situational, personal
Kinslow et al, 2020 ⁴²	USA	Cross-sectional	May-July 2020	81 (not stated)	Not stated	50.6	General surgery	1-6	Validated questionnaire against MBI	Situational
Block et al., 2013 ⁴³	USA	Cross-sectional	May-June 2011	55 (72)	29±3	53	Internal medicine	1	MBI	Situational
Zis et al, 2015 ⁴⁴	Greece	Cross-sectional	October-2014 November 2014	116 (88.5)	34±3.6	44.8	Neurology	Not stated	MBI	Situational, personal
Matsuo et al, 2021 ⁴⁵	Japan	Cross-sectional	2018-2019	604 (12.7)	27±2.8	62.9	Multiple	1-2	MBI-GS	Situational, personal, professional

Continued.

Author/ Study year	Country of origin	Study design	Research time	Sample size (response rate, %)	Age (mean) (Years)	Gender (male, %)	Medical specialty	Year of training	Validated outcome tools	Stress determinants identified
Marchalik et al, 2019⁴⁶	USA Europe (Italy, Portugal, France, Belgium)	Cross-sectional	May 2018	211 (20.9) 158 (45.2, 30.5, 12.5, 9.4)	Not stated	63	Urology	Not stated	MBI	Situational, personal
Ferguson et al, 2020⁴⁷	Canada	Cross-sectional	26 February 2019	718 (41.1)	30.1±3.7	40.8	Multiple	1-7	MBI-HSS	Situational, personal, professional
Huang et al, 2020⁴⁸	China	Cross-sectional	June 2017	318 (96.4)	Not stated	44.3	Multiple	1-3	MBI-HSS	Situational, personal
Sahasrabuddhe et al, 2015⁴⁹	India	Cross-sectional	Not stated	273 (49.6)	26.5	62	Multiple	1-3	PSS	Situational
Castelo-Branco et al, 2006⁵⁰	Spain	Cross-sectional	October 2004	109 (67)	27±2.3	14	Obstetrics-gynecology	Not stated	MBI	Situational
Lue et al, 2010⁵¹	Taiwan	Cross-sectional	January 2007- June 2007	555 (90)	29.3±2.5	67.7	Multiple	1	CBI, CJSQ	Situational, personal
Zhang et al, 2019⁵²	China	Cross-sectional	August 2017	159 (not stated)	27.3±6.2	23.2	Internal medicine	1-3	MBI	Situational
Marchalik et al, 2019⁵³	USA	Cross-sectional	May 2018	211 (20.9)	Not stated	69	Urology	1-4	MBI	Situational, personal
Jean et al, 2020⁵⁴	USA-Canada and Europe	Cross-sectional	August-2019 September 2019	797 (not stated)	Not stated	Not stated	Neurosurgery	Not stated	MBI	Situational, professional
Burhamah et al, 2021⁵⁵	Kuwait	Cross-sectional	January-2020 February 2020	85 (not stated)	Not stated	64.7	Multiple surgery	1-5	aMBI-HSS	Situational
De Oliveira et al, 2013⁵⁶	USA	Cross-sectional	Not stated	1508 (54)	Not stated	57	Anesthesiology	1-4	MBI	Situational, personal
Lichstein et al, 2020⁵⁷	USA	Cross-sectional	Not stated	661 (58)	Not stated	83	Orthopedics	1-5	aMBI	Situational, personal

aMBI: abbreviated Maslach burnout inventory; CJSQ: Cooper's job stress questionnaire; CBI: Copenhagen burnout inventory; HCJSSQ: Hospital consultants' job stress and satisfaction questionnaire; KOSS-SF: Korean occupational stress scale-short form; MBI: Maslach burnout inventory; MBI-GS: Maslach burnout inventory-general survey; MBI-HSS: Maslach burnout inventory-human services survey; MBI-HSS-MP: Maslach burnout inventory-human services survey for medical personnel; OLBI: Oldenburg burnout inventory; OSI-R: Occupational stress inventory-revised (Osipow); PSS: Perceived stress scale.

CHARACTERISTICS OF STUDIES

From 55 studies, it was found that the most researched countries studying about stress/burnout in residents was the United States with 17 studies (30.9%). Other countries include 4 studies in India and China, 3 studies in Saudi Arabia and Japan, 2 studies in Nigeria, France, Jordan, Singapore, and Canada; one study in Netherlands, Greece, Pakistan, Egypt, Australia, Iran, South Korea, Thailand, Spain, Taiwan, and Kuwait; also study with combine countries include 1 study of United States-Europe, and 1 study of United States-Canada-Europe. Most of the studies are cross-sectional study that surveys the samples through a questionnaire. There is 1

prospective study, and 1 study that combine of cross-sectional and longitudinal study. All studies used a validated outcome measurement instruments for stress/burnout. The Maslach burnout inventory was the most used validated tool in 42 studies (76%), and perceived stress scale was the second most used in 8 studies (14.5%) (Table 1).

DETERMINANTS OF STRESS IDENTIFIED

Reports of the identified and statistically significant stress determinants in resident physicians from each study. Assessment is carried out based on a higher weight such as sample size from each study (Table 2 and 3).

Table 2: Stress determinants identified (more often to less often).

Situational	Personal	Professional
-Inordinate and inflexible time demands, fatigue, sleep deprivation		
-Inadequate learning condition/ environment	-Psychosocial problems	-Responsibilities for patient care
-Excessive workload	-Lack of leisure time	-Career planning
-Too many difficult patients (like alcohol, drug abuse, AIDS, exposure to blood and body fluid, high-risk areas)	-Financial problems	-Information overload
-Insufficient and lack of support from allied health personnel (colleagues, nursing, social services, laboratory workers)	-Family problems (spouse, significant other, children)	-Supervision of more junior residents and students
-Burdensome clerical and administrative responsibilities, and lack of support from these staff	-Inadequate stress coping skills (include coping with alcohol or drug abuse)	-Difficult patients and difficult patient problems (abusive, self-injury, medical decision such as do-not-resuscitate)
	-Isolation and relocation problems	

Table 3: Ten highest stressors identified in all determinants.

S. No.	Highest stressors identified
1	Excessive working time per week, includes night shift, on-call, work on day off, and rotation more than 24 hours
2	Lack of support from family, spouse, friends, colleagues, supervisors, and institution
3	Sleep deprivation
4	Less weekends, less day off per months
5	Unsatisfactory balance between work and personal life
6	Responsibilities between home, family, and work; conflict between family and work
7	Educational debts
8	Making medical errors
9	Rotation on high-risk areas
10	Mistreatment (intimidation, discrimination, sexual abuse, verbal abuses, physical abuse)

QUALITY ASSESSMENT OF STUDIES

There were 2 studies (3.6%) as unsatisfactory studies (4 points), 23 studies (41.8%) as satisfactory studies (5 points), 17 studies (30.9%) as satisfactory studies (6 points), 10 studies (10.1%) as good studies, and 2 studies (3.6%) as good studies. Overall, there are 2 studies (3.6%) as low-quality studies, 40 studies (72.7%) as moderate-quality, as well as twelve studies (21.8%) as high-quality studies in these cross-sectional studies.

DISCUSSION

This systematic review and meta-synthesis of 55 studies on 29,031 participants was to determine the various determinants related to stress/burnout in resident physicians based on situational, personal and professional determinants. Situational determinant was known to occupy the most influence as a stressor on residents in this study, followed by personal determinant, and the latter was professional determinant.

Situational determinant due to time demands (more frequent to less frequent) includes: (1) Excessive working time, including night shift, on-call, working on holiday, and job rotation exceeding 24 hours as the highest stressor identified, (2) sleep deprivation, (3) poor sleep quality, (4) poor time management and deadline, (5) alteration on rotation and day off schedule during COVID-19 pandemic. It was stated in a study by Marchalik et al that residents who received 3-night shifts during holiday causes burnout.⁴⁶ Research such as by Treluyer et al stated that working time per week more than 60 hours is associated with burnout, and Somerson stated that working time per week more than 80 hours causes burnout.⁸ The accreditation council for graduate medical education (ACGME) has determined: (1) limit the number of work hours of residents to 80 hours weekly, including in-house call, averaged over 4 weeks, (2) residents must be given 1 day out of 7 free from all clinic and educational responsibilities, averaged over four weeks, (3) residents cannot be scheduled for in-house call more than once every 3 nights, averaged over 4 weeks, (4) duty periods cannot last for more than 30 hours, (5) residents required to rest for 10 hours between period of duty. Long working hours will cause physical and emotional exhaustion with an impact on physical disorders, executive function, attention, memory, and may have a negative effect on work and personal relationship. Other disorders that can arise are insomnia, depression, mental disorders, and occupational consequences. The ACGME limits 80 hours as the upper limit to protect against the negative effects of chronic sleep deprivation, and limits 24 hours plus 6 hours to protect against the effects of acute sleep deprivation. Study such as by Alosaimi et al stated that 2 to 6 hours of sleep, and Sahasrabuddhe et al stated that sleep less than 6 hours per day as an effect on stress/burnout.^{39,49} Sleep deprivation are known to cause neurobehavior, performance and physical disorders. Sleep deprivation itself has a definition of inadequate sleep quality and quantity. Geng et al, Choi et al and Ramya et al stated that poor sleep quality as a consequence of lack of sleep less than 6 hours per day.^{27,33,38}

Situational determinant due to inadequate learning environment include: (1) Mistreatment like intimidation, discrimination, sexual, verbal and physical abuse from staff, institution, and patients, (2) work environment perceived as less collaborative but more competitive, (3) lack of autonomy, (4) lack of mentoring or poor balance between academic and health services, (5) residents who being underappreciated, feeling unfairly treated for their achievements and work; (6) less time allocated for studying, and (8) research time is not enough. The autonomy of resident physicians is needed to develop independency and become a competent specialist doctor. Supervision and autonomy must be balance to manage patients independently.

Situational determinant due to workload can include: (1) High patients per resident ratio (high patient

admissions), (2) academic burdens, (3) residents who are often given work assignments; (4) resident involved in scut work, (5) multiple procedures, and (6) limited breaktime between their work. The scut work will impact on the lack of resident physicians in their professional development due to working that should not be really needed in their educational programs. The patient's workload is actually a major component of the educational programs. Either a small or an excessive number of patients will be a source of stress, as residents sacrifice time demands while getting sufficient knowledge in their educational program.

Situational determinant due to handling too many difficult patients can include: (1) Rotation in high-risk areas such as emergency room, intensive care unit, neonatal intensive care unit, or isolation room, (2) handling critically ill patients, (3) having an accidents or injury at work.

Situational determinant due to lack of health allied personnel and their support can include: (1) Conflicts between residents; (2) conflicts relationship with co-workers; (3) lack of human resources especially related to patient care; (4) low number of residents per supervisors. As a resident, they will work in time pressure, high-risk situations, and engage with teams from different backgrounds and perspectives. In health services, conflict that arise can come from any tasks, process, and relationship factors.

Situational determinant due to clerical and administrative responsibilities such as paperwork and used of prolonged medical records become a stressor for residents, with less benefit on their professional development.

Personal determinant due to psychosocial problems can include: (1) Lack of support from family, spouse, friends, colleagues, supervisors, and institution. Other problems are (2) dissatisfaction with the balance between work and personal life, (3) perfectionists, (4) neuroticism and emotional labile, (5) communication problems at work, (6) residents who have difficulty in making decisions or making wrong decisions, (7) anxiety, (8) emotional demands on patients and co-workers, (9) other social stressors outside of work, (10) psychosomatic problems, (11) low self-efficacy, and (12) pessimism.

Personal determinant due to limited leisure time can include: (1) Lack of weekends, lack of day off per months, (2) lack of time for self-care, exercise, and doing favourite activities, and (3) lack of time for family and homesick.

Personal determinant due to financial problems can include: High educational debt and low income. This also caused of residency training that not allowed residents to do moonlighting. Although financial problems as a source of stress, several studies stated that residents were not affected by financial problems. This

may be due to their expectations of low salaries. Apart from this, it is necessary to propose a salary or increase the nominal salary for residents, as well as reduce the amount of educational costs to minimize educational debts.

Personal determinant due to family problems can include: (1) Responsibilities between home, family, and work; conflict between family and work, and (2) conflict with spouse or families.

Personal determinant due to inadequate stress coping among residents include: Difficulty accessing mental health services, and inadequate coping stress that may leads to physical, behavioural and neuropsychiatric disorders.

Personal determinant due to isolation and relocation include: (1) Less programmatic social events followed by residents, and (2) work location was far from family and friends. However, Takayesu et al stated that new location can be positively seen as enthusiasm and adventure toward new atmospheres and places.²⁴

Professional determinant due to responsibilities of patient care include: (1) Residents who makes medical errors, (2) demands or complaints from patients, (3) doing work outside competency. Professional determinant due to career planning include: (1) lack exposure to patient cases, (2) regret or unhappy with career choice, (3) worried about career, and (4) not interested in work. Professional determinant due to information overload can include: (1) intellectual demands, (2) difficult to understand what is being studied, and (3) too much to be learn. The last two professional determinants are problems with patient or patient families, and supervise more junior residents and students.

There are several limitations in this study. First, the results may create risk of bias due to search for articles that cannot identify all the relevant studies according to the inclusion criteria. Second, we categorized any stressor items in each determinant based on our preferences with the basis of several other literature references. Third, most of the included studies were cross-sectional studies, which is cannot establish a definite causal relationship between determinant and stress/burnout. Fourth, our study also excluded languages other than English and Indonesia. Fifth, any included studies were not homogenous based on medical specialties and year of training. Sixth, studies about determinant tend to use self-report questionnaire survey, which can risk a response, recall, and social desirability bias. Seventh, not all potential participants who experience stress/burnout will complete the questionnaire, or conversely, participants who complete the questionnaire may not really perceived stress/burnout, which can risk of selection bias. Eight, it is not possible for each study to control for all additional factors, which can lead to confounding bias. Ninth,

random sampling is described in only 4 studies. Tenth, the study did not proceed to meta-analysis due to inconsistent effect sizes across studies.

However, there are several strengths in our study. First, we included 55 studies relevant to stress/burnout outcome of resident physicians. Second, we include studies with the population limited to only resident physicians. Third, the number of 29.031 residents obtained from 55 studies such a large sample, and we revealed that there were 26 studies with a high participants response rate more than 50% (56.8%). Fourth, our study excluded grey literatures to avoid any low-quality studies. Fifth, the determinants identified have a statistical significance and are based on standardized metrics. Sixth, we only included studies with stress/burnout outcome that using validated tools. Seventh, the overall quality assessment of studies that we included was moderate for a cross-sectional study. Eight, our findings consider studies that deserve higher weight, for example a larger sample size.

CONCLUSION

The finding of our systematic review summarized that the outcome of stress/burnout in resident physicians was strongly related to the situational determinants, secondly to the personal determinants, and the latter related to professional determinants. Stress/burnout are experienced by many resident physicians which may have impact on residents and patients on the health care services they provide. The results of the study we obtained support the need for an intervention in the educational program of the institutions to preventing stress/burnout of resident physicians in the future.

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