








## RESEARCH ARTICLE

**REVISED** Mental health status and quality of life among Cambodian migrant workers in Thailand [version 2; peer review: 1 approved, 1 approved with reservations]Wongsa Laohasiriwong <sup>1</sup>, Pall Chamroen <sup>2,3</sup>, Sim Samphors <sup>4</sup>, Thiwakorn Rachutorn<sup>5</sup>, Rebecca S. Dewey <sup>6</sup>, Vong Pisey <sup>7</sup><sup>1</sup>Faculty of Public Health, Khon Kaen University, Khon Kaen, 40002, Thailand<sup>2</sup>Ministry of Education, Youth and Sport, Phnom Penh, Cambodia<sup>3</sup>KHANA Center for Population Health Research, Phnom Penh, Cambodia<sup>4</sup>Graduate School, Chea Sim University of Kamchaymear, Prey Veng, Cambodia<sup>5</sup>Department of Environmental Health, Faculty of Public Health, Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima, Thailand<sup>6</sup>University of Nottingham, United Kingdom, UK<sup>7</sup>Office of Rural Health Care, Pursat Provincial Department of Rural Development, Ministry of Rural Development, Phnom Penh, Cambodia**V2** First published: 16 Sep 2020, 9:1138  
<https://doi.org/10.12688/f1000research.25419.1>Latest published: 25 Sep 2020, 9:1138  
<https://doi.org/10.12688/f1000research.25419.2>**Abstract****Background:** Migrant workers have become a major issue for Thailand. Most of the migrants are from Myanmar, Cambodia, and Laos. Most are employed in jobs referred to as the "3 Ds"; difficult, dangerous and dirty. However, little is known concerning the living and working conditions, or health-related quality of life of these migrant workers. This study aims to determine factors influencing the quality of life of Cambodian migrant workers in Thailand.**Methods:** A cross-sectional study was conducted among 1,211 Cambodian migrant workers in Thailand, using multistage random sampling from eight districts of the two provinces (Sa Kaeo and Surin) with a structured questionnaire interview. The WHOQOL-BREF was used to measure Quality of Life (QOL) with Cronbach's alpha of 0.77. Mental health status was assessed using the Perceived Stress Scale (PSS) and Center for Epidemiological Studies-Depression (CES-D) scale with Cronbach's alpha of 0.83. Descriptive statistics provide participant characteristics. Multilevel logistic regression (MLR) were used to determine which factors significantly impacted the outcome measures in terms of the adjusted odds ratio (AOR).  $P < 0.05$  was considered statistically significant.**Results:** About one third of these migrant workers had a poor quality of life (34.52%; 95%CI: 31.84-37.20), and had moderate-to-high levels of stress (67.96%; 95%CI: 65.33-70.59), and symptoms of depression (69.69%; 95%CI: 67.10-72.29). After controlling other covariate factors,**Open Peer Review**Reviewer Status  

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report



report

**version 1**

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the factors associated with poor QOL were a high level perceived of stress (AOR=3.64; 95%CI: 2.41-5.49;  $p<0.001$ ); living with family and relatives (AOR=3.63; 95%CI: CI 2.42-5.45;  $p<0.001$ ); and housing being provided by their employer (AOR=2.66; 95%CI: 1.74-4.08;  $p<0.001$ ).

**Conclusion:** Stress was strongly associated with QOL. The living environment was found to be the next most influential factor on QOL. Mental health programs aimed at helping migrant workers to cope with stress and to improve their living conditions will help improve QOL in the target group.

### Keywords

Quality of Life, Mental Health, Adaptation, Transients and Migrants, Cambodian migrant workers

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The author list was updated to include Wongsu Laohasiriwong.

**Any further responses from the reviewers can be found at the end of the article**

## Introduction

Migration has become a critical global issue. Reports state the arrival into Thailand of more than 3.5 million migrant workers from Myanmar, Cambodia and Laos, most of whom are employed in jobs described as the “3 Ds” (difficulty, dangerous and dirty), with low pay that would not attract most native Thai employees<sup>1,2</sup>. According to the Thailand Migration Report, 2011, 41.0% of migrant workers are employed in industry, 27.6% in agriculture, and 31.4% in other services. Because of their working status and only having access to certain sectors of employment, most migrant workers are frequently exposed to hazardous and dangerous conditions: chemical use in agriculture, poor working conditions in industry, forced long hours and work overload. This is coupled with the potential for deportation, arrest, workplace accidents, violence or abuse, and living and working in dirty, dangerous, unhealthy, unclean, uncomfortable or unfavorable conditions, often resulting in illness, disability and death. 90% of low-skilled migrant workers have low levels of educational attainment<sup>3,4</sup>.

At present, over one-third of the Cambodian population are migrants to Thailand. Almost half the Cambodian population remains in poverty, with 80% of them are living in rural areas where their quality of life is likely to be lower than those living in urban areas. Migration to Thailand is reported to provide a better quality of life than other migrant worker destinations<sup>5-7</sup>. However, migration abroad is associated with a worse financial status than working in Phnom Penh due to high levels of stress incurred in relation to money, their future, and consequently the impact on mental health causing a decrease in quality of life<sup>8</sup>.

The term quality of life (QOL) refers to the level of an individual’s standard of health, comfort, and happiness. It is a multidimensional construct, involving physical health, psychological health, social relationships, and environmental domains, as defined by the World Health Organization<sup>9</sup>. Studies on the psychological impact of the working and living environments report low-to-medium QOL levels within migrant workers working in various occupations in Thailand<sup>10-12</sup>, and adult garment manufacture in Bangladesh<sup>13</sup>. This has been associated with health difficulties of migrant workers in France<sup>14</sup>, low-to-medium QOL in rural-to-urban female migrant factory workers in China<sup>15</sup>, and with an impact on social relationships among Burmese domestic female workers in Singapore<sup>16</sup>. Agricultural workers have frequently reported work-related injuries and occupational-health issues related to stress and depression<sup>17,18</sup>. Nearly one third of Cambodian farm workers in eastern Thailand reported occupational injury (back pain/joint pain), and most had limited access to healthcare services<sup>19</sup>, likely compounding the impact on QOL.

However, while most studies have focused on Burmese migrant workers or on workers of unspecified nationality, there has been little attention paid to Cambodian migrant workers, especially on their mental health status and QOL<sup>20</sup>. Little is known concerning their living and working conditions and health-related QOL. This study aims to determine the factors influencing QOL within Cambodian migrant workers in Thailand.

## Methods

### Study design and sample

A cross-sectional study was conducted by using a multistage random sampling method to choose the study sample. Data were collected between March 2018 and May 2018. Cambodian migrant workers are required to register with the Department of Employment Office in each province in order to benefit from Universal Health Coverage (UHC), and to be bestowed with legal working status in Thailand. We applied for and gained permission to use this list from the Department of Employment Office in Thailand. For Sa Kaeo and Surin provinces, a total of 24,256 Cambodian migrant workers were listed during time of study. Finally 1,211 sample size was calculated following the formula from Hsieh FY *et al.* (1998) as follows:

$$np = \frac{n_1}{1 - \rho_{1,2,3,\dots,p}^2}$$

The approximate sample size was 435 which were further adjusted to control the over-fitting using the rho ( $\rho$ ) of 0.65 and variance inflation factor (VIF) equal to 2.85. Therefore, the total number of the sample was 1,211. The sample size was calculated to be 1,211. The sampling process was achieved as follows: (I) Sa Kaeo and Surin provinces were randomly selected from the total number of 7 eastern and northeastern Thai provinces that share a boarder with Cambodia, representing a total migrant population in the two provinces of 24,256 (Sa Kaeo represents 89% of this with 21,619 migrant workers, and Surin the remaining 11%, with 2,637 migrant workers). (II) The sample size was split by proportion to the relative populations of the two provinces, with 1,053 samples allocated to Sa Kaeo province and 158 to Surin. (III) Simple random sampling was used to select 8 out of 26 districts. (IV) Systematic random selections were made from the name lists of the total migrant worker population in each of these districts until the completed sample size was achieved.

**Inclusion criteria:** All participants in the study were 18 years of age or above, and had been working in Thailand for at least 1 month before the interview period. Having the required legal documents including a passport, work-permit, border pass required for legal migrant workers, and good physical health and mental health and were willing to participate in the study.

**Exclusion criteria:** Any person with a disability was excluded. Participants with unofficial documents and who were not willing to participate in the study were also excluded.

The data was collected through in-person interviews conducted by trained interviewers. Interviews took place between March 2018 and May 2018. Prior to data collection five research

assistants were trained one-day training on the study objectives and how to administer the questionnaires. Once they understood the data collection process research assistants were paired to test the questionnaire on each other to further ensure they were familiar with all parts of the questionnaire.

All participants were informed about the purpose, benefits and assured of confidentiality before signing the consent for the study. For convenience, researcher also asked permission from the employer of the migrant workers to interview participants at time that would minimize disruption to their working hours. If participants were illiterate researchers asked a literate volunteer to witness the accurate reading of the consent form, allow the participant to ask any questions and then subsequently signed on their behalf. This study was approved by the Khon Kaen University (KKU) committee for research ethics in human research (Reference no. HE602361), Khon Kaen, Thailand.

### Research instruments

A structured questionnaire was developed from reviewed literatures based on research questions, first in English and was then translated into Khmer using forward and backward translation procedures. The questionnaire consisted of 4 sections which were a) individual characteristics and socio-demographic factors, namely gender, age, marital status, educational attainment, occupation, financial status, work environment, incidence of work injury, residential arrangement, house tenure, distance from house to community center (km), daily travel to work, the incidence of work-related diseases during past 12 months, and smoking status. A copy of the questions asked are provided as extended data, b) the Perceived of Stress Scale (PSS) of Cohen *et al.* (1983), d) depression Scale (CES-D) of Radloff *et al.* (1977) with Cronbach's alpha of 0.83, and c) WHOQOL-BREF Khmer version with Cronbach's alpha of 0.77. The questionnaire was undergone content validation by five experts and was revised to improve validity.

### Statistical analysis

Demographic characteristics of the participants were described using frequency and percentage for categorical data and using mean and standard deviation for continuous data. Inferential statistics comprising simple logistic regression bivariate and multivariate models were used in a multilevel mixed-effects model to reduce clustering effects. Confidence intervals (CI) were taken at 95% and statistical significance was considered at  $p < 0.05$ . All analyses were performed using *Stata* version 10.0 (Stata Corp, College Station, TX).

## Results

### Demographic characteristics

Of the 1,211 Cambodian migrant workers, 50.37% were male and 50.29% were working in the agricultural sector. The mean age was 32.54 ( $\pm 11.13$ ) years (range: 18–67) (Table 1). The majority of respondents were married (62.59%). Most had no formal education (42.69%). The median monthly personal income was 7,500 (range: 7,500–20,000) Baht (equivalent to 237 USD at time of publication; Table 1). Mental health problems were common, with 57.72% of participants reporting moderate levels of perceived stress (32.04% low level and 10.24% high level).

**Table 1. Characteristics of Cambodian migrant workers in Thailand (n=1,211).**

Characteristics	Number	Percentage (%)
<b>Sex</b>		
Male	610	50.37
Female	601	49.63
<b>Age (years)</b>		
<20	157	12.96
20 – 29	381	31.46
30 – 39	384	31.71
40 – 49	164	13.54
≥50	125	10.32
Mean±SD 32.54 ± 11.14 years, Median (Min, Max): 31 (18, 67)		
<b>Marital status</b>		
Married (with certificate)	435	35.92
Married (without certificate)	323	26.67
Single	303	25.02
De facto	107	8.84
Separated/divorced/widowed	43	3.55
<b>Educational attainment</b>		
No formal education	517	42.69
Primary education	454	37.49
Secondary education	181	14.95
High School or equivalent and higher	59	4.87
<b>Occupation</b>		
Agricultural worker	609	50.29
Construction worker	278	22.96
Household worker	134	11.07
Service industry worker	126	10.40
Manufacturing industry worker	48	3.96
Animal husbandry worker	16	1.32
<b>Financial status</b>		
Not enough with debts	566	46.74
Enough with saving	328	27.09
Enough but not saving	225	18.58
Not enough	92	7.60
<b>Work environment</b>		
Outdoor	805	66.47

Characteristics	Number	Percentage (%)
Semi-indoor	218	18.00
Indoor	188	15.52
<b>Work injuries (during past 12 months)</b>		
No	534	44.10
Yes	677	55.90
<b>Residential arrangement</b>		
Family	982	81.09
Alone	115	9.50
Friend	114	9.41
<b>House tenure</b>		
Provided by employer	1,015	83.82
Rented	196	16.18
<b>Distance from community center</b>		
<1 km	431	35.59
1 km – 4.9 km	432	35.67
≥5km	348	28.74
<b>Daily travel to workplace facility</b>		
By employer’s vehicle	827	68.29
By motorbike	178	14.70
By foot	177	14.62
By bicycle	29	2.39
<b>Work-related diseases (during past 12 months)</b>		
No	467	38.56
Yes	744	61.44
<b>Smoking</b>		
No	865	71.43
Yes	346	28.57

Many respondents reported symptoms of depression (69.69% compared to 30.31% not reporting these symptoms) (Table 2). Most of the participants (55.33%) had a moderate QOL level, 34.52% had low QOL and 10.16% had high QOL (Table 3).

The bivariate analysis using simple logistic regression (SLR) indicated that having a high perceived stress score and having depression symptoms were significantly associated with poor QOL (p<0.001 and p=0.001 respectively). However, sex, age, marital status, educational attainment, job category, financial status, working environment, suffering a work injury in the past 12 months, residential arrangement, house tenure, distance between

**Table 2. Number and percentage of common mental health problems among Cambodian migrant workers in Thailand (n=1,211).**

Mental Health Status	n	percent	95%CI: CI
<b>Perceived Stress (PSS)</b>			
Low level (0-13)	388	32.04	29.41 to 34.67
Moderate level (14-26)	699	57.72	54.93 to 60.51
High level (27-40)	124	10.24	8.53 to 11.95
<b>Depression (CES-D)</b>			
No depression (0-15)	367	30.31	27.71 to 32.90
Depression (≥16)*	844	69.69	67.10 to 72.29

\*(>=16)=Cutoff score of 16 or higher on CES-D is indicative of depression symptoms.

**Table 3. Number and percentage of quality of life (QOL) scores among Cambodian migrant workers in Thailand (n=1,211).**

Quality of Life (QOL)	n	percent	95%CI: CI
Low level (26-60)	418	34.52	31.84 to 37.20
Moderate level (61-95)	670	55.33	52.52 to 58.13
High level (96-130)	123	10.16	8.45 to 11.86

n: number of participants.

house and community center, daily travel to work, suffering work-related diseases in the past 12 months, and smoking were also all significantly associated with poor QOL (Table 4).

The final model was constructed using multivariate analysis, controlling for clustering effects using multilevel logistic regression (MLR) and control covariates. This final model indicated that factors significantly associated with poor QOL were a high perceived stress level (AOR=3.64; 95%CI: 2.41-5.49; p<0.001); living with family/relatives (AOR=3.63; 95%CI: 2.42-5.45; p<0.001); living in housing provided by their employer (AOR=2.66; 95%CI: 1.74-4.08; p<0.001); commuting to work using their employer’s vehicle or by foot (AOR=1.64; 95%CI: 1.11-2.42; p=0.012); and living more than 1 km from the community center (AOR=1.41; 95%CI: 1.07-1.87; p=0.016). However, having symptoms of depression was not associated with poor QOL [Table 1–Table 5].

**Discussion**  
**Explaining the findings**

The prevalence of low QOL in Cambodian migrant workers was 34.52% (95%CI: 31.84-37.20) with moderate QOL at 55.33% (95%CI: 52.52-58.13) and high QOL at 10.16% (95%CI: 8.45-11.86). This result is in contradiction to a previous study on the QOL of Burmese migrant workers in the Chiang Rai province of Thailand<sup>10</sup>, which reported 0.20% as having low QOL, 56% moderate QOL and 43.8% high levels of QOL. These

**Table 4. Bivariate analyses for factors associated with low Quality of Life (QOL) of migrant workers (n=1,211) using Simple logistic regression (SLR).**

Characteristics	Number	Low QOL (%)	Crude OR	95%CI: CI	p-value
<b>Overall</b>	<b>418</b>	<b>34.52</b>	<b>N/A</b>	<b>31.84 to 37.20</b>	N/A
<b>Sex</b>					0.047
Female	601	31.78	1		
Male	610	37.21	1.27	1.00 to 1.61	
<b>Age (years)</b>					0.095
<30	538	31.97	1		
≥30	673	36.55	1.23	0.96 to 1.56	
<b>Marital status</b>					0.002
Single/separated/divorced/widowed	346	28.03	1		
Married/ de facto	865	37.11	1.51	1.15 to 2.00	
<b>Educational attainment</b>					0.015
Secondary education or higher	240	27.92	1		
Primary education or less	971	36.15	1.46	1.07 to 2.00	
<b>Occupation</b>					<0.001
Service industry/ manufacturing/ household worker	308	23.70	1		
Construction worker	278	39.93	2.13	1.50 to 3.05	
Agricultural/animal husbandry worker	625	37.44	1.31	1.03 to 1.66	
<b>Financial status</b>					0.208
Enough with saving	328	31.71	1		
Not enough/with debt/cannot saving	883	35.56	1.19	0.91 to 1.56	
<b>Work environment</b>					0.018
Indoor	188	27.13	1		
Semi-indoor/outdoor	1,023	35.87	1.50	1.06 to 2.12	
<b>Work injuries (during past 12 months)</b>					0.168
No	534	32.40	1		
Yes	677	36.19	1.18	0.93 to 1.50	
<b>Residential arrangement</b>					<0.001
Stay alone/with friend	240	12.92	1		
Stay with family/with relative	971	39.86	4.47	3.00 to 6.66	
<b>House tenure</b>					<0.001
Rented	196	15.31	1		
Provided by employer	1,015	38.23	3.42	2.27 to 5.15	
<b>Distance from community center</b>					0.001
<1 km	431	27.15	1		
≥1km	780	38.59	1.69	1.30 to 2.18	



Characteristics	Number	Low QOL (%)	Crude OR	95%CI: CI	p-value
<b>Daily travel to workplace facility</b>					<0.001
By motorbike/bicycle	207	20.77	1		
By employer's vehicle/by foot	1,004	37.35	2.27	1.59 to 3.26	
<b>Work-related diseases (during past 12 months)</b>					0.058
No	467	31.26	1		
Yes	744	36.56	1.27	1.00 to 1.62	
<b>Smoking</b>					0.006
No	865	32.14	1		
Yes	346	40.46	1.44	1.11 to 1.86	
<b>Perceived Stress (PSS)</b>					<0.001
Low/moderate level	1,087	30.91	1		
High level	124	66.13	4.36	2.94 to 6.47	
<b>Depression (CES-D)</b>					0.001
No depression	367	27.25	1		
Depression	844	37.68	1.61	1.23 to 2.11	

**Table 5. Multivariate analysis for factors associated with low Quality of Life (QOL) of migrant workers (n=1,211) by using multilevel logistic regression (MLR).**

Characteristics	Number	Depress (%)	SLR*	MLR**	95%CI: CI	p-value
			Crude OR	Adjusted OR		
<b>Perceived Stress (PSS)</b>						<b>&lt;0.001</b>
Low/moderate level	1,087	30.91	1	1		
High level	124	66.13	4.36	3.64	2.41 to 5.49	
<b>Type of residents arrangement</b>						<b>&lt;0.001</b>
Stay alone/with friend	240	12.92	1	1		
Stay with family/with relative	971	39.86	4.47	3.63	2.42 to 5.45	
<b>House tenure</b>						<b>&lt;0.001</b>
Rented	196	15.31	1	1		
Provided by employer	1,015	38.23	3.42	2.66	1.74 to 4.08	
<b>Daily travel to workplace facility</b>						<b>0.012</b>
By motorbike/ bicycle	207	20.77	1	1		
By employer vehicle transported/by foot	1,004	37.35	2.27	1.64	1.11 to 2.42	
<b>Distance from community centre</b>						<b>0.016</b>
<1 km	431	27.15	1	1		
≥1km	780	38.59	1.69	1.41	1.07 to 1.87	

\* Simple logistic regression (SLR) shows crude OR

\*\* Multilevel logistic regression (MLR) shows Adjusted OR: 95%CI: CI and p-value after adjusted for other covariates factors.

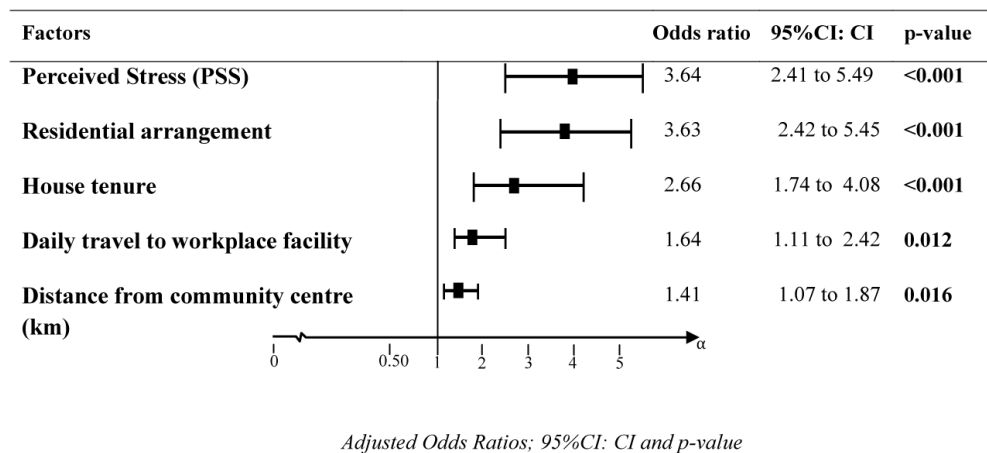
differences in the prevalence of low QOL may be due to the target population of the previous study being mainly women between 18 and 29 years old, mostly working in industry. The working and living environments of those in industry are less objectionable when compared to that of agricultural workers. In contrast, the population surveyed in the present study had a gender balance nearer parity, mostly within the age range 20 to 49 years, and half of the sample worked at agriculture. Moreover, the socio-cultural settings of Cambodian migrant workers and Burmese migrant workers are different. The findings of the present study are in agreement with a study conducted in Phang-Nga province of Thailand that also reported most migrant workers as having low to moderate QOL<sup>12</sup>. A study in Dhaka city, Bangladesh showed that 94% of adult migrant workers in garment manufacture had low QOL, with only 3.25% and 2.75% having moderate and high QOL respectively. This may be due to the study in Bangladesh recruiting more female than male workers; within Indianite cultures, the female gender is devalued and females are perceived as the inferior gender, both physically and psychologically, resulting in very low QOL compared to males<sup>13</sup>. The above results demonstrate the inconsistency of QOL findings across the literature. This inconsistency likely results from the multicultural differences in context and setting of the living and working environments of migrant workers. Another example is the report of female domestic migrant workers in Singapore exhibiting a high QOL within three domains out of four, with the social relationship domain exhibiting a low score and also being associated with stress<sup>16</sup> [Figure 1].

Moreover, mental health problems were reported among migrant workers. The prevalence of moderate to high perceived stress was 67.96% (95%CI: 65.33-70.59) and symptoms of depression was 69.69% (95%CI: 67.10-72.29). A comparable study in Europe<sup>21</sup> reported 63% of low-skilled workers to exhibit symptoms of distress. Moreover, stress and depression are often cited as the most predominant factors associated with reduced QOL scores, with some studies finding depression to be the most influential on QOL, and vice-versa<sup>22</sup>. Additionally,

stress is commonly reported to impact QOL for migrant workers; such as 62.2% of white-collar migrant workers in China reporting work related-stress<sup>23</sup>.

After controlling for other covariate factors, the factors that were indicated as being significantly associated with poor QOL were high perceived stress (AOR=3.64; 95%CI: 2.41-5.49; p<0.001); living with family/relatives (AOR=3.63; 95%CI: 2.42-5.45; p<0.001); living in employer-provided housing (AOR=2.66; 95%CI: 1.74-4.08; p<0.001); commuting to work using their employer’s vehicle or by foot (AOR=1.64; 95%CI: 1.11-2.42; p=0.012); and living more than 1 km from the community center (AOR=1.41; 95%CI: 1.07-1.87; p=0.016). However, having symptoms of depression was not significantly associated with poor QOL in the final model.

Factors associated with perceived stress have a strong association with poor QOL (AOR=3.64; 95%CI: 2.41-5.49; p<0.001). In stressful situations, migrant workers may turn to alcohol and smoking. This in turn will increase the economic burden, impact on their capacity to work, may cause conflicts in the family, and can sometimes be associated with gambling. Moreover, stressful situations themselves may cause workers to lose focus on their job and worry about earning money to feed their family or reduce the debt incurred in the process of migration. Many workers worry about the expiration of work permits and health insurance documents. A study in China has shown that work related stress was associated with poor QOL<sup>15,23</sup>. A previous study among migrant workers in India found 14.6% workers to have poor QOL and 25.5% to be in psychological distress, with QOL being significantly (p≤0.05) associated with the factors of age, marital status, low education status<sup>24</sup>. Stress was associated with both depression and anxiety study among Burmese migrant workers on the borders<sup>25</sup>. Lifestyle factors were also found to impact migrant workers in the study, for example smoking was associated with low QOL. Smoking was common among the male migrant workers surveyed in the present study in terms of the habitual lifestyle associated with a stressful work-



**Figure 1.** Forest plot of the adjusted odds ratios and 95%CI: confidence intervals of the association between common mental health problems and poor quality of life among Cambodian migrant workers in Thailand using multilevel logistic regression (MLR).



ing environment. Smoking severely increases the economic and health burden on migrant workers. In the study rural to urban Chinese migrant workers, it was found that unhealthy lifestyles caused by many factors, such as the kind of job that they were doing, working in too small a space, low income and long working hours, were significantly related to the poor mental health of migrant workers<sup>26</sup>.

Living with family and relatives (AOR=3.63; 95%CI: 2.42-5.45;  $p<0.001$ ) means that migrant workers have greater levels of responsibility in their daily life. In a Bangladeshi study, living with at least one family member was highly associated with low QOL ( $p=0.01$ )<sup>13</sup>. In the context of Cambodia, migrant workers often live in a small cottage where they work together with many family members, relatives or friends. If this living space becomes too crowded, workers will have difficulty sleeping and further decreased QOL.

Having their living accommodation provided by their employer (AOR=2.66; 95%CI: 1.74-4.08;  $p<0.001$ ) was more likely to be associated with low QOL than living in rented housing. In the present study, many migrant workers who lived inside farm-worker camps or construction site camps were reported to live in employer-owned accommodation, and also were more likely to be exposed to hazardous living environments<sup>27</sup>. There are many potential factors associated with this. For example, in worker camps, even though most employer provide employees with a living place free of charge, migrant workers have to build the cottage themselves, often resulting in poor build-quality in terms of dirt, dust and a lack of mains electricity supply. Living together with strangers is not good for psychological health, and often migrant workers from Cambodia end up cohabiting with many colleagues from different places. However, renting a house may cause a low QOL depending on the study context<sup>13</sup>. Migrant workers in China showed that residential satisfaction was at a moderate level<sup>28</sup>.

Commuting daily to the workplace using their employer's vehicle or on foot (AOR=1.64; 95%CI: 1.11-2.42;  $p=0.012$ ) was more highly associated with low QOL compared to travelling to work using their own vehicle. Daily basic transportation was important among migrant workers where most were living in isolated rural areas. A study among Burmese migrant workers in Thailand found transportation difficulties to be barriers to accessing health services<sup>29</sup>.

Living further than 1 km away from the community center was associated (AOR=1.41; 95%CI: 1.07-1.87;  $p=0.016$ ) with low QOL. It might be that living far from a community center makes it difficult to buy food or to access essential services. Migrant workers who did not own vehicles in Thailand, like bicycles or motorbikes, were more likely to have a low quality of life. This may be further confounded by an unfamiliarity with the area where they live and work, making it difficult to locate the community center if they live far from it. This will make it more difficult when they want to buy food at the market or access to other services in Thailand. Similarly, a study of workers in Russia showed that distance from house to workplace had a significant impact on job satisfaction<sup>30</sup>.

## Study limitations

This cross-sectional study design was conducted only on a subset of the border provinces in Thailand and therefore may not be generalizable to other settings of migrants in Thailand, or more widely. Moreover, a cross-sectional study design only shows associations, where longitudinal studies will make evident the cause and effect relationships between risk factors and health in this population. Furthermore, study of work related-injuries and mental health problems of migrant workers is required to ascertain the healthcare needs of this population.

## Conclusions

In summary, workers who participated in the present study had poor health-related QOL, particularly in the environment domain. It could be concluded that perceived stress and living condition are predictors of health-related QOL. Consequently, to improve worker's health-related QOL, interventional programs should focus on mental health by providing coping strategies for stress and strategies for improving the living environment, obtaining suitable accommodation, providing transportation facilities enabling migrant workers to access essential services, with additional focus on those migrants who do not live directly within the community.

## Recommendations

The findings from this study should be used to inform the development of interventional programs to improve QOL in migrant workers, and provide a crucial direction for future research studies to build on the knowledge in this field.

## Data availability

### Underlying data

Figshare: 1. Dataset 1 Raw data from a survey mental health status and quality of life among Cambodian migrant workers in Thailand.xlsx. <https://doi.org/10.6084/m9.figshare.12769856.v2>

- Dataset 1: Raw data from a survey mental health status and quality of life among Cambodian migrant workers in Thailand.xlsx (Questionnaire responses)
- Code book for interpreting the data.docx (Codebook for dataset)

### Extended data

Figshare: 1. Dataset 1 Raw data from a survey mental health status and quality of life among Cambodian migrant workers in Thailand.xlsx. <https://doi.org/10.6084/m9.figshare.12769856.v2>

This project contains the following extended data:

- 2. Q\_En.docx (Study questionnaire, English translation)
- 2.1 Q\_KH.docx (Study questionnaire)
- 3. Information sheet(EN).docx (Study information sheet)
- 3.1 Informed consent(EN).docx (Study consent form)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

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Version 2

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**Sari Andajani**

School of Public Health and Interdisciplinary Studies, Auckland University of Technology, Auckland, New Zealand

This article is well written. It includes relevant literatures, appropriate methodology and the results are well linked to the conclusion section.

As an international -non-Thai readers, I would appreciate more review on current migrant policies in Thailand and possible some historical connection of migrant groups from Cambodia coming to Thailand.

This then can be linked to the conclusion, for to influence some policy changes or bilateral collaboration between countries.

**Is the work clearly and accurately presented and does it cite the current literature?**

Partly

**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**

Yes

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Public health, health promotion, global health

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

Reviewer Report 08 December 2020

<https://doi.org/10.5256/f1000research.29745.r74162>

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**Patchana Hengboriboonpong Jaidee** 

Fundamental of Public Health, Burapha University, Chonburi, Thailand

#### Summary of the article:

- This paper is the original research, and clearly important to public health workers and policymakers. The aim of the study and the measuring outcomes are defined with appropriate references to the literature.

#### Study design:

- The study design and sample stated that “Cambodian migrant workers are required to register with the Department of Employment Office in each province in order to benefit from Universal Health Coverage (UHC)”. This sentence should be reconsidered about the compulsory migrant health insurance and the Social Security Scheme in Thailand for the migrant workers as the work of McMichael C. & Healy J. (2017)<sup>1</sup>, Pudpong N. *et al.* (2019)<sup>2</sup>, and the United Nations Thematic Working Group on Migration in Thailand (2019).<sup>3</sup>

#### Method:

- A cross-sectional study was appropriated to define the multistage random sampling but from Hsieh FY *et al.* (1998)'s formula, the authors should explain more about the parameter referenced for calculation of the sample size by simple logistic regression formula and the reference of rho and VIF for adjusting the sample size.

#### Results:

- The results showed the final model in table 5 as well as in figure 1, therefore it should be considered that the only illustration should be presented. In my opinion, I will present figure 1 to show the final model.
- Details of the control covariates in the result section should be addressed below the related tables or figures.

**Discussion:**

- Consider referring to the work of Wong WKF, Chou KL. & Chow NWS. (2012)<sup>4</sup> and Leiler A. *et al* (2019)<sup>5</sup>, who found the association between depression and poor QOL. Therefore, please be more specific in detail about how the depression was not related to the quality of life in the discussion topic of the manuscript.

**The minor issues that should be addressed:**

- In the details of the research instruments, it showed the section of the research questionnaire. Please check the sequential writing of sections from a,b,c, and d.

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**Is the work clearly and accurately presented and does it cite the current literature?**

Yes

**Is the study design appropriate and is the work technically sound?**

Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**

Partly

**If applicable, is the statistical analysis and its interpretation appropriate?**

Partly

**Are all the source data underlying the results available to ensure full reproducibility?**

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.**Reviewer Expertise:** migrant health

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

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