

# The Prevalence and Associated Factors of Depression among Residents in Training in a Northern Thailand University: A Cross-sectional Study

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## ABSTRACT

**OBJECTIVE** This study aimed to investigate the prevalence of and factors associated with depression in residents in training at the Faculty of Medicine, Chiang Mai University.

**METHODS** This cross-sectional study was conducted with Faculty of Medicine residents in training from March to July 2020. We used the nine-item Patient Health Questionnaire (PHQ-9) to determine the level of depression. Binary logistic regression was used to evaluate associated factors: loneliness, burnout, sleep quality, emotional quotients (EQ), and perceived social support (PSS).

**RESULTS** About one-fifth of the residents in training exhibited depression (47 of 201), and 6.97% had indications of suicidality. Factors showing a positive correlation with depression included loneliness (aOR: 1.27; 95% CI: 1.15–1.40); burnout scales of depersonalization (aOR: 1.18; 95% CI: 1.10–1.25), and reduced personal accomplishment (aOR: 1.10; 95% CI: 1.05–1.14). Factors showed a negative correlation with depression: perceived social support from significant others (aOR: 0.91; 95% CI: 0.85–0.98). Three subscales of EQ included motivation (aOR: 0.82; 95% CI: 0.68–0.99); life satisfaction (aOR: 0.83; 95% CI: 0.70–0.97); level of peace (aOR: 0.76; 95% CI: 0.66–0.87).

**CONCLUSIONS** The prevalence of depression in residents was 23.40%. Loneliness, low social support, and burnout (depersonalization, reduced personal accomplishment) were all associated with depression. Three EQ factors (motivation, life satisfaction, and peace) appeared to have potential for reducing depression.

**KEYWORDS** depression, resident training, loneliness, emotional intelligence, burnout

## INTRODUCTION

Depression is characterized by psychological symptoms, e.g., persistent sadness or anhedonia, feelings of worthlessness, as well as physical symptoms, e.g., lack of energy, loss of appetite, and insomnia. The World Health Organization (WHO) reported that 322 million people, estimated to be 4.40% of the global population, have

depression and that depression increased by 18.40% over the ten year period 2005 to 2015 (1). Previous studies have found a higher prevalence of depression among physicians than in the general population, especially among physicians in training (2). The reported prevalence of depression or depressive symptoms among resident physicians were ranging from 20.9%

to 43.2% globally (2–5) and 21.5–24.6% in Thailand (6–7). Depression can cause distress, dysfunction, self-harm, and suicide and can often result in homicide (8). Disability due to depression among physicians can affect their daily living, studying, and caring for patients (2). Understanding the impacts and factors associated with depression is essential to design effective preventive interventions for residents.

Substantial research has been conducted to understand the determinants of depression among residents. Potential risks identified include: being female, having had depression in the past, working more than 80 hours per week, and feeling burned out (6,7,9).

Burnout is a psychological syndrome which emerges as a prolonged response to chronic interpersonal stressors on the job. The three key dimensions of this response are overwhelming exhaustion, cynicism and depersonalization, and a sense of ineffectiveness and lack of accomplishment. Depersonalization refers to a negative view toward relations in the workplace causing isolation behaviors, insensitivity, and dehumanization (10,11).

Loneliness, a perception of lacking intimate relationships or social networks, is a predictor of depression. The correlation between loneliness and depression can be explained in both biological and psychological ways. Biologically, feeling lonely causes increased cortisol levels that can negatively affect the emotional brain (hippocampus), resulting in depression (12). Psychologically, loneliness involves painful feelings of isolation, disconnectedness from others, and not belonging; it is associated with low self-esteem, low social competence, and poorer quality social interactions (13). Additionally, loneliness shares common causes with depression, e.g., poor social skills, shyness, and a maladaptive attributional style (14).

Emotional quotients (EQ), comprised of self-motivation, life satisfaction, and peace, might represent a personal protective factor against depression. Self-motivation, the ability to pursue one's own goals, consist of outcome controllability (estimation of one's own abilities to control outcomes in an environment), outcome value (the expected reward or punishment for reaching an outcome), and effort costs (the effort require-

ments for getting an outcome). Good self-motivation refers to a substantial ability to control cognition beyond emotion. People with much self-motivation have a favorable view of self, e.g., self-respect and self-esteem, which can help prevent depression (15).

Barriers to mental health care were found to be related to workload. In a qualitative study of general practitioners, doctors reported feeling pressured to attend to work and a lack of having insufficient time for help-seeking and self-care (16). In addition to stigmatizing attitudes towards mental disorders within the medical professions, practitioners reported barriers related to concerns about confidentiality and the potential impact on career progression (17).

However, there have been limited studies focusing on methods of preventing depression, such as EQ and social support (18). The present study aimed to determine the prevalence of and factors associated with depression (potential risk and strengths) among residents for use in strategic planning to prevent depression.

## METHODS

### Study design

This cross-sectional study was conducted among residents at the Faculty of Medicine, Chiang Mai University, from March to July 2020. This study was approved by the Research Ethics Committee, Faculty of Medicine, Chiang Mai University (reference number 041/6957).

The authors affirm that all methods were carried out in accordance with the committee's guidelines and regulations. Informed consent was obtained from all participants and all the participants were over 16 years.

### Participants

This study included all residents at the Faculty of Medicine, Chiang Mai University, in the 2019 academic year. The only inclusion criterion was fluency in the Thai language. Exclusion criteria were unwillingness to participate and incomplete questionnaires. Participants received an invitation, consent form, and questionnaires via an online platform, and they completed questionnaires privately without compulsion or compensation. All responses were anonymous and confidential. Incomplete questionnaires

were not included in our database.

### Assessment

The following sociodemographic characteristics, five factors strongly related to the occurrence of depression were studied.

#### *Sociodemographic characteristics*

Sociodemographic characteristics included age, sex, marital status, hometown, institutions from which they had received a medical degree, number of years of training, number of years of general practice before training, income (baht per month), overtime working hours per week, underlying medical diseases, psychiatric history, family psychiatric history, and alcohol drinking.

#### *Burnout syndrome*

The Thai version of the Maslach Burnout Inventory, a 22-item self-report, was used to evaluate burnout in three dimensions: emotional exhaustion (EE) (Cronbach's  $\alpha = 0.92$ ), depersonalization (DP) (Cronbach's  $\alpha = 0.66$ ), and reduced personal accomplishment (PA) (Cronbach's  $\alpha = 0.65$ ). Each subscale used a seven-point Likert scale ranging from 0 (never) to 7 (every day) for negative questions and 7 (every day) to 0 (never) for positive questions. Higher summary scores of EE and DP and lower summary scores of PA are associated with higher levels of burnout (19).

#### *Loneliness*

The Thai version of the 6-Item Revised UCLA Loneliness Scale (RULS-6), a short version of the UCLA Loneliness Scale, was modified and tested by Nahathai Wongpakaran, et al. Cronbach's  $\alpha$  of the RULS-6 was 0.83. The questionnaire measures loneliness, e.g., "How often do you feel alone?". Each item used a four-point Likert scale: 1 (often), 2 (sometimes), 3 (rarely), and 4 (never). A higher score indicates a higher loneliness level (20,21).

#### *Perceived social support*

The revised Thai version of the Multidimensional Scale of Perceived Social Support (r-T-MSPSS) was used to measure the individual's perceived social support from three sources: significant others (SO), family (FA), and friends (FR). The 12-item self-report questionnaire responses were scored on a seven-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). Higher scores refer

to higher perceived social support from each source (22).

#### *Emotional quotients (EQ)*

The Department of Mental Health, Ministry of Public Health, developed an EQ measurement for Thai people aged 18–60 years (23). This self-report questionnaire measures nine subscales of EQ: emotional self-control, empathy, responsibility, self-motivation, problem-solving, interpersonal relationships, self-regard, life satisfaction, and peace. The rating scale is a four-point Likert scale with scores ranging from 1 (not true) to 4 (very true) for positive questions and 4 (not true) to 1 (very true) for negative questions. The overall Cronbach's  $\alpha$  is 0.85 (24).

### Sleep quality

The Thai Version of the Pittsburgh Sleep Quality Index (T-PSQI) is a 19-item self-report questionnaire that evaluates sleep quality in the past month and consists of seven component scores. Each component's score ranges from 0 (no difficulty) to 3 (severe difficulty), with a total PSQI score  $> 5$  defined as poor sleep quality (Cronbach's  $\alpha = 0.84$ ) (25,26).

### Depression

Depression was determined using the Thai version of the nine-question Patient Health Questionnaire Scale (PHQ-9). This self-report questionnaire refers to depressive symptoms experienced in the past two weeks ("feeling down, depressed, or hopeless"). Scores for each item range from 0 (not at all) to 3 (nearly every day). The recommended cut-off score for depression is 9. The severity of depression is classified as mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). The Thai version of PHQ-9 has good internal consistency (Cronbach's  $\alpha = 0.79$ ) (27,28).

### Study size estimation

The calculated sample size was 260 based on the prevalence of 21.52% reported in previous study (6). That study's response rate was relatively low (38.50%). For that reason, we invited all residents in training at Chiang Mai University in 2019 ( $N=598$ ) to participate in the study rather than using sampling.

## Statistical analysis

Categorical data was calculated as percentages and was compared using Fisher's exact test. For continuous data with a normal distribution, we used the mean  $\pm$  the standard deviation (SD) and independent t-test results. We used the median interquartile range (IQR) and the Mann Whitney U test for non-normally distributed continuous data. Prevalence and severity of depression in residents are reported as percentages. Univariable analysis was carried out to determine the statistically significant factors. The association between factors and depression was analyzed using multivariable logistic analysis to adjust for the effect of other predictor factors.

We divided the factors into three models and analyzed each of them separately as follows.

- Model 1 included having an underlying medical disease, being a poor sleeper, and suffering burnout (EE, DP, PA)
- Model 2 included loneliness and perceived social support (SO, FA, FR)
- Model 3 included nine subscales of EQ (emotional self-control, empathy, responsibility, self-motivation, problem-solving, interpersonal relationships, self-regard, life satisfaction, and peace)

The effect sizes of the associations are presented as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at  $p < 0.05$  (two-sided).

## RESULTS

Two hundred and one of 598 residents in training (33.60%) completed the questionnaire. The mean age was  $28.18 \pm 0.15$  years. Most participants were female (65.70%). The majority were unmarried (89.10%). Almost half of the participants studied in their hometown and 75.10% studied in the institution where they received their MD degree. A plurality of the study participants was in their first (33.30%) or second year (30.30%). Of the participants, 12.40% had underlying medical conditions and 3.50% had a history of psychiatric problems. Most (84.60%) drank alcohol less than once a month (Table 1).

The prevalence of depression among residents was 23.40% (47 of 201). Of that number, 37.30% (75 of 201) had mild depression (a PHQ-9

score lower than the cut-off of 9), 11.90% had moderate depression, 2.50% had moderately severe depression and 1.50% had severe depression. Overall, the prevalence of suicidality in the depression group was 29.79% with the occurrence increasing with the severity of the depression (Table 2).

The proportion of the participants who received treatment for depression during the study period was relatively low at 3.48% (7 of 201). Among the participants with mild depression, 6.67% (5 of 75 participants) had suicidal thoughts, but none had received treatment. The percentage of participants with moderate depression with suicidal thoughts was 16.67, but only 4.17% had received treatment. Surprisingly, 60% of participants with moderately severe depression had suicidal ideations, but none had received treatment. Lastly, of the participants in the severe depression group, only those with suicidal ideas had received treatment (Table 2).

In the univariable analysis, all factors were significantly associated with depression (Table 3). However, multivariable logistic regression found only loneliness and two burnout dimensions (DP and PA) to be statistically significantly positively correlated with depression. Furthermore, perceived social support from significant others and EQ (motivation, life satisfaction, and peace) were negatively correlated with depression (Table 4). Having a medical underlying disease was negatively associated with depression with an adjusted odds ratio (aOR) of 0.21 ( $p = 0.055$ ) (Tables 3, 4).

## DISCUSSION

### The prevalence of depression

In this study, the prevalence of depression among residents was 23.40%. Compared with previous studies, this prevalence of depression among residents was lower than the worldwide rate of about one-third (2) and similar to the rate in Thailand of about one-fourth (6,7). Although the majority of the depressed participants experienced mild to moderate depression in a stressful situation such specialty training, the depressive symptoms and the delay of needed treatment could have had negative effects on the quality of their work and reduced their empathic response to patients and may resulted in

**Table 1.** Sociodemographic characteristics of the participants

| Sociodemographic data<br>n(%) or median(IQR) | All<br>(n=201)            | Depression<br>(n=47)      | Non-depression<br>(n=154) | p-value |
|----------------------------------------------|---------------------------|---------------------------|---------------------------|---------|
| Age                                          | 28 (27-29)                | 28 (27-29)                | 28 (27-29)                | 0.497   |
| Female                                       | 132 (65.70%)              | 31 (66.00%)               | 101 (65.60%)              | 0.962   |
| Marital status                               |                           |                           |                           |         |
| Single                                       | 179 (89.10%)              | 42 (89.40%)               | 137 (89.00%)              | 0.761   |
| Married (living together)                    | 12 (6.00%)                | 2 (4.30%)                 | 10 (6.50%)                |         |
| Married (separated)                          | 10 (5.00%)                | 3 (6.40%)                 | 7 (4.50%)                 |         |
| Have a child/children                        | 4 (2.00%)                 | 2 (4.30%)                 | 2 (1.30%)                 | 0.204   |
| Training place same as hometown              | 94 (46.80%)               | 20 (42.60%)               | 74 (48.10%)               | 0.508   |
| Training place same as MD graduation         | 151 (75.10%)              | 35 (74.50%)               | 116 (75.30%)              | 0.905   |
| Years of general practice                    | 2 (1-3)                   | 3 (1-3)                   | 1.25 (1-3)                | 0.330   |
| Income (baht/month)                          | 35,000<br>(30,000-40,000) | 35,000<br>(30,000-40,000) | 35,000<br>(30,000-40,000) | 0.621   |
| Overtime (hours/week)                        | 32 (14-50)                | 40 (21-60)                | 32 (11-50)                | 0.093   |
| Year of training                             |                           |                           |                           |         |
| First                                        | 67 (33.30%)               | 18 (38.30%)               | 49 (31.80%)               | 0.290   |
| Second                                       | 61 (30.30%)               | 16 (34.00%)               | 45 (29.20%)               |         |
| Third                                        | 45 (22.40%)               | 5 (10.60%)                | 40 (26.00%)               |         |
| Fourth                                       | 25 (12.40%)               | 7 (14.90%)                | 18 (11.70%)               |         |
| Fifth                                        | 3 (1.50%)                 | 1 (2.10%)                 | 2 (1.30%)                 |         |
| Extra personal practice                      | 32 (15.90%)               | 9 (19.10%)                | 23 (14.90%)               | 0.489   |
| Underlying medical conditions                | 25 (12.40%)               | 2 (4.30%)                 | 23 (14.90%)               | 0.052   |
| Psychiatric history                          | 7 (3.50%)                 | 3 (6.40%)                 | 4 (2.60%)                 | 0.215   |
| Family psychiatric history                   | 4 (2.00%)                 | 1 (2.10%)                 | 3 (1.90%)                 | 0.938   |
| Alcohol drinking                             |                           |                           |                           |         |
| None                                         | 93 (46.30%)               | 24 (51.10%)               | 69 (44.80%)               | 0.761   |
| ≤ 1 time/month                               | 77 (38.30%)               | 15 (31.90%)               | 62 (40.30%)               |         |
| 2-4 times/month                              | 28 (13.90%)               | 7 (14.90%)                | 21 (13.60%)               |         |
| 2-3 times/week                               | 3 (1.50%)                 | 1 (2.10%)                 | 2 (1.30%)                 |         |

IQR, interquartile ranges; MD, Medical Doctor or Doctor of Medicine

**Table 2.** Percentage having suicidal ideas and receiving of treatment by severity of depression

| Severity of depression              | Mild<br>depression<br>(n=75) (%) | Moderate<br>depression<br>(n=24) (%) | Moderately severe<br>depression<br>(n=5) (%) | Severe<br>depression<br>(n=3) (%) |
|-------------------------------------|----------------------------------|--------------------------------------|----------------------------------------------|-----------------------------------|
| Received treatment                  | 2.67                             | 4.17                                 | 0                                            | 66.67                             |
| Suicidal thoughts without treatment | 6.67                             | 12.50                                | 60                                           | 0                                 |
| Suicidal thoughts (in treatment)    | 0                                | 4.17                                 | 0                                            | 66.67                             |

the termination of their training.

For residents, accessibility of treatment was problematic. Not all suicidal participants had received or were receiving treatment at the time of the study, and only 14.89% of the depression group had received treatment. Studies of suicidal ideation rates and treatment-seeking by US physicians have reported similar results, i.e., 6.50% of the participants reported having suicidal thoughts in the previous 12 months, and physicians with suicidal ideation were less

likely to report that they would seek help than physicians without suicidal ideation (64.20% or 203 of 316 versus 73.50% or 3,318 of 4,517), respectively,  $p = .001$  (29).

The low rate of seeking treatment may be the result of barriers, e.g., unclear policies and processes, fear of professional consequences from disclosure to a supervisor, and an excessive workload with insufficient free time. A National Mental Health Survey across Australia in 2013 reported stigmatization of mental health

**Table 3.** Factors associated with depression

| Factors, median (IQR)           | All (n=201) | Depression (n=47) | Non-depression (n=154) | OR (95% CI)      | p-value  |
|---------------------------------|-------------|-------------------|------------------------|------------------|----------|
| Burnout                         |             |                   |                        |                  |          |
| Emotional exhaustion            | 19 (10–28)  | 27 (19–36)        | 16 (8–26)              | 1.07 (1.04–1.11) | < 0.001* |
| Depersonalization               | 6 (3–13)    | 13 (9–19)         | 6 (3–10)               | 1.14 (1.08–1.21) | < 0.001* |
| Reduced personal accomplishment | 14 (9–23)   | 20 (15–29)        | 13 (8–21)              | 1.06 (1.03–1.10) | < 0.001* |
| Poor sleeper                    | 119 (59.2)  | 36 (76.6)         | 83 (53.9)              | 2.80 (1.33–5.90) | 0.007*   |
| Loneliness                      | 12 (9–15)   | 15 (13–18)        | 11 (8–14)              | 1.31 (1.19–1.45) | < 0.001* |
| Perceived social support        |             |                   |                        |                  |          |
| Total                           | 70 (62–75)  | 62 (54–71)        | 71.5 (66–76)           | 0.92 (0.89–0.96) | < 0.001* |
| Significant others              | 24 (20–25)  | 20 (16–24)        | 24 (21–26)             | 0.87 (0.82–0.93) | < 0.001* |
| Friends                         | 24 (21–25)  | 21 (18–24)        | 24 (22–26)             | 0.82 (0.75–0.90) | < 0.001* |
| Family                          | 24 (22–27)  | 22 (19–24)        | 24 (22–27)             | 0.86 (0.80–0.93) | < 0.001* |
| Emotional quotient              |             |                   |                        |                  |          |
| Self-control                    | 19 (17–20)  | 17 (14–19)        | 19 (18–21)             | 0.73 (0.64–0.84) | < 0.001* |
| Empathy                         | 18 (16–21)  | 17 (15–19)        | 19 (17–21)             | 0.76 (0.66–0.88) | < 0.001* |
| Responsibility                  | 20 (17–21)  | 18 (15–21)        | 20 (18–22)             | 0.82 (0.73–0.93) | 0.001*   |
| Motivation                      | 16 (15–17)  | 15 (14–16)        | 16 (15–18)             | 0.75 (0.64–0.88) | < 0.001* |
| Problem-solving                 | 17 (15–20)  | 15 (14–18)        | 18 (15–20)             | 0.78 (0.69–0.89) | < 0.001* |
| Relationship                    | 17 (16–19)  | 16 (15–17)        | 17 (16–20)             | 0.78 (0.68–0.90) | 0.001*   |
| Self-esteem                     | 11 (10–13)  | 11 (9–11)         | 12 (11–13)             | 0.61 (0.49–0.76) | < 0.001* |
| Life satisfaction               | 19 (17–21)  | 17 (15–19)        | 20 (17–21)             | 0.71 (0.62–0.82) | < 0.001* |
| Peace                           | 19 (16–22)  | 15 (15–18)        | 21 (17–23)             | 0.70 (0.62–0.79) | < 0.001* |

IQR, interquartile ranges; OR, odds ratio; CI, confidence interval

\*significant  $p < 0.050$  (two-sided)**Table 4.** Multivariable binary logistic regression

| Model | Variable(s)                                   | aOR (95% CI)       | p-value  |
|-------|-----------------------------------------------|--------------------|----------|
| 1     | Having a medical underlying disease           | 0.21 (0.04 – 1.04) | 0.055    |
|       | Burnout (depersonalization)                   | 1.18 (1.10 – 1.25) | < 0.001* |
|       | Burnout (reduced personal accomplishment)     | 1.10 (1.05 – 1.14) | < 0.001* |
| 2     | Loneliness                                    | 1.27 (1.15 – 1.40) | < 0.001* |
|       | Perceived social support (significant others) | 0.91 (0.85 – 0.98) | 0.009*   |
| 3     | Emotional Quotient (self-motivation)          | 0.82 (0.68 – 0.99) | 0.041*   |
|       | Emotional Quotient (life satisfaction)        | 0.83 (0.70 – 0.97) | 0.023*   |
|       | Emotional Quotient (peace)                    | 0.76 (0.66 – 0.87) | < 0.001* |

Model 1 was adjusted for having an underlying medical disease, burnout (emotional exhaustion, depersonalization, reduced personal accomplishment), and poor sleeping

Model 2 was adjusted for loneliness and perceived social support (significant others, friends, and family)

Model 3 was adjusted using nine Emotional Quotient subscales (emotional self-control, empathy, responsibility, self-motivation, problem-solving, interpersonal relationships, self-regard, life satisfaction, and peace)

aOR, adjusted odds ratio; CI, confidence interval

\*significant  $p < 0.050$  (two-sided)

problems among young doctors including a belief that a doctor having depression was a sign of personal weakness and that for a doctor to be a patient was a source of embarrassment. The younger practitioners were more comfortable seeking help from a friend or relative than

seeking professional support from a psychiatrist or a psychologist (13).

### Associative factors of depression

Experiencing burnout and loneliness seem to be potential risks, whereas social support

and EQ seem to be possible protective factors.

Participants with depression reported significantly higher burnout scores in all three key dimensions. Still, in this study multivariable binary logistic regression analysis (Table 4) found only two burnout dimensions to be positively correlated with depression: depersonalization and a low level of personal accomplishment. However, the absence of consensual clinical diagnostic criteria and the overlap of burnout and major depression symptoms may have contributed to these findings.

The burnout scores in all dimensions in the present study are lower than in a study at another university teaching hospital in Thailand. A survey at Songklanagarind Hospital (7) reported the total prevalence of burnout syndrome among residents was 100%, with EE, DP, and PA scores of  $25.3 \pm 12.6$ ,  $8.0 \pm 6.8$ , and  $13.9 \pm 8.8$ , respectively. In contrast, a study at Thammasat University Hospital (30) reported EE, DP, and PA scores of  $27.5 \pm 12.7$ ,  $7.7 \pm 6.3$ , and  $14.3 \pm 1.9$ , respectively.

For the EQ domains, peace of mind was characterized by the affective states of internal peace and harmony. The people who had more peace of mind suffered less from psychological distress. Our study found that individuals with a high level of peace had a possible internal protective factor against depression.

The median duration of overtime was 32 hours per week which was similar to the 37.79 hours at another teaching hospital (31), but the present study found no significant difference in overtime work between groups of participants unlike the other study which found that residents with depression worked more overtime compared with the residents without depression (average 49.33 hours per week and 28.43 hours per week, respectively).

A strength of this study is the effort to identify protective factors related to depression among residents which could be used as a starting point for planning intervention to prevent depression. However, the study had limitations in that it was a single site, cross-sectional study and that it was based on a relatively small sample.

Other limitations of this study include, first, that the nonresponse rate might have negatively impacted the precision of the findings. This study's response rate was 33.60%, similar

to other survey studies conducted in the same fashion (6,30,32,33). The low response rate in the present study may have resulted from the doctors' unfamiliarity with the digital survey platform at the time this study was conducted. Additionally, the participants in the study were from various departments, with only small numbers from some departments. Differences in academic and working environments in those departments may have affected trainees' mental health.

A further multiple-site longitudinal study with a larger sample size might provide increased generalizability, better support for causative explanations, and greater statistical power. The findings of this study should be interpreted with caution because of possible information bias resulting from the limitations of self-report questions.

## CONCLUSIONS

The depression rate of over 20% among Northern Thai medical residents is higher than the general population but lower than among medical residents worldwide and those in other Thai medical institutions. Decreasing loneliness, increasing social support, and reducing the incidence of burnout (depersonalization and feelings of low personal accomplishment) and improving EQ (motivation, life satisfaction, and peace) might help reduce depression among residents.

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## CONFLICTS OF INTEREST

The authors of this study have no conflicts of interest.

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