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Original article

# Prevalence and associated factors of health problems among Indonesian farmers☆

Tantut Susanto [a, *], Retno Purwandari [b], Emi Wuri Wuryaningsih [c]

[a] Family and Community Health Nursing Department, School of Nursing, University of Jember, Indonesia
[b] Basic Science Nursing and Nursing Management, School of Nursing, University of Jember, Indonesia
[c] Mental Health Nursing Department, School of Nursing, University of Jember, Indonesia

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ABSTRACT

***Objective:*** This study examined the prevalence of health problems and their associated factors among Indonesian farmers.
***Methods:*** A cross-sectional study was conducted among 179 farmers who completed a self-administered questionnaire and physical examination. The data were analyzed using descriptive, comparative, and multinomial logistic regression analyses.
***Results:*** The prevalence of varying health problems was 28.5% underweight, 10.6% overweight, 62.6% anemia, and 50.3% joint and bone pain. These results showed that being older and drinking coffee increased the likelihood of being underweight, while having less than 30 min of recess per working period and working for more than 5 days per week decreased the likelihood of being overweight. Meanwhile, being a younger male and working for less than 5 days per week decreased the risk of anemia. Furthermore, older age and less than 30 min of recess per working period were associated with increased joint and bone pain.
***Conclusions:*** We recommend the provision of screening programs and health education programs, including dietary programs and physical and exercise programs, by the occupational health nursing (OHN) program, to prevent and reduce health problems in the agricultural sector.


## 1. Introduction

The majority of Indonesia's labor force work in informal sectors in rural areas, particularly the agricultural sector. Based on the results of a study by the Occupational Safety and Health Board of the Occupational Safety and Health Agency, workers in the informal economy in Indonesia were found to suffer from malnutrition, diseases caused by parasites (e.g., worms), asthma, skin allergies, cancer, chemical poisoning, food poisoning, disorders of the muscles and bones, respiratory disorders, diseases of the lymph nodes, and blood diseases.[1] This report indicated that Indonesian farmers are vulnerable and at risk for numerous health problems that affect their productivity and long-term health status.

Additionally, there is a large body of evidence from other countries showing that socio-demographics,[2] health and safety at the work environment,[3] psychosocial factors,[4] and hazards[5] influence the health problems among farmers, including malnutrition/being underweight, low back pain, joint and bone pain, and stress of the workload. A previous study illustrated that the musculoskeletal disorder diseases are the most common disorder among farmers, amounting up to 1144 million cases of musculoskeletal disorders.[6] In addition, the agricultural sector has all aspects of workplace safety and occupational risks. The most common workplace risks includes all types of muscle pain due to sprains or sprains from lifting and carrying, repetitive stress disorders, improper ergonomics, and various psychosocial problems.[1] Evidence shows that 23% of workers do not work properly and are absent from work for eight days due to back pain. Furthermore, worker productivity can be decreased by 60% due to sore necks and/or wrists.[7]

Occupational health and safety efforts in an agricultural is an attempt to create a working atmosphere that is safe and comfortable with end goal of achieving higher productivity.[8] The goal is absolute health and safety to be present for any type of fieldwork,

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* Corresponding author.
*E-mail address:* tantut_s.psik@unej.ac.id (T. Susanto).
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without exception. Health and safety in the agricultural sector is expected to prevent and reduce the risk of accidents or illness because of performing the job.[9] Health and safety in agriculture is an important aspect to support the welfare and increase the productivity of workers and the larger public, as health and safety efforts are considered to reduce the risk of the emergence of occupational diseases.

The agricultural sector is the number one source of commodity exports from Indonesia and contributes significantly to the Indonesian economy. It is necessary to approach occupational health and safety from a primary healthcare perspective when dealing with less tightly organized sectors such as agriculture. However, the low awareness of farmers' current occupational safety and health is a current issue because the work of farmers currently does not have standard occupational health and safety standards. Agricultural workers are an at risk population,[4] and when studying such populations, it is helpful to know the risk factors that are associated with specific health outcomes, as the presence of these risk factors can be used to predict the presence of those health outcomes in the population. Risk factors that influence the presence of health problems fall into several categories among them biological risks, social risks, economic risks, lifestyle risks, and life event risks.[10] Therefore, we used a risk approach as the research framework in this study to identify risk factors among farmers (Fig. 1). Furthermore, more in-depth study needs to be determine the characteristics of malnutrition, joint and bone pain, and anemia in the tobacco farmers, specifically. In the present study, we investigated (1) the prevalence of health problems among Indonesian farmers, including being underweight or overweight, anemia, and joint and bone pain; and (2) the associated risk factors related to these health problems among Indonesian farmers.

## 2. Methods

### 2.1. Study design

This study was a cross-sectional quantitative study.

### 2.2. Study population

This study was conducted in the rural, agricultural area of Jember, East Java in Indonesia. According to the national statistics data from 2013, the dominant use of land in the city of Jember was for agricultural activities, at 51.47% of the total area of the city. Plantations were devoted to 14.92% of the land, residential areas comprised 27.05% of the land, fishponds covered 0.01% of the land, and other use of the land area were at 4.20%.[11]

In this study, our target sample size was estimated using a 95% confidence interval with a precision of 10%. The Jember database has the proportion of people working in the agricultural sector at approximately 41.20% of the population. Therefore, the required sample size was 169 farmers. We used a multiple-stage, random sampling method to recruit farmers for this survey. In the preliminary stage, we randomly selected an area and then selected farming groups from each area in two of the districts from that area that were in the primary agricultural sector.

### 2.3. Ethical considerations

The study was approved by the Ethical Committee Review Board of the Research of University of Jember. Then, we obtained ethical and administrative approval from the Department of Political Unity for the Protection of the Public, the District National Health Department, and the public health centers. We interviewed and informed public health centers about the study, and then informed the participants about the study in their farming groups in each area. After participants' permission was received, a data collection plan was designed.

### 2.4. Measurements

Metrics used in this study were selected based on a risk assessment approach[10] (Fig. 1). Biological risk factors were assessed via physical factors including height and weight (a measure of nutritional status), blood pressure (reflecting hypertension),

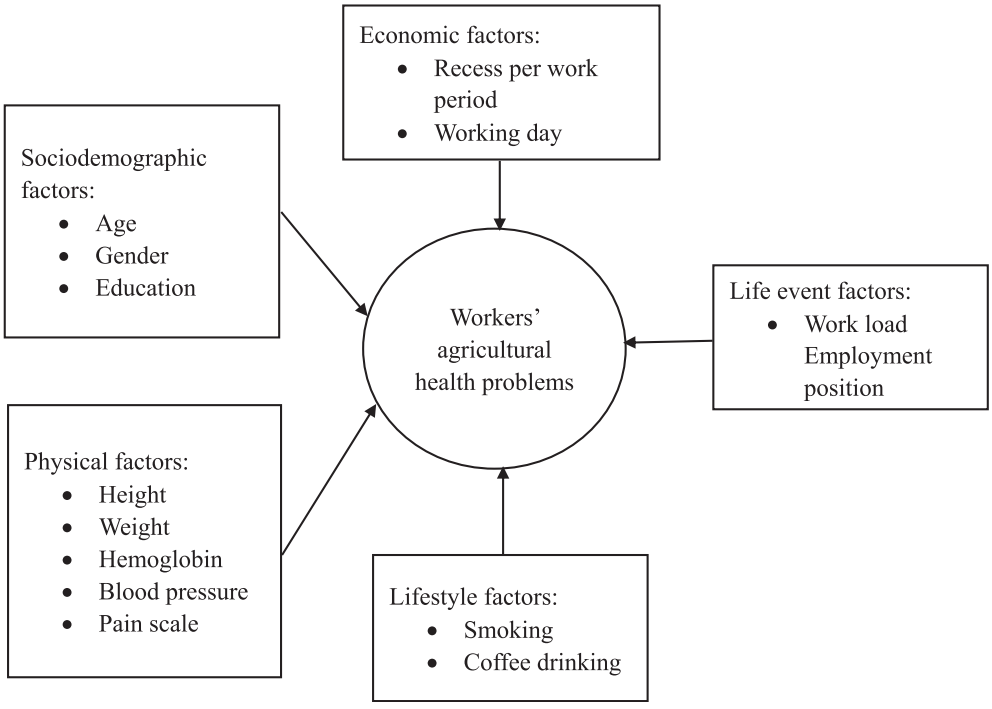


**Fig. 1.** Research framework of factors related to farmers' agricultural health problems, using a risk-based approach.

hemoglobin (to assess for anemia), and a pain scale. Social and psychological factors were measured through sociodemographic information, including age, gender, and education. Lifestyle risk factors were evaluated by assessment of the farmers' daily living habits, including smoking and coffee drinking. Economic risk measurements involved assessing the farmers' work characteristics, including the amount of recess per working period and the number of working days per week. Life event risks were measured by assessing the working environment, including work load and working position.

Variables in this study consisted of independent, dependent, and confounding variables. Independent variables included the safety and health of the work environment (including hours worked per week, amount of recess per work period, working days per week, work load, and working position). The dependent variables were the prevalence of health problems (including nutritional status problems, anemia, and joint and bone pain). In addition, confounding variables consisted of socio-demographic factors (age, gender, and education) and lifestyle factors (including smoking and coffee drinking).

#### 2.4.1. Independent variable measurement

The safety and health at the working environment was measured through assessment of the number of hours worked per week, amount of recess per working period, working days per week, work load, and working position of the farmers done in an agricultural area. This assessment was developed and modified by the Occupational Health Service Program in the Community Health Center of the Ministry of Health of Indonesia.[12,13] Hours worked per week were measured by summing the hours worked per week and then assigning that sum a score (less than 40 h/week = 1 and more than 40 h/weeks = 2). Amount of recess per work period was summed assigned the following scores: less than 30 min = 1 and more than 30 min = 2.

Working days per week was assigned scores as follows: less than 5 days worked/week = 1 and more than 5 days worked/week = 2. Workload was measured using a 12-item survey consisting of 5-point Likert-type scale questions (strongly disagree = 1, disagree = 2, rarely agree = 3, agree = 4, strongly agree = 5). The 12 scores were summed to create a composite workload score, with higher scores indicating a more stressing workload. Each composite score was that categorized into one of two groups based on a comparison to the median score: no stress vs. stress. Working position was measured using a 31-item survey consisting of 5-point Likert-type scale questions (as above). The 31 items were summed to create a composite working position score, with higher scores indicating more ergonomics, and then scores were categorized in two groups: not ergonomic vs. ergonomic.

#### 2.4.2. Dependent variable measurement

The dependent variables included nutritional status, anemia, and joint and bone pain. Nutritional status was measured using weight and height. Body weight was measured with an Omron digital weighing scale. Standing height was measured with a microtoise medical measurement systems and scales (SECA). Then, weight and height were used to determine the body mass index (BMI). BMI was then used to evaluate nutritional status using the standard ranges (underweight: BMI less than 18.5 kg/m$^2$; normal: BMI 18.5–24.9 kg/m$^2$; overweight: BMI 25.0–27.0 kg/m$^2$; and obese: BMI higher than 27.0 kg/m$^2$. For our purposes, overweight and obese results were pooled into one group (overweight). Anemia was measured directly in the field using a HemoCue® Hb 301 System (Ängelholm, Sweden) to measure hemoglobin (Hb). Hb Sahli method[14] commonly used in community health center in Indonesia.[15] Anemia was defined as a Hb less than 12.0 g/L. Joint and bone pain was identified from physical examination of directed patient history about pain, using the questions “have you had pain in the lower or upper extremities or pain in the back bones for the last week?” The answer was categorized dichotomously (pain or no pain).

#### 2.4.3. Confounding variable measurement

Confounding variables included various socio-demographics data that was gathered by a questionnaire: age (less than 40 years, 41–60 years, and more than 60 years), gender (male or female), and education (no education, completion of elementary school, completion of junior high school, or completion of senior high school or higher). Lifestyle data that was collected consisted of the presence of a smoking habit (yes or no) and coffee consumption (yes or no).

### 2.5. Validity and reliability

The questionnaires used in this study were developed and modified by the researchers after a pilot study and in consultation with an expert committee that modified it in accordance with Indonesian society, culture, and the agricultural workplace environment. The expert committee included two community health nurses and one nurse with occupational health experience. A pilot study was completed to evaluate the validity and reliability of the questionnaires. The questionnaires were tested by 30 farmers who were not included in the study. The independent variables tested were workload (Cronbach's $\alpha = 0.84$) and working position (Cronbach's $\alpha = 0.88$). The assessment of weight, height, and Hb were validated by a community health center.

### 2.6. Procedure

After obtaining their consent forms, the investigators distributed questionnaires to eligible participants. Our eligibility criteria included the following factors: (1) age more than 17 years old, (2) greater than 5 year work history in an agricultural area, (3) obtained signed informed consent after an explanation of the study's purpose, risks, and benefits, (4) registration at select community health centers, and (5) the ability to understand and respond to survey questions. The participants filled out the questionnaires in the community health centers. For responses to be minimally affected by confounders, participants were asked to complete questionnaires independent of confounding variables first, and then they were encouraged to measure weight, height, Hb, and pain symptoms in a private room. It took approximately 30 min for each participant to complete the questionnaire. To control for bias, community health nurses administered the questionnaires and physical exams.

### 2.7. Statistical analysis

To identify the prevalence of health problems, we used descriptive statistics of their frequencies. To determine the risk factors related to the presence of nutritional problems, we used a multinomial logistic regression analysis to examine associations between nutritional status groups (underweight, normal, and overweight) and our independent and confounding variables. In addition, to determinate the risk factors for anemia and joint and bone pain, we used a logistic regression analysis to examine associations between the presence of anemia or joint and bone pain with our independent and confounding variables. Model fit was determined using an alpha value of 0.05, with $P$ less than 0.05 indicating statistical significance. All data were analyzed using SPSS version 22.

**Table 1**
Prevalence of health problems among farmers ($n = 179$).

| Prevalence of health problems | | $n$ (%) | 95% Confidence interval | |
|---|---|---|---|---|
| | | | Lower limit | Higher limit |
| Nutritional status | Normal | 109 (60.9) | 51.7 | 70.0 |
| | Underweight | 51 (28.5) | 16.1 | 40.9 |
| | Overweight | 19 (10.6) | −4.4 | 23.4 |
| Anemia | Normal | 67 (37.4) | 25.8 | 49.0 |
| | Anemia | 112 (62.6) | 56.7 | 74.0 |
| Joint and bone pain | No pain | 89 (49.7) | 39.3 | 60.1 |
| | Pain | 90 (50.3) | 39.9 | 60.6 |

Note: Nutritional status categorized by BMI (underweight: BMI less than 18.5 kg/m$^2$; normal: BMI 18.5–24.9 kg/m$^2$; overweight: BMI 25.0–27.0 kg/m$^2$; and obese: BMI more than 27.0 kg/m$^2$). Anemia defined by hemoglobin (anemia: less than 120 g/L, and normal: more than 120 g/L).

## 3. Results

### 3.1. Prevalence of nutritional problems, anemia, and joint and bone pain among farmers

The prevalence of health problems among farmers were divided into three categories of health problems: nutritional problems, anemia, and joint and bone pain (Table 1). Regarding nutritional status, the underweight prevalence was 28.5% (95% *CI*: 16.1–40.9%) and the overweight prevalence was 10.6% (95% *CI*: 4.4–23.4%). The prevalence of anemia among farmers was 62.6% (95% *CI*: 56.7–74%). Based on symptoms of pain in the upper and lower extremities and/or back bones, the prevalence of joint and bone pain was 50.3% (95% *CI*: 39.9–60.6%).

### 3.2. Factors associated with nutritional problems among farmers

Using a univariate analysis, we evaluated risk factors for the presence of nutritional problems among farmers, with *P* less than 0.05 (Table 2). The factors associated with the presence of nutritional problems among farmers are age ($P = 0.001$), coffee consumption ($P = 0.026$), and number of working days per week ($P = 0.003$). In this analysis, the model outcome was a nutritional problem group (underweight or overweight), with normal weight as the reference group. For our multinomial logistic regression analysis (Table 3), the factors inversely associated with an underweight status among farmers were age of less than 40 years old (OR = 0.28, 95% *CI*: 0.10–0.78), age of 40–60 years old (OR = 0.25, 95% *CI*: 0.10–0.61), and not drinking coffee (OR = 0.36, 95% *CI*: 0.16–0.82). The factors associated with being overweight among were recess per working period of less than 30 min (OR = 0.07, 95% *CI*: 0.01–0.87) and working more than 5 days per week (OR = 0.06, 95% *CI*: 0.01–0.41).

### 3.3. Factors associated with anemia among farmers

Using a univariate analysis, we evaluated risk factors for the presence of anemia among farmers, with *P* less than 0.05 (Table 2). The associated factors for the presence of anemia among farmers were gender ($P = 0.002$), smoking ($P = 0.022$), and working position ($P = 0.047$). Using a logistic regression analysis (Table 3), the factors associated with anemia among farmers were age of 40–60 years old (OR = 0.39, 95% *CI*: 0.17–0.90), male gender (OR = 0.10, 95% *CI*: 0.02–0.44), and working less than 5 days per week (OR = 0.48, 95% *CI*: 0.24–0.93).

**Table 2**
Univariate analyses of sociodemographic, lifestyle, and workplace health and safety factors as they relate to nutritional status, anemia, and joint/bone pain ($n = 179$) $n$ (%).

| Variable | Total | Nutritional Status | | | | Anemia | | | Joint/bone pain | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Underweight | Normal | Overweight | $\chi^2(P)$ | Normal | Anemia | $\chi^2(P)$ | Pain | No pain | $\chi^2(P)$ |
| *Age* | | | | | | | | | | | |
| Less than 40 years | 51 (28.5) | 10 (19.6) | 36 (33.0) | 5 (26.3) | 18.186 | 16 (23.9) | 35 (31.2) | 3.525 | 23 (25.6) | 28 (31.5) | 6.112 |
| 40–60 years | 88 (49.2) | 19 (37.3) | 58 (53.2) | 11(57.9) | (0.001) | 39 (58.2) | 49 (43.8) | (0.172) | 40 (44.4) | 48 (53.9) | (0.047) |
| More than 60 years | 40 (22.3) | 22 (43.1) | 15 (13.8) | 3 (15.8) | | 12 (17.9) | 28 (25.0) | | 27 (30.0) | 13 (14.6) | |
| *Gender* | | | | | | | | | | | |
| Female | 23 (12.8) | 3 (5.9) | 15 (13.8) | 5(26.3) | 5.369 | 2 (3.0) | 21 (18.8) | 7.950 | 8 (8.9) | 15 (16.9) | 1.874 |
| Male | 156 (87.2) | 48 (94.1) | 94 (86.2) | 14 (73.7) | (0.068) | 65 (97.0) | 91 (81.2) | (0.005) | 82 (91.1) | 74 (83.1) | (0.171) |
| *Education* | | | | | | | | | | | |
| Not attending school | 41 (22.9) | 14 (27.5) | 25 (22.9) | 2 (10.5) | 8.113 | 10 (14.9) | 31 (27.7) | 4.364 | 22 (24.4) | 19 (21.3) | 0.684 |
| Elementary school | 80 (44.7) | 25 (49.0) | 49 (45.0) | 6 (31.6) | (0.230) | 34 (50.7) | 46 (41.0) | (0.225) | 41 (45.6) | 39 (43.8) | (0.877) |
| Junior high school | 35 (19.6) | 8 (15.7) | 20 (18.3) | 7 (36.8) | | 15 (22.5) | 20 (17.9) | | 17 (18.9) | 18 (20.3) | |
| Senior high school or more | 23 (12.8) | 4 (7.8) | 15 (13.8) | 4 (21.1) | | 8 (11.9) | 15 (13.4) | | 10 (11.1) | 13 (14.6) | |
| *Smoking* | | | | | | | | | | | |
| Yes | 97 (54.2) | 28 (54.9) | 64 (58.7) | 5 (26.3) | 7.000 | 44 (65.7) | 53 (47.3) | 4.971 | 53 (58.9) | 44 (49.4) | 1.252 |
| No | 82 (45.8) | 23 (45.1) | 45 (41.3) | 14 (73.7) | (0.030) | 23 (34.3) | 59 (52.7) | (0.026) | 37 (41.1) | 45 (50.6) | (0.263) |
| *Coffee drinking* | | | | | | | | | | | |
| Yes | 121 (67.6) | 31 (60.8) | 82 (75.2) | 8 (42.1) | 9.281 | 47 (70.1) | 74 (66.1) | 0.159 | 64 (71.1) | 57 (64.0) | 0.723 |
| No | 58 (32.4) | 20 (39.2) | 27 (24.8) | 11 (57.9) | (0.010) | 20 (29.9) | 38 (33.9) | (0.690) | 26 (28.9) | 32 (36.0) | (0.395) |
| *Hours worked per week* | | | | | | | | | | | |
| More than 40 h | 75 (41.9) | 18 (35.3) | 53 (48.6) | 4 (21.1) | 6.331 | 25 (37.3) | 50 (44.6) | 0.649 | 39 (43.3) | 36 (40.4) | 0.057 |
| Less than 40 h | 104 (58.1) | 33 (64.7) | 56 (51.4) | 15 (78.9) | (0.042) | 42 (62.7) | 62 (55.4) | (0.421) | 51 (56.7) | 53 (59.6) | (0.811) |
| *Recess per working period* | | | | | | | | | | | |
| Less than 30 min | 40 (22.3) | 16 (31.4) | 23 (21.1) | 1 (5.3) | 5.687 | 14 (20.9) | 26 (23.2) | 0.031 | 27 (30.0) | 13 (14.6) | 5.256 |
| More than 30 min | 139 (77.7) | 35 (68.6) | 86 (78.9) | 18 (94.7) | (0.058) | 53 (79.1) | 86 (76.8) | (0.861) | 63 (70.0) | 76 (85.4) | (0.022) |
| *Working days per week* | | | | | | | | | | | |
| More than 5 days | 108 (60.3) | 30 (58.8) | 73 (67.0) | 5 (26.3) | 11.243 | 36 (53.7) | 72 (64.3) | 1.535 | 51 (56.7) | 57 (64.0) | 0.733 |
| Less than 5 days | 71 (39.7) | 21 (41.2) | 36 (33.0) | 14 (73.7) | (0.004) | 31 (46.3) | 40 (35.7) | (0.215) | 39 (43.3) | 32 (36.0) | (0.392) |
| *Workload* | | | | | | | | | | | |
| Not stressed | 92 (51.4) | 27 (52.9) | 55 (50.5) | 10 (52.6) | 0.099 | 37 (55.2) | 55 (49.1) | 0.407 | 53 (58.9) | 39 (43.8) | 3.387 |
| Stressed | 87 (48.6) | 24 (47.1) | 54 (49.5) | 9 (47.4) | (0.952) | 30 (44.8) | 57 (50.9) | (0.524) | 37 (41.1) | 50 (56.2) | (0.036) |
| *Working position* | | | | | | | | | | | |
| Ergonomic | 87 (48.6) | 27 (52.9) | 48 (44.0) | 12 (63.2) | 2.905 | 39 (58.2) | 48 (42.9) | 3.364 | 41 (45.6) | 46 (51.7) | 0.450 |
| Not ergonomic | 92 (51.4) | 24 (47.1) | 61 (56.0) | 7 (36.8) | (0.234) | 28 (41.8) | 64 (57.1) | (0.067) | 49 (54.4) | 43 (48.3) | (0.502) |

Note: Nutritional status categorized by BMI (underweight: BMI less than 18.5 kg/m$^2$; normal: BMI 18.5–24.9 kg/m$^2$; overweight: BMI 25.0–27.0 kg/m$^2$; and obese: BMI more than 27.0 kg/m$^2$). Anemia defined by hemoglobin (anemia: less than 120 g/L, and normal: more than 120 g/L). *P* values determined by Chi square $\chi^2$ or Fisher exact test.

**Table 3**
Multinomial and logistic regression analysis of factors associated with health problems among farmers ($n = 179$).

| Variable | Regression coefficient | Standard deviation | Wald $\chi^2$ value | $P$ | OR value | 95% Confidence interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Higher limit |
| **Underweight**[a] | | | | | | | |
| *Age* | | | | | | | |
| Less than 40 years | −1.283 | 0.530 | 5.867 | 0.015 | 0.28 | 0.10 | 0.78 |
| 40–60 years | −1.383 | 0.452 | 9.362 | 0.002 | 0.25 | 0.10 | 0.61 |
| More than 60 years | Ref. | – | – | – | – | – | – |
| *Coffee drinking* | | | | | | | |
| No | −1.031 | 0.424 | 5.913 | 0.015 | 0.36 | 0.16 | 0.82 |
| Yes | Ref. | – | – | – | – | – | – |
| **Overweight**[a] | | | | | | | |
| *Recess per work period* | | | | | | | |
| Less than 30 min | −2.635 | 1.274 | 4.281 | 0.039 | 0.07 | 0.01 | 0.87 |
| More than 30 min | Ref. | – | – | – | – | – | – |
| *Working days per week* | | | | | | | |
| More than 5 days | −2.807 | 0.982 | 8.172 | 0.004 | 0.06 | 0.01 | 0.41 |
| Less than 5 days | Ref. | – | – | – | – | – | – |
| **Anemia**[b] | | | | | | | |
| *Age* | | | | | | | |
| More than 60 years | −0.331 | 0.478 | 0.481 | 0.488 | 0.72 | 0.28 | 1.83 |
| 40–60 years | −0.952 | 0.431 | 4.885 | 0.027 | 0.39 | 0.17 | 0.90 |
| Less than 40 years | Ref. | – | – | – | – | – | – |
| *Gender* | | | | | | | |
| Male | −2.341 | 0.778 | 9.049 | 0.003 | 0.10 | 0.02 | 0.44 |
| Female | Ref. | – | – | – | – | – | – |
| *Working days per week* | | | | | | | |
| Less than 5 days | −0.744 | 0.343 | 4.702 | 0.030 | 0.48 | 0.24 | 0.93 |
| More than 5 days | Ref. | – | – | – | – | – | – |
| **Joint and bone pain**[c] | | | | | | | |
| *Age* | | | | | | | |
| More than 60 years | 0.906 | 0.446 | 4.124 | 0.042 | 2.48 | 1.03 | 5.94 |
| 40–60 years | 0.406 | 0.406 | 4.718 | 0.030 | 2.41 | 1.09 | 5.35 |
| Less than 40 years | Ref. | – | – | – | – | – | – |
| *Recess per work period* | | | | | | | |
| Less than 30 min | 0.891 | 0.384 | 5.386 | 0.020 | 2.44 | 1.15 | 5.17 |
| More than 30 min | Ref. | – | – | – | – | – | – |

Note:
[a] The multinomial logistic regression reference group in this analysis was normal nutritional status = −2LL = 212.795 ($P < 0.001$); Cox and Snell $R^2 = 0.309$; Nagelkerke $R^2 = 0.373$; McFadden = 0.209.
[b] The logistic regression of anemia = −2LL = 216.047 ($P < 0.001$); Cox and Snell $R^2 = 0.109$; Nagelkerke $R^2 = 0.149$.
[c] The logistic regression of joint and bone pain = −2LL = 236.279 ($P < 0.001$); Cox and Snell $R^2 = 0.064$; Nagelkerke $R^2 = 0.085$.

### 3.4. Factors associated with joint and bone pain among farmers

Using a univariate analysis, we evaluated risk factors for the presence of joint and bone pain among farmers, with $P$ less than 0.05 (Table 2). The associated factors for the presence of joint and bone pain among farmers were age ($P = 0.047$), amount of recess per worked ($P = 0.022$), and workload ($P = 0.036$). Using a logistic regression analysis (Table 3), the factors associated with joint and bone pain among farmers were age of more than 40 years (OR = 2.48, 95% *CI*: 1.03–5.94), age of 40–60 years old (OR = 2.41, 95% *CI*: 1.09–5.35), and less than 30 min of recess per work period (OR = 2.44, 95% *CI*: 1.15–5.17).

## 4. Discussion

### 4.1. Prevalence of nutritional problems, anemia, and joint and bone pain among farmers

The current study found that prevalence of being underweight was 28.5%, which is higher than underweight rates in rural areas of Vietnam (28%).[2] This difference in results may be exacerbated by differences in the age range of participants of the studies (18–35 years old in Vietnam), as age can be associated with the BMI. Furthermore, in this work, the overweight prevalence was 9.7%. This is significantly lower than the overweight (39.6%) and obese (25.5%) rates in Canada.[16] This difference may be caused by differences in the standard of living and socio-economic circumstances in developing countries compared to developed countries. The results of this study indicated that the predominant nutritional problem among farmers in the Indonesia is being underweight. Thus, the findings suggest the importance of developing dietary health-promotion strategies for farmers to decrease the prevalence of being underweight.

In this study, the prevalence of anemia was 62.6%, which is higher than the prevalence of anemia among women in Nepal (39.7%).[17] This difference may be caused by differences in the of distribution of ages and genders between these studies, both of which can influence the incidence of anemia. The results of this study indicate that the prevalence of anemia among farmers in the Indonesia is higher, and may affect the health status and productivity of farmers. Thus, the findings suggest the importance of periodic screening among farmers at community health center services for the early detection and treatment of anemia among Indonesian farmers.

Regarding joint and bone pain, the prevalence was 50.3%, which is lower than those of previous studies on farmers in Southwest Nigeria (74.4% with low back pain)[18] and farmers in Korea (91.3% with pain in more than one body part).[3] This difference in results may be caused by a difference in screening tools between the various studies. The results of this study indicate that the prevalence of joint and bone pain among farmers in Indonesian farmers is moderate, although it may increase in the future based on trends in working time, workload, and working position. These findings suggest the importance of health education

regarding proper ergonomics to prevent pain symptoms among farmers in Indonesia.

### 4.2. Factors associated with nutritional problems among farmers

There were two factors inversely associated with being underweight among farmers, specifically age less than 40 years (OR = 0.28) or age between 40 and 60 years (OR = 0.25), and coffee consumption (OR = 0.36). These findings indicate that farmers under 60 years of age are more likely to be underweight. This finding is consistent with previous studies in Vietnam, Spain, Indonesia, and Ethiopia[1,2,19,20] that found that older workers might be at risk for problems around the work environment. These findings may be explained by the fact that farmers over 60 years old have begun to experience age-related declines in function, with degeneration in the body's functions, including metabolic functions that affects the digestive process, resulting in the problem of becoming underweight. This suggests the need for the regulation of the age of farmers, given changes in work-related health status among older farmers.

This study showed that farmers who did not drink coffee were at reduced risk of being underweight, which is consistent with previous studies[1,20] in which the consumption of this stimulant during the work period is related to nutritional status and increased energy for working. These findings may be due to coffee influencing the gastrointestinal absorption of nutrients,[21] as it can cause dyspepsia and associated difficulties with food intake. This suggests the importance of health education programs for Indonesian farmers focusing on healthy lifestyles habits including reduced coffee consumption.

In this study, two factors were inversely associated with being overweight among farmers: amount of recess per work period (OR = 0.07) and number of working days per week (OR = 0.06). Among farmers who had less than 30 min of recess per work period, there was a reduced prevalence of being overweight, which is consistent with previous studies[16,22] in which activity was related to anemia and nutritional status. This may be caused a shift in the balance between adequate rest periods and periods of work where energy is consumed. These finding suggest the need for new regulations regarding rests during work shifts to recoup the energy needed for labor.

Meanwhile, among farmers who worked more than five days per week there was reduced prevalence of being overweight. This finding is consistent with a previous study where specific types of work were described by metabolic equivalent scoring.[16] These findings may be explained by that the fact the number of working days is associated with fatigue among farmers, due to increased energy expenditure and associated weight loss. Nutrients are needed for the physical activities done by farmers; the highly physical activities have an impact on the quality of the work.[23] These findings advocate for provision of recess that fits the needs of each farmers' work activities of at least 30 min per work period to reduce the workload that affects farmer nutritional status and productivity.

### 4.3. Factors associated with anemia among farmers

In the current study, there were three factors inversely associated with anemia among farmers, including age (OR = 0.39), gender (OR = 0.10), and number of working days per week (OR = 0.48). Male farmers aged 40–60 years were the least likely to be anemic. These findings are consistent with previous studies in Indonesia[1] and Nepal[17] that showed that female workers tend to experience more anemia. This may be explained uniquely female biological aspects, such as menstruation and pregnancy that are related to the development of anemia. These findings suggest the need for setting hours and days of allowable labor, particularly for female workers, to prevent health problems such as anemia. This would be in accordance with the regulations on leave for women who are menstruating and pregnant that already exist in Indonesia.

Other results of this study include the finding that working for less than five days per week reduced the risk of anemia among farmers, which is also consistent with previous studies[24,25] in which unhealthy workplace environments contribute to several noncommunicable and communicable diseases in workers. This may be because the number of working days affects the total workload and the long-term durability of workers. This finding suggests the need for a balance between the number of working days and rest to prevent job burnout conditions that will affect the health of the workers. Community health-based stress reduction programs for farmers, centered on activities such as physical activity and recreation, need to be designed to reduce job stress. Additionally, special dietary programs for farmers are needed to prevent anemia and meet the minimum levels of caloric intake to prevent weight loss.

### 4.4. Factors associated with joint and bone pain among farmers

There were three factors associated with joint and bone pain, including age older than 60 years (OR = 2.48), age between 40 and 60 years (OR = 2.41), and amount of recess per working period (OR = 2.44). The results show that farmers who were older than 40 years were more likely to have joint and bone pain. These findings are consistent with previous studies[26,27] that showed that the posture and position taken during work tasks are related to musculoskeletal illnesses and low back pain among workers. This may be explained by the fact that farmers used their bones and joints in their work and so as they age, they develop pain. Unfortunately, age is associated with degenerative metabolic disease characterized by reduced bone mass and risk for fractures that results in loss of independence and mobility.[28] This findings suggests that rehabilitation programs should be part of the basic care measures given to farmers who are experiencing pain, involving relaxation exercises, massage and compresses,[29] to reduce their pain symptoms.

The findings indicate that less than 30 min of recess per working period was a large risk factor for joint and bone pain. This is consistent with previous studies[3,18,30] in which musculoskeletal disorders and low back pain are associated with workload. This may be explained by the unergonomic posture and position of farming, with work that lasts from morning until evening, without adequate time for rest breaks during work. This suggests the need for prevention and rehabilitation programs for farmers over the age of 40 years to reduce and manage complaints of joint and bone pain. Preventative programs would include the provision of stretching exercises before and after work[24] or back exercises to help cope with low back pain.[31]

Finally, the study results suggest the need for early intervention programs to reduce the incidence of health problems in farmers. In particular, OHN programs should be developed for the Indonesian agricultural working environment. The OHN program in Indonesia should focus on older age farmers and the amount of recess per working period, to decrease the amount of joint and bone pain. Meanwhile, regulations for agricultural farmers centered on working age and number of days worked must be designed to support a younger age of farmers and no more than 5 working days per week, to reduce nutritional problems and anemia. Furthermore, regular health education should be implemented to change lifestyle habit such as coffee drinking. Additionally, regularly scheduled

screening of workers needs at community health centers services needs to be established for the early detection, diagnosis, and treatment of farmers' health problems.

Lastly, there are limitations in this study related to its cross-sectional nature, which resulted in associations between the variables of the study, rather than causal conclusions. Additionally, this study is limited in the accuracy of measured prevalence of the health problems that were addressed, which may differ from those found in other studies, due to the small sample size of this study. Future research based on intervention programs of the OHN could be done to measure the effectiveness of health programs in the agricultural sector.

## 5. Conclusions

This study showed that age and amount of recess per work period were important factors in the development of joint and bone pain. The risk of being underweight among farmers was reduced by being at a younger age and not drinking coffee, whereas the risk of being overweight was reduced by limited amounts of recess per work period and the working for more days. In addition, the risk anemia was lower in younger farmers and among males and was lower among those with limited working days. Thus, the study results suggest the importance in the provisioning of screening programs and health education programs, including dietary programs and physical and exercise programs, by the OHN, to prevent and reduce health problems in the agricultural sector.

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## Conflicts of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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