

ความชุกของภาวะหมดไฟและมาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19 ของบุคลากรทางการแพทย์ระหว่างการระบาดในโรงพยาบาลในประเทศไทย

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การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาความชุกของภาวะหมดไฟของบุคลากรโรงพยาบาลและมาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19 เปรียบเสมือนมาตรการป้องกันของโรงพยาบาล การศึกษารูปแบบภาคตัดขวางในการประเมินบุคลากรทางการแพทย์ที่ดูแลผู้ป่วยในโรงพยาบาล 30 แห่ง โดยประเมินการรับรู้มาตรการป้องกันเพื่อลดการสัมผัสความเสี่ยงโควิด-19 ตามหลักการควบคุมอันตรายตามลำดับขั้น ร่วมกับการประเมินความรู้ ทักษะ และพฤติกรรมการปฏิบัติ นอกจากนี้ บุคลากรจะถูกประเมินภาวะหมดไฟตาม Maslach Burnout Inventory (MBI) โดยข้อมูลจะถูกวิเคราะห์หาความเกี่ยวข้องโดยใช้ Generalized Linear Model (GLM) ผลการศึกษาพบว่า บุคลากรในการศึกษา จำนวน 3,086 คน จากโรงพยาบาลรัฐและเอกชน รวม 30 แห่ง โดยโรงพยาบาลส่วนใหญ่มีคะแนนการรับรู้มาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19 อยู่ในระดับสูง กลุ่มตัวอย่างส่วนใหญ่เป็นพยาบาล/ผู้ช่วยพยาบาล/ผู้ช่วยเหลือคนไข้ ร้อยละ 53.3 และแพทย์ ร้อยละ 1.1 พบความชุกของภาวะหมดไฟ ร้อยละ 7.3 โดยเป็นกลุ่มภาวะหมดไฟระดับสูง ร้อยละ 6.2 และปานกลาง ร้อยละ 1.1 ตามลำดับ นอกจากนี้ แบ่งภาวะหมดไฟเป็น 3 กลุ่ม คือ overextended ร้อยละ 4.0, disengaged ร้อยละ 4.9 และ ineffective ร้อยละ 24.4 อายุเท่ากับหรือน้อยกว่า 40 ปี เพิ่มความเสี่ยงของภาวะหมดไฟสูง 1.6 เท่า (ความเชื่อมั่นร้อยละ 95=1.1-2.3) และความวิตกกังวลจากโควิด-19 เพิ่มความเสี่ยงของภาวะหมดไฟสูง 1.6 เท่า (ความเชื่อมั่นร้อยละ 95=1.4-1.9) ขณะที่คะแนนการปฏิบัติและมาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19 ที่มีประสิทธิภาพจะลดภาวะหมดไฟระดับสูงได้ร้อยละ 13 และร้อยละ 4.7 ตามลำดับ ผลการศึกษาพบว่าภาวะหมดไฟกระทบกับการทำงานผิดพลาด มาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19 ที่มีประสิทธิภาพเป็นอีกมาตรการที่ช่วยลดภาวะหมดไฟ ลดความผิดพลาดในการทำงาน และรักษามาตรฐานการดูแลผู้ป่วยในช่วงการระบาด

คำสำคัญ: ภาวะหมดไฟ; บุคลากรทางการแพทย์; มาตรการควบคุมการสัมผัสความเสี่ยงโควิด-19; การระบาด

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The prevalence of burnout and the COVID-19 risk exposure control measure among health workers during pandemic in hospitals in Thailand

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Abstract

This study aimed to investigate the prevalence of burnout among health workers and evaluate the COVID-19 risk exposure control (REC) measures as preventive strategies in hospitals. A cross-sectional study was conducted to evaluate healthcare personnel involved in patient care across 30 hospitals, assessing their perception of preventive measures to reduce COVID-19 exposure risk based on the hierarchy of hazard control principles, along with evaluations of knowledge, attitudes, and practices. Additionally, personnel were assessed for burnout using the Maslach Burnout Inventory (MBI), and the data were analyzed for associations using the Generalized Linear Model (GLM). The study found that among 3,086 personnel from 30 public and private hospitals, most hospitals had a high level of perceived implementation of COVID-19 exposure control measures. The majority of participants were nurses, practical nurses, or nurse aides (53.3%), while physicians accounted for 1.1%. The prevalence of burnout was 7.3%, comprising 6.2% with high burnout and 1.1% with moderate burnout, respectively. In addition, burnout was categorized into three groups: overextended (4.0%), disengaged (4.9%), and ineffective (24.4%). Being aged 40 years or younger increased the risk of high burnout by 1.6 times (95% CI: 1.1-2.3) and COVID-19-related anxiety also increased the risk of high burnout by 1.6 times (95% CI: 1.4-1.9). Whereas practice scores and effective COVID-19 risk exposure control measures reduced high burnout by 13% and 4.7%, respectively. The study found that burnout affects work errors. Effective COVID-19 exposure control measures are another strategy that helps reduce burnout, minimize work errors, and maintain high standards of patient care during a pandemic.

Keywords: burnout; health workers; the COVID 19 risk control measures; pandemic

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Introduction

The sudden emergence of the COVID-19 pandemic challenged hospitals in terms of emergency organization, structure, systems, resources, equipment, and personal protective equipment (PPE)¹. This impact was particularly significant for personnel directly involved in patient care and treatment. In response, hospitals rapidly organized and implemented measures to reduce viral transmission. The COVID-19 Risk Exposure Control (REC) measures were implemented based on the Hierarchy of Control framework, which focuses on eliminating or reducing hazards through a three-level management approach, prioritized as follows²⁻³: 1) Viral elimination or risk reduction measures: These included structural management and improvements in ventilation³⁻⁴. 2) Administrative measures: These involve developing policies or practice guidelines, team organization and training, and implementing new working systems to reduce workplace exposure risk helped lower infection rates⁴⁻⁵. 3) Personal Protective Equipment (PPE): PPE was used to protect individuals from infectious exposure⁴, particularly during treatment procedures that generated droplets and posed a high risk of transmission. During the pandemic, hospitals experienced a rapid increase in patient numbers, often resulting in inadequate rest for health workers⁶⁻⁷. Health workers faced substantial challenges, including managing unfamiliar diseases, treating large numbers of critically ill and dying patients⁷. They experienced the frustration due to unsuccessful patient outcomes, anxiety about becoming infected

or transmitting the virus to family and friends⁷⁻⁸, and emotional distress related to being categorized as high-risk personnel which often required temporary removal from their professional roles for quarantine⁹. During the COVID-19 pandemic, the prevalence of work-related burnout was found to be higher among health workers compared to other occupations¹⁰. The prevalence of burnout was reported to be 67.0% among doctors¹¹ and 40.0% among nurses¹². Among doctors, emotional exhaustion, a sense of depersonalization, and a diminished sense of personal accomplishment were observed in 72.0%, 68.0%, and 63.0%, respectively¹¹. For nurses, these symptoms were observed in 29.2-51.8%, 20.5-32.0%, and 21.7-29.9%, respectively¹². These conditions led to negative emotions, aggressive behavior, and increased tendencies toward social isolation among both doctors and nurses¹³. Burnout is a syndrome characterized by emotional exhaustion, a sense of separation, and low self-esteem. It represents a psychological burden resulting from working under high responsibility, pressure, long hours, and continuous stress accumulation of stress¹⁴. Common symptoms include a loss of energy, tiredness, fatigue, a diminished work attitude, and negative feelings towards work-ultimately leading to an unhappy work life that adversely affects relationships with friends and family. There are three main component burnout: 1) Emotional exhaustion (EE) 2) Depersonalization (D) 3) Decreased sense of personalized achievement (PA)¹⁴⁻¹⁶. Burnout often presents physical symptoms such as headaches, fatigue,

gastrointestinal disturbances, and sleep disorders. It also negatively affects work attendance and productivity, and increases the risk of errors^{16,17}. The World Health Organization (WHO) has recognized burnout as an occupational phenomenon in the International Classification of Diseases, 11th Revision (ICD-11)¹⁸. During the pandemic, the fear of contagion while caring for patients-compounded by inadequate rest, led to the accumulation of chronic stress and adversely affected the physical and mental well-being of health workers¹⁹.

This study aimed to investigate the prevalence of burnout among health workers and examine the role of the COVID-19 Risk Exposure Control (REC) measures. The findings provide essential information to support individual-level stress management⁸ and underscore the importance of implementing organizational strategies to protect workers' physical and mental health, thereby ensuring business continuity and enhancing workplace safety.⁸

Materials and Methods

This cross-sectional study was conducted among health workers in 30 hospitals, including government hospitals (regional, general, and provincial hospitals) and private hospitals located in the Bangkok Metropolitan area and surrounding regions. The study was approved by the ethics committees of Nopparat Rajathanee hospital and all participating hospitals. The sample included 100 health workers from each hospital, specifically

selected from frontline workers, occupational health teams, infection control teams, and supervisors. Participants provided informed consent electronically via Google Forms. Data collection occurred from April to May 2021. The COVID-19 risk exposure control measure assessment form (36 items) was structured based on the hierarchy of controls, covering the domains of policy (3 items), risk reduction (9 items), administration (19 items), and PPE practice (5 items). Assessment of knowledge (7 items), attitude (14 items), and practice (4 items) was adapted from the World Health Organization (WHO) COVID-19 virus exposure risk questionnaire²⁰. A "yes" response was scored as one point, with total scores calculated for each domain. The questionnaire was validated by three specialists and tested for reliability among 100 health workers at Nopparat Rajathanee Hospital, yielding a Cronbach's alpha coefficient of 0.82. Occupational burnout was assessed using the Maslach Burnout Inventory (MBI), which consists of three dimensions and 22 questions, translated into Thai^{14,21}. The questionnaire was distributed to the selected participants via Google Forms. According to Maslach's criteria, burnout was defined based on the following cut-off scores: emotional exhaustion (≥ 17), depersonalization (≥ 7), and personal achievement (≤ 32). High burnout was classified as high emotional exhaustion (score ≥ 27), high depersonalization (score ≥ 13), and low personal achievement (score ≤ 31)²¹. Subtypes of burnout were categorized as follows: Overextended, high emotional exhaustion

only; Disengaged, high depersonalization only; and Ineffective, low personal achievement only¹⁵.

Data was collected and analyzed using a statistical software package. Qualitative data were analyzed using frequency and percentage. Quantitative data were analyzed by calculating means and 95% confidence intervals (CI). The influence of various factors on individual burnout scores and the presence of high burnout was examined using the Generalized Linear Model (GLM).

Results

A total of 3,086 healthcare personnel participated in the study, yielding a response rate of 93.3%. The majority of participants were from regional or general hospitals, accounting for 51.9% (see Table 1). The average age of participants was 34.1 years. Most were female (85.5%), worked as nurses: RN, practical nurses: PN, or nurse aid: NA (53.3%), and were primarily involved in patient care (88.0%). Additionally, 95.8% of participants had attained an education level up to a bachelor's degree. Among the respondents, 43.5% reported high-risk contact with COVID-19 patients, and 17.9% reported a history of COVID-19 infection.

Table 1 Burnout component and burnout stratified by health worker characteristics

Variable N (%)	High EE (19.6%)	High D (22.9%)	Low PA (36.3%)	Burnout (7.3%)	Overextend (4.0%)	Disengaged (4.9%)	Ineffective (24.2%)
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Hospital type							
Regional 1,601 (51.9)	284 (17.7)	339 (21.2)	591 (36.9)	113 (7.1)	66 (4.2)	73 (4.6)	394 (24.9)
Private 667 (21.6)	117 (17.5)	136 (20.4)	203 (30.4)	36 (5.5)	25 (3.8)	32 (4.9)	128 (19.7)
Community 818 (26.5)	203 (24.8)	233 (28.5)	326 (39.9)	77 (9.5)	30 (3.7)	43 (5.3)	216 (26.6)
Age (Mean=34.1, SD=9.18)							
≤40 2,263 (73.3)	495 (21.9)	556 (24.6)	850 (37.6)	182 (8.2)	105 (4.7)	106 (4.8)	546 (24.5)
>40 823 (26.7)	109 (13.2)	152 (18.5)	270 (32.8)	44 (5.4)	16 (2.0)	42 (5.1)	192 (23.5)
Gender							
Female 2,637 (85.5)	544 (20.6)	616 (23.4)	962 (36.5)	201 (7.7)	112 (4.3)	24 (5.5)	102 (23.4)
Male 449 (14.5)	60 (13.4)	92 (20.5)	158 (35.2)	25 (5.7)	9 (2.1)	124 (4.7)	636 (24.3)
Position							
Doctor 34 (1.1)	6 (17.6)	10 (29.4)	13 (38.2)	3 (8.8)	0 (0.0)	2 (5.9)	9 (26.5)
RN/PN/NA 1,373 (44.5)	417 (22.1)	438 (23.2)	700 (37.2)	157 (8.4)	87 (4.7)	77 (4.1)	457 (24.5)
Other 1,168 (337.8)	181 (15.5)	260 (22.3)	407 (34.8)	66 (5.8)	34 (3.0)	69 (6.0)	272 (23.7)

Table 1 Continued

Variable N (%)	High EE (19.6%)	High D (22.9%)	Low PA (36.3%)	Burnout (7.3%)	Overextend (4.0%)	Disengaged (4.9%)	Ineffective (24.2%)
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Education							
Up to a bachelor's degree: 2,957 (95.8)	576 (19.5)	679 (23.0)	1,079 (36.5)	215 (7.4)	114 (3.9)	144 (4.9)	713 (24.4)
Higher than a bachelor's degree: 129 (4.2)	28 (21.7)	29 (22.5)	41 (31.8)	11 (8.6)	7 (5.5)	4 (3.1)	25 (19.5)
Direct patient care							
Yes 2,717 (88.0)	553 (20.4)	637 (23.4)	967 (35.6)	207 (7.7)	109 (4.1)	133 (5.0)	630 (23.5)
No 369 (12.0)	51 (13.8)	71 (19.2)	153 (41.5)	19 (5.2)	12 (3.3)	15 (4.1)	108 (29.5)
High risk of COVID-19 contact							
Yes 1,341 (43.5)	311 (23.2)	370 (27.6)	522 (38.9)	113 (8.6)	56 (4.3)	73 (5.6)	323 (24.6)
No 1,745 (56.5)	293 (16.8)	338 (19.4)	598 (34.3)	113 (6.5)	65 (3.8)	75 (4.3)	415 (23.9)
COVID-19 positive							
Yes 553 (17.9)	108 (19.5)	130 (23.5)	245 (44.3)	37 (7.0)	21 (4.0)	22 (4.2)	156 (29.4)
No 2,533 (82.1)	496 (19.6)	578 (22.8)	875 (34.5)	189 (7.5)	100 (4.0)	126 (5.0)	582 (23.1)

EE = emotional exhaustions, D = depersonalization, PA = personal achievement

Table 2 Burnout component and burnout stratified by KAP and the COVID-19 risk exposure control scores (ANOVA test)

Variable 3,086 (100%)	Emotional exhaustion			Depersonalization			Personal accomplishment			Burnout	
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Yes	No
Knowledge scores	6.32	6.18	6.15	6.31	6.20	6.21	6.29	6.31	6.22	6.17	6.27
Mean=6.26, SD=1.14	(1.09)	(1.20)	(1.22)	(1.09)	(1.19)	(1.19)	(1.12)	(1.10)	(1.16)	(1.18)	(1.13)
p-value		0.001			0.036			0.171		0.241	
Attitude scores	3.73	3.76	3.86	3.71	3.80	3.85	3.80	3.76	3.73	3.87	3.75
Mean=3.76, SD=0.56	(0.58)	(0.55)	(0.42)	(0.61)	(0.47)	(0.45)	(0.52)	(0.55)	(0.57)	(0.43)	(0.56)
p-value		<0.001			<0.001			0.008		0.003	
Practice scores	13.30	13.23	13.04	13.29	13.26	13.09	13.21	13.24	13.26	13.01	13.25
Mean=13.24, SD=1.08	(1.00)	(1.10)	(1.27)	(1.01)	(1.03)	(1.27)	(1.21)	(1.10)	(0.95)	(1.32)	(1.04)
p-value		<0.001			<0.001			0.581		0.001	

Table 2 Continued

Variable 3,086 (100%)	Emotional exhaustion			Depersonalization			Personal accomplishment			Burnout	
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Yes	No
The COVID-19 REC scores	32.80	31.84	30.75	32.73	32.11	31.24	31.85	31.93	32.76	30.99	32.33
Mean=32.26, SD=4.49	(4.13)	(4.61)	(5.10)	(4.11)	(4.62)	(5.02)	(4.68)	(4.69)	(4.15)	(4.55)	(4.46)
p-value		<0.001			<0.001			<0.001			<0.001

According to Maslach's criteria, the prevalence of burnout among participants was 7.3%, with high burnout recorded at 6.3% (as shown in Table 1). The result was found high emotional exhaustion, depersonalization and low personal accomplishment were 19.6, 22.9 and 36.3. Burnout was more prevalent among health workers aged 40 years and younger, particularly among doctors, nurses, and those with a history of high-risk contact (Table 1). The group classified as overextended primarily included staff aged ≤ 40 years, females, and nurses. The group classified as ineffective mainly included health workers who had no direct contact with patients and who had experienced COVID-19 infection. Furthermore, health workers with lower mean scores in knowledge and practice tended to have higher scores for emotional exhaustion and depersonalization (Table 2). A low perception of organizational measures was

also associated with higher mean scores of emotional exhaustion and depersonalization, as well as lower levels of personal accomplishment. Overall, health workers with burnout demonstrated significantly lower mean scores in practice, and perception of organizational measures ($p \leq 0.001$) (Table 2).

Adjusting influencing variables for high burnout using Generalized Linear Models (GLMs), it was found that health workers aged ≤ 40 years old had a 1.6 times higher likelihood of experiencing high burnout compared to those aged > 40 years old (95% CI: 1.1-2.3) (Table 3). Each 1-point increase in anxiety related Covid-19 score was associated with a 1.6 times higher risk of being in the high burnout group (95% CI: 1.4-1.9). Conversely, each 1-point increase in practice score and risk control measures score reduced the risk of high burnout by 0.13 and 0.05 times, respectively (95% CI: 0.77-0.99 and 0.92-0.98).

Table 3 Odds Ratio for high Burnout and associated variables analyzed using Generalized Linear Models

Variable	N (%)	SE	COR	AOR	95%CI		p-value
					Lower	Upper	
Age: ≤40 years	2,230 (73.2)	0.191	1.63	1.60	1.10	2.34	0.015
Direct patient care	2,682 (88)	0.261	1.34	1.18	0.71	1.96	0.529
High risk of COVID-19 contact	1,315 (43.1)	0.154	1.37	1.17	0.86	1.59	0.325
Increase COVID 19 anxiety scores	3,048 (100)	0.056	1.63	1.61	1.40	1.86	<0.001
Increase KAP-Practice scores	3,048 (100)	0.066	0.83	0.87	0.77	0.99	0.035
Increase COVID-19 REC score	3,048 (100)	0.016	0.94	0.95	0.92	0.98	0.002

Model: (Intercept), Age, Patient care, Contact high risk, Anxiety, KAP: Practice score, KAP-Knowledge, KAP-Attitude, KAP-Practice, COVID-19 REC (risk exposure control) scores

Health workers who had been infected with COVID-19 and those experiencing high burnout had an increased work error score by 1.2 points (95% CI: 1.12-1.33 and 1.07-1.34, respectively) (see Table 4). Furthermore, each 1-point increase in anxiety score was associated with a 1.05-point increase in the work error score (95% CI: 1.03-1.07). Conversely, health

workers involved in direct patient care demonstrated a 0.12-point decrease in their work error score (95% CI: 0.80-0.96). Additionally, a 1-point increase in knowledge, practice, and organizational risk control scores was associated with decreases in work error scores by 0.04, 0.05, and 0.01 points, (95% CI: 0.94-0.99, 0.92-0.98, and 0.98-0.99), respectively.

Table 4 Odds Ratio for working error scores by high burnout and other variables analyzed using Generalized Linear Models

Variable	N (%)	SE	COR	AOR	95%CI		p-value
					Lower	Upper	
Direct patient care	2,682 (88)	0.261	0.90	0.88	0.80	0.96	0.004
High risk of COVID-19 contact	1,315 (43.1)	0.154	1.09	1.03	0.97	1.10	0.321
COVID-19 positive	530 (17.4)	0.044	1.21	1.22	1.12	1.33	<0.001
High burnout	192 (6.3)	0.062	1.29	1.21	1.07	1.37	0.002
Increase COVID-19 anxiety scores	3,048 (100)	0.056	1.06	1.05	1.03	1.07	<0.001
Increase KAP-Knowledge Scores	3,048 (100)	0.014	0.95	0.96	0.94	0.99	0.005
Increase KAP-Practice scores	3,048 (100)	0.016	0.93	0.95	0.92	0.98	0.002
Increase COVID-19 REC score	3,048 (100)	0.004	0.98	0.99	0.98	0.99	0.006

Model: (Intercept), Age, Direct patient care, High risk of COVID-19 contact, COVID-19 positive, COVID-19 anxiety scores, KAP-Knowledge, KAP-Attitude, KAP-Practice, COVID-19 REC (risk exposure control) scores

Discussion

The COVID-19 REC Measure and KAP

The COVID-19 pandemic placed immense strain on health workers, increasing the risk of burnout²² due to long working hours, high patient loads, and psychological distress. This study found that, despite hospitals implementing comprehensive COVID-19 Risk Exposure Control (REC) measures, burnout remained a significant concern. The high REC scores (mean: 32.3/36) indicate that hospitals prioritized infection prevention strategies, including enhanced ventilation, structural modifications, administrative controls, and personal protective equipment (PPE)^{1,22}. While these measures contributed to creating a safer work environment, they did not fully mitigate burnout, highlighting the complex and multifaceted nature of occupational stress among health workers⁷. The effectiveness of COVID-19 REC measures varied based on hospital type, resource availability, and workforce dynamics. Hospitals with robust administrative controls and sufficient PPE supplies reported lower burnout rates, whereas facilities facing resource constraints experienced higher stress levels. Additionally, the implementation of these control measures influenced work efficiency, stress levels, and the adaptability of health workers in crisis situations²². Furthermore, hospitals made efforts to educate and train personnel to provide care for infected patients with confidence. This study found that health workers achieved high levels of knowledge, understanding, and practical skills, with

average scores of 6.3, 3.8, and 13.2 out of 7, 4, and 14, respectively. These findings may reflect the government's active dissemination of information and knowledge through various social media channels during the pandemic²³. Overall, while health risk control measures are essential, they must be complemented by broader workforce support strategies, including psychological interventions, workload management, and organizational flexibility³⁻⁵.

Prevalence and Components of Burnout

The study identified a burnout prevalence of 7.3%, notably lower than the rates exceeding 60% reported in international literature²². Additionally, the prevalence of high burnout was found to be only 6.3%, compared to 53% reported in a study conducted in Germany²⁴. This discrepancy may be attributed to differences in study methodology, population demographics, workplace conditions, and the categorization of burnout groups. The structured administrative controls and government support provided in Thailand may have contributed to reducing burnout, compared to Western settings where health workers faced prolonged exposure to high-risk environments with limited systemic support²⁴. However, variations in measurement tools and cultural perceptions of burnout may also influence differences in prevalence rates²⁵. In this study, burnout was classified into moderate and high levels, while low burnout was considered representative of a normal, engaged group¹⁵, which may partly explain the lower prevalence observed. The

components of burnout, including emotional exhaustion and depersonalization scores, were also lower than those reported in European studies²⁴. Notably, burnout was more common among younger health workers (≤ 40 years), female staff, nurses, and those with direct patient exposure and belonging to high-risk groups. These findings can be attributed to the rapid increase in infected patients, heavy workloads, extended working hours, and inadequate rest^{16,25}. The need to solve emerging problems quickly may have depleted physical and mental energy, contributing to stress and burnout¹⁶. The segmentation into burnout subtypes, Overextended (4.0%), Disengaged (4.9%), and Ineffective (24.4%), provided deeper insights into how different groups experienced occupational stress^{14,15}. Nurses, particularly those in frontline roles, exhibited high levels of emotional exhaustion and were predominantly categorized into the overextended group, a primary indicator of burnout²⁶, characterized by a loss of enthusiasm and focus on work²⁷. In contrast, doctors demonstrated greater depersonalization and decreased personal accomplishment, placing them in the ineffective group, consistent with previous studies¹¹. This trend may reflect the psychological toll associated with witnessing a high number of COVID-19 patient deaths rather than successful treatment outcomes.

Factors Influencing Burnout and Its Impact on Work Performance

Health workers aged ≤ 40 years faced a 1.6-times higher risk of burnout compared

to older staff, with most affected individuals being nurses who provided direct care for COVID-19 patients. This finding aligns with a systematic review reporting that the prevalence of burnout among ICU nurses caring for severely ill COVID-19 patients ranged from 49.3% to 58%²⁸. One possible explanation for the lower burnout rates observed in this study is that Thai hospitals implemented flexible work rotations and additional mental health support, which may have mitigated the severity of burnout⁶. Similarly, a study conducted in Thailand among nurses working in cohort wards, frontline workers exposed to a rapid influx of patients and inadequate PPE supplies, found persistent stress and fatigue¹⁶. These findings are consistent with global studies indicating that younger age groups are more vulnerable to burnout, likely due to fewer coping strategies, limited work experience, and higher exposure to emotionally demanding tasks²⁵. High anxiety levels were significantly associated with increased burnout risk, whereas adherence to COVID-19 REC measures and effective workplace practices reduced the incidence of burnout by 13% and 4.7%, respectively³⁻⁵. Notably, high burnout was linked to a 1.2-times increase in work errors, underscoring its impact on patient safety and care quality^{16,17}. Psychological resilience and coping mechanisms played a crucial role in mitigating burnout. Workers who had access to peer support programs and structured stress management training reported lower levels of emotional exhaustion. Moreover, engaging in recovery activities such

as exercise, mindfulness practices, and taking time off from work was associated with improved well-being^{6,29}. Institutions that implemented psychological support systems observed a noticeable decrease in absenteeism and improvements in work performance, reinforcing the critical importance of mental health interventions²².

This study has several limitations. First, its focus on frontline health workers limits the generalizability of the findings to the broader hospital workforce, as the experiences of non-frontline staff may differ significantly. Second, data collection took place when the severity of the pandemic declined, which may have led to an underestimation of psychological stress and burnout levels compared to earlier, more critical phases. Third, reliance on self-reported data introduces potential bias, as staff perceptions of organizational measures may not fully align with the actual policies or their effectiveness. Fourth, this study does not employ an intervention design, resulting in limited control over confounding factors such as institution-specific stress management initiatives, which are critical for mitigating burnout. This may have obscured the true impact of COVID-19 REC measures on burnout reduction. These limitations underscore the need for broader, more inclusive studies that encompass diverse healthcare roles. Future research should explore longitudinal trends in burnout to better understand the lasting effects of the pandemic on health workers and refine the development and evaluation of intervention strategies and models³⁰.

Practical Implications from this study: Hospitals should consider refining burnout prevention programs by focusing on at-risk groups, improving access to mental health resources, providing stress management training, and fostering workplace adaptability^{22,26}. Hospitals should establish a proactive, multidisciplinary approach to occupational well-being by integrating health risk control measures with mental health support strategies. This includes optimizing workload distribution, supporting team collaboration, adapting to technology service systems, and promoting a culture of open communication. Enhancing access to mental health resources may further improve work-life balance and reduce burnout risks⁶. These measures will be essential to ensure sustainability and preparedness for future public health crises^{8,27}. Given the dynamic nature of occupational stressors, continuous monitoring, tailored support programs, and proactive workforce management will be required to ensure sustainability and maintain a resilient healthcare workforce^{27,29}.

Conclusions

This study highlights that while REC (Risk Exposure Control) measures effectively can reduce COVID-19 exposure, they did not fully address burnout. Burnout was strongly associated with work stressors, particularly among younger healthcare workers and frontline staff. The discrepancy between the findings in this study and previous international reports suggests that contextual factors, such

as organizational policies, workplace culture, and institutional support structures, significantly influence burnout prevalence. Additionally, given that burnout has a direct impact on healthcare delivery and patient outcomes, hospitals should establish reasonable work schedules, strengthen leadership and team collaboration support, and improve access to mental health resources. These measures are crucial for minimizing stress and reducing burnout risks.

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