Public Health Section

# Socioeconomic Disparity and Musculoskeletal Disorders: The National Socioeconomics Survey, 2010 and 2012

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## ABSTRACT

**Introduction:** Musculoskeletal Disorders (MSDs) is one of the leading public health problems in Thailand especially among the working age and elderly population. MSDs is the disease that can be affected by many factors such as working environment, abnormal body structure and age related degenerative conditions.

**Aim:** To explore the prevalence and association between Socioeconomic Status factors (SES) and MSDs in Thai population.

**Materials and Methods:** A cross-sectional study was performed by using the data from the National Socioeconomics Survey conducted by the National Statistical Office (NSO) in 2010 and 2012. A total of 17,040 and 16,905 participants who met the inclusion criteria of this study were recruited in 2010 and 2012 respectively. The required information was collected by face-to-face interview with structured questionnaires. Multilevel mixed-effects logistic regression analysis was performed to determine potential socioeconomic factors associated with MSDs.

**Results:** The prevalence of MSDs in 2010 and 2012 was 3.90% (95% CI: 3.61 to 4.19) and 2.96% (95% CI: 2.70 to 3.21) respectively. The multilevel mixed-effects logistic regression observed that odds of having MSDs were significantly higher among those who had low education attainment ($OR_{adj}$=1.52: 95% CI: 1.18 to 1.95), were agriculturist ($OR_{adj}$=1.69; 95% CI: 1.32 to 2.18), aged 40 year old or greater ($OR_{adj}$=9.10; 95% CI: 7.02 to 11.80) and were female ($OR_{adj}$=1.22; 95% CI: 1.04 to 1.44). In addition, the factors that were associated with MSDs in 2012 data were respondents residing in the North region ($OR_{adj}$=2.25; 95% CI: 1.36 to 3.70), were agriculturist ($OR_{adj}$=1.72; 95% CI: 1.28 to 2.32), had low education attainment ($OR_{adj}$=1.51; 95% CI: 1.14 to 1.99) and aged 40 year old or greater ($OR_{adj}$=11.28; 95% CI: 7.96 to 15.98).

**Conclusion:** The study indicated that socioeconomic status was associated with musculoskeletal disorders. Those who were female, agriculturalist and had low educational attainment were vulnerable to MSDs in Thai population.

**Keywords:** Disability, Education on health, Multilevel mixed-effect logistic regression, Socioeconomic status, Thailand

## INTRODUCTION

Musculoskeletal disorders has impact on high, low and middle income countries. Across the European Union, diseases of muscles and bones are associated with the large group and the treatment costs for MSDs is high. Only in England, nearly 1.34 billion pounds were expended in 2003 for the consultants and general practitioners to treat the patients having mental illnesses because of bones and muscles [1-3]. In Germany, the treatment cost of bone and muscular system related problems was equivalent to 28.5 billion Euros in 2008, which was more than 11% of the total cost of the treatment expenditure of all diseases in that year [4,5]. MSDs could cause less productivity and increased disability as well as deteriorating economic growth throughout the world [6-9]. MSDs is one of the health system problems of Thailand especially among working age and elderly population [10]. MSDs is mostly related to working environment, abnormal body structure, raising age as well as declining mental condition [11]. Moreover, there are some socioeconomic factors that can also increase risk of having MSDs such as level of education, household income, occupation, living area and region [12-17]. National Research Council of America classified risk factors of MSDs into two groups [18]. First, personal risk factor such as gender, age, working duration and stress. Second, occupational risk factor such as inappropriate working posture, exertion and working duration. In addition, overload working hours could increase risk of injury [19]. Low-middle income countries including Sri Lanka, Thailand, and Uganda also reported several risk factors of MSDs as aforementioned by the National Research Council [18, 20-23]. Although Thailand has a number of research studies about factors affecting MSDs [10,14,19,21,23], but most of them have not conducted it at national level.

Thailand has carried out the National Socio-Economic survey (NSS) by the National Statistical Office (NSO) since 1957 [23]. The NSS is the nationwide income and expenditure survey, so as to gather data annually on household income and household expenditures, household consumption, changes in assets and liabilities, durable goods ownership, and housing characteristics including other living conditions of households in whole country excluded foreign diplomats and temporary residents. Therefore, this study aimed to explore the association between the SES and MSDs in Thai population, which used a national sample data of the whole country. The results will be useful for the prevention of MSDs and can also be used to prevent disability and death which will improve the health systems in an effective manner.

## MATERIALS AND METHODS

This cross-sectional study used data of the National Socioeconomics Survey (NSS) 2010 and 2012. This study was conducted during 20 March 2017-11 February 2018. The study used a stratified two-stage random sampling design to select a nationally representative sample. Face-to-face interview using the structured questionnaire by well-trained staff was performed for data collection. The study tools have been designed by National Statistical Office in 1975 was used to collect data [23]. A total of 17,040 study participants in 2010 and 16,905 participants in 2012 were recruited. The respondents who aged 15 years and older and those who could communicate well as well as willing to participate in the NSS were included in

this study. Subjects who did not respond to all questions related to both socioeconomic condition and health status, and whose heads of the families had emigrated were excluded.

This study received permission to use the data from the National Statistical Office (NSO) before sending the proposal to the Office of Khon Kaen University Ethics Committee in Human Research to get ethical approval to conduct a research and received an ethical approval (No. HE 602212).

The main indicators of questionnaire were gender, age, marital status, education attainment, occupation, residential area, region, employment, current liabilities, monthly income, and remaining debt. For outcome, it was a self-reported MSDs of the questions "Do you have chronic diseases or congenital diseases?" If the answer was "Yes", the next question would be asked as "What disease or chronic disease do you have?"

Gender, age in year and in a 10-year interval groups, marital status, education attainment (high and low education divided by education levels), occupation, monthly income in Baht, residential area (urban and rural), remaining debt in Baht, region (South, Central, North and Northeast), working hour per week, and working day per month were taken into account for the associated factors that were explored to find the association with MSDs. Assessment of every variable was by same method as that of the dependent variable. Some groups of certain variables were combined depending on the number of MSDs case distributed in each group in order not to violate rule of ten events per parameter in logistic regression analysis. Marital status was categorised according to general pattern then it was combined into two groups included 1) single, and 2) marriage combined with widow/divorce/separate. Grouping occupation could be illustrated as 1) government/state enterprise, 2) trade/private business and 3) agriculturist.

## STATISTICAL ANALYSIS

The characteristics of the study participants were described as frequency and percentage for categorical variables and presenting mean and standard deviation, median (minimum and maximum) for continuous variables. Crude odds ratios and their 95% confidence interval (95% CI) was calculated by using simple logistic regression to identify the association between an individual factor and MSDs. Independent variables with a p-value <0.25 were included in the multivariable analysis model. The multilevel mixed-effects logistic regression analysis was performed to estimate the association between independent variables with MSDs using backward elimination technique to select the variables for the final model when controlling the clustering effect. All analyses were performed by using Stata software version 13.0. p-value <0.05 was considered as statistically significant.

## RESULTS

The prevalence of MSDs in 2010 and 2012 was 3.90% and 2.96% respectively. The majority of the study samples was female (53.57%) in 2010 and 53.21% in 2012 respectively. The average age of the participants was 43.27±17.73 and 44.37±18.16 years in both years respectively. Similarly, in both year it was found that most of the population had low educational level (65.06% and 63.38%). Furthermore, majority of the respondents were agriculturist/fishing 52.41% and 55.88% and had household income less than 10,000 baht per month (87.65% and 85.06%). Other demographic characteristics are shown in [Table/Fig-1].

The bivariate analysis revealed that in the year 2010 female gender (OR=1.37; 95% CI: 1.17 to 1.61), aged 40 years and above (OR=11.15; 95% CI: 8.66 to 14.35), residing in rural areas, had low educational attainment, having occupation of trade/private business and agriculturist were significantly associated with MSDs (p<0.001).

| Characteristic | 2010 | | 2012 | |
|---|---|---|---|---|
| | Number | Percentage (%) | Number | Percentage (%) |
| **Gender** | | | | |
| Male | 7,912 | 46.43 | 7,910 | 46.79 |
| Female | 9,128 | 53.57 | 8,995 | 53.21 |
| **Age (year)** | | | | |
| <40 | 7,491 | 43.96 | 6,950 | 41.11 |
| 40-49 | 3,451 | 20.25 | 3,351 | 19.82 |
| 50-59 | 2,812 | 16.50 | 2,953 | 17.47 |
| ≥60 | 3,286 | 19.28 | 3,651 | 21.60 |
| (Mean±SD) | 43.27±17.73 | | 44.37±18.16 | |
| Median (Min:Max) | 42 (15:100) | | 44 (15:99) | |
| **Marital status** | | | | |
| Single | 4,054 | 23.79 | 4,143 | 24.51 |
| Marriage | 10,814 | 63.46 | 10,493 | 62.07 |
| Widow/Divorce/Separate | 2,172 | 12.75 | 2,269 | 13.42 |
| **Educational attainment** | | | | |
| High (Junior high school or higher) | 5,953 | 34.94 | 6,190 | 36.62 |
| Low (No education and primary education) | 11,087 | 65.06 | 10,715 | 63.38 |
| **Occupation** | | | | |
| Government/State | 1,428 | 8.38 | 1,242 | 7.35 |
| **Enterprise** | | | | |
| Agriculture/Fishing | 8,931 | 52.41 | 9,447 | 55.88 |
| Staff/Employer | 3,651 | 21.43 | 3,344 | 19.78 |
| Trade/Private business | 3,030 | 17.78 | 2,872 | 16.99 |
| **Monthly income (Baht)** | | | | |
| ≥10,000 | 2,104 | 12.35 | 2,526 | 14.94 |
| 5,000-9,999 | 2,316 | 13.59 | 2,306 | 13.64 |
| <5,000 | 12,620 | 74.06 | 12,073 | 71.42 |
| (Mean±SD) | 4,087.94±9,673.87 | | 4,807.95±17,089.03 | |
| **Residential area** | | | | |
| Urban | 6,241 | 36.63 | 7,438 | 44.00 |
| Rural | 10,799 | 63.37 | 9,467 | 56.00 |
| **Remaining debt** | | | | |
| No | 12,213 | 71.67 | 12,825 | 75.87 |
| Yes | 4,827 | 28.33 | 4,080 | 24.13 |
| **Region** | | | | |
| Bangkok | 3,297 | 19.35 | 2,970 | 17.57 |
| Central | 3,541 | 20.78 | 3,586 | 21.21 |
| North | 3,292 | 19.32 | 3,192 | 18.88 |
| North-East | 4,817 | 28.27 | 5,019 | 29.69 |
| South | 2,093 | 12.28 | 2,138 | 12.65 |
| **Working hour per week** | | | | |
| ≤48 | 4,755 | 38.47 | 4,610 | 38.53 |
| >48 | 7,606 | 61.53 | 7,355 | 61.47 |
| **Working day per month** | | | | |
| ≤24 | 4,663 | 37.80 | 4,258 | 35.59 |
| >24 | 7,675 | 62.20 | 7,707 | 64.41 |

**[Table/Fig-1]:** Demographic characteristics of study participants (2010; n=17,040, 2012; n=16,905)
Working hour per week in 2010 and 2012 was n=12,361 and 11,965 respectively
Working day per month in 2010 and 2012 was n=12,338 and 11,965 respectively

Simultaneously, in year 2012, female respondents (OR=1.21; 95% CI: 1.01 to 1.45), aged 40 years and above (OR=13.87; 95% CI: 9.86 to 19.52), had low educational attainment (OR=3.48; 95% CI: 2.70 to 4.50), having occupation of trade/private business (OR=2.19; 95% CI: 1.56 to 3.09) and major occupation as agriculturist (OR=3.03; 95% CI: 2.28 to 4.02) were significantly associated with MSDs (p<0.001) [Table/Fig-2].

In multivariable analysis using the multilevel mixed-effects logistic regression analysis after adjusting covariates, the results revealed that factors associated with MSDs in 2010 data were low education attainment ($OR_{adj}$=1.52; 95% CI: 1.18 to 1.95), worked in agricultural sectors/fishing ($OR_{adj}$=1.69; 95% CI: 1.32 to 2.18), aged 40 years old or greater ($OR_{adj}$=9.10; 95% CI: 7.02 to 11.80) and were females ($OR_{adj}$=1.22; 95% CI: 1.04 to 1.44). The factors associated with MSDs in 2012 data were residing in the North region of Thailand ($OR_{adj}$=2.25; 95% CI: 1.36 to 3.70), worked in agricultural sectors /fishing ($OR_{adj}$=1.72; 95% CI: 1.28 to 2.32), had low educational attainment ($OR_{adj}$=1.51; 95% CI: 1.14 to

1.99) and aged 40 year old or greater ($OR_{adj}$=11.28; 95% CI: 7.96 to 15.98) [Table/Fig-3].

## DISCUSSION

The present study revealed the factor associated with MSDs were the subjects: who had low education attainment, worked in agricultural sectors, aged 40 years old or greater, were female and lived in the North region of Thailand. There were some previous studies that shown the similar result such as the study of Quintana R et al., had studied about MSDs and rheumatism in native population of Rosario, Argentina found that majority of respondents finished primary school where the prevalence of MSDs among them was 53.7% [13]. The occupation played a significant role in having MSDs of which those who worked as the agriculturist had higher prevalence when compared with other occupations. This finding is similar to the study of Gupta G, et al., which was conducted on the agriculturist in Kanpur, India, and it was found that the prevalence of MSDs was high (60%) and most of agriculturists had back pain, knee pain and shoulder pain [15]. The possible explanation to this

| Factors | 2010 (n=17,040) | | | | 2012 (n=16,905) | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | %MSDs | OR (95%CI) | p-value | Number | % MSDs | OR (95%CI) | p-value |
| Overall | 17,040 | 3.90 | NA | NA | 16,905 | 2.96 | NA | NA |
| **Gender** | | | | | | | | |
| Male | 7,912 | 3.27 | 1 | <0.001 | 7,910 | 2.67 | 1 | 0.032 |
| Female | 9,128 | 4.45 | 1.37 (1.17-1.61) | | 8,995 | 3.22 | 1.21 (1.01-1.45) | |
| **Age (year)** | | | | | | | | |
| <40 | 7,491 | 1.54 | 1 | <0.001 | 6,950 | 1.42 | 1 | <0.001 |
| ≥40 | 9,543 | 6.74 | 11.15 (8.66-14.35) | | 9,955 | 1.43 | 13.87 (9.86-19.52) | |
| **Marital status** | | | | | | | | |
| Single | 4,054 | 3.45 | 1 | 0.187 | 4,143 | 2.28 | 1 | 0.090 |
| Marriage | 12,986 | 4.65 | 1.11 (0.94-1.31) | | 12,762 | 4.14 | 1.14 (0.94-1.38) | |
| **Residential area** | | | | | | | | |
| Urban | 6,241 | 3.28 | 1 | <0.001 | 7,438 | 2.72 | 1 | 0.091 |
| Rural | 10,799 | 4.26 | 1.31 (1.10-1.54) | | 9,467 | 3.16 | 1.16 (0.97-1.40) | |
| **Educational attainment** | | | | | | | | |
| High (Junior high school or higher) | 5,953 | 1.50 | 1 | <0.001 | 6,190 | 1.16 | 1 | <0.001 |
| Low (No education and primary education) | 11,087 | 5.20 | 3.61 (2.88-4.52) | | 10,715 | 4.00 | 3.48 (2.70-4.50) | |
| **Occupation** | | | | | | | | |
| Government/State enterprise | 5,079 | 1.69 | 1 | <0.001 | 4,586 | 1.29 | 1 | <0.001 |
| Trade/Private business | 3,030 | 3.60 | 2.16 (1.62-2.88) | | 2,872 | 2.86 | 2.19 (1.56-3.09) | |
| Agriculturist | 8,931 | 5.60 | 3.22 (2.55-4.06) | | 9,447 | 3.81 | 3.03 (2.28-4.02) | |
| **Average monthly income (Baht)** | | | | | | | | |
| ≥10,000 | 2,104 | 1.38 | 1 | <0.001 | 2,526 | 0.99 | 1 | <0.001 |
| <10,000 | 14,936 | 4.26 | 3.18 (2.18-4.63) | | 14,379 | 3.31 | 3.19 (2.11-4.81) | |
| **Region** | | | | | | | | |
| South | 2,093 | 3.68 | 1 | <0.001 | 2,138 | 1.96 | 1 | <0.001 |
| Central | 6,838 | 3.10 | 0.83 (0.64-1.09) | | 6,556 | 2.39 | 1.22 (0.86-1.72) | |
| North | 3,292 | 5.04 | 1.39 (1.05-1.83) | | 3,192 | 5.01 | 2.63 (1.86-3.71) | |
| Northeast | 4,817 | 4.36 | 1.19 (0.91-1.55) | | 5,019 | 2.83 | 1.45 (1.02-2.05) | |
| **Remaining debt** | | | | | | | | |
| No | 12,213 | 3.86 | 1 | 0.622 | 12,825 | 2.85 | 1 | 0.114 |
| Yes | 4,827 | 4.02 | 1.04 (0.88-1.23) | | 4,080 | 3.33 | 1.09 (0.89-1.33) | |
| **Working hour per week (n=11,965)** | | | | | | | | |
| ≥48 | 4,755 | 3.64 | 1 | 0.004 | 4,610 | 2.56 | 1 | 0.176 |
| >48 | 7,606 | 2.72 | 0.74 (0.60-0.90) | | 7,335 | 2.18 | 0.84 (0.66-1.07) | |
| **Working day per month (n=11,965)** | | | | | | | | |
| ≤24 | 4,663 | 3.05 | 1 | 0.862 | 4,258 | 2.37 | 1 | 0.793 |
| >24 | 7,675 | 3.10 | 1.01 (0.82-1.25) | | 7,707 | 2.30 | 0.96 (0.75-1.23) | |

**[Table/Fig-2]:** Crude odds ratios (OR) of having MSDs and their 95% confidence intervals for each factor in 2010 and 2012.

| Factors | 2010 (n=17,040) | | | | | 2012 (n=16,905) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number | %MSDs | OR (95%CI) | OR$_{adj}$ (95%CI) | p-value | Number | %MSDs | OR (95%CI) | OR$_{adj}$ (95%CI) | p-value |
| **Gender** | | | | | | | | | | |
| Male | 7,912 | 3.27 | 1 | 1 | <0.001 | - | - | - | - | - |
| Female | 9,128 | 4.45 | 1.37 (1.17-1.61) | 1.22 (1.04-1.44) | | - | - | - | - | - |
| **Age (year)** | | | | | | | | | | |
| <40 | 7,491 | 1.54 | 1 | 1 | <0.001 | 8,578 | 0.42 | 1 | 1 | <0.001 |
| ≥40 | 9,543 | 6.74 | 11.15 (8.66-14.35) | 9.10 (7.02-11.80) | | 8,327 | 5.58 | 13.87 (9.86-19.52) | 11.28 (7.96-15.98) | |
| **Educational attainment** | | | | | | | | | | |
| High (Junior high school or higher) | 5,953 | 1.50 | 1 | 1 | <0.001 | 6,190 | 1.16 | 1 | 1 | <0.001 |
| Low (No education and primary education) | 11,087 | 5.20 | 3.61 (2.88-4.52) | 1.52 (1.18-1.95) | | 10,715 | 4.00 | 3.48 (2.70-4.50) | 1.51 (1.14-1.99) | |
| **Occupation** | | | | | | | | | | |
| Government/State enterprise | 5,079 | 1.69 | 1 | 1 | <0.001 | 4,586 | 1.29 | 1 | 1 | <0.001 |
| Trade/Private business | 3,030 | 3.60 | 2.66 (1.62-2.88) | 1.29 (0.96-1.74) | | 2,872 | 2.86 | 2.19 (1.56-3.09) | 1.42 (1.00-2.02) | |
| Agriculture/Fishing | 8,931 | 5.26 | 3.22 (2.55-4.06) | 1.69 (1.32-2.18) | | 9,447 | 3.81 | 3.03 (2.28-4.02) | 1.72 (1.28-2.32) | |
| **Region** | | | | | | | | | | |
| South | - | - | - | - | | 2,138 | 1.96 | 1 | 1 | <0.001 |
| Central | | | | | | 6,556 | 2.39 | 1.22 (0.86-1.72) | 1.34 (0.82-2.18) | |
| North | | | | | | 3,192 | 5.01 | 2.63 (1.86-3.71) | 2.25 (1.36-3.70) | |
| Northeast | | | | | | 5,019 | 2.83 | 1.45 (1.02-2.05) | 1.28 (0.78-2.11) | |

**[Table/Fig-3]:** AdjustedOdds ratios (OR$_{adj}$) of having MSDs and their 95% confidence intervals for SES adjusted for all other factors presented in the table using multilevel mixed-effects logistic regression, 2010 and 2012.

was that who were growing rice, used various abnormal postures, repetition with longer hours of working which is a known cause of MSDs. Age was one of the leading factors for having MSDs in a previous study by Daoruang Y and Chantawong C, found that age was a major risk factor for having MSDs in waste collectors in Bangkok, Thailand which was also similar with that of a study by Saetan O et al., [24-25]. The study conducted by Juntratep Peerapong CS, revealed that age was associated with MSDs among waste collectors in Nong Bua Lam Phu Province, those who aged 40 years old and older had higher risk of having MSDs [19]. Moreover, a study found that rubber tapper workers who aged 40 and older have higher risk of having MSDs by 3.322 times while compared with workers who were younger than 40 years old [20]. It might be because MSDs is a chronic disease and the older people have longer working experiences. Therefore, MSDs would be more prominent when they are old. The present study found that females had higher risk of MSDs which was in concurrence with previous studies conducted by Phorntip C et al., [21]. In Sweden, the study of Holland P et al., observed that females had MSDs more than males and had higher chance to quit a job than that of males [26]. On the other hand, Taghinejad H. et al., found that gender had no association with having MSDs in the study which was conducted among nurse population [27]. Living in different region might be the factor affecting subjects for having MSDs, since each region had unique lifestyle, jobs and working conditions. In addition, within the same job, they had different ways of doing their works, for example in each region of Thailand, farmers grow rice differently some use more machines other used manuals. Different procedures had different effect on MSDs. In this study, the result revealed that people who were living in the North region of Thailand had higher prevalence of having MSDs as compared with others. Most of the population in the North region still working as agriculturist in the mountainous area, therefore, they might have to use more forces in their work. Taechasubamorn P et al., illustrated that the prevalence of low-back pain amongst the farmers in rural areas of Thailand was 77% and majority of them were facing low-back pain [28]. It might be that they seldom used any machine to reduce the tensions from

works. The study from Bolivia, found that teachers who taught in rural areas had more prevalence of having MSDs than teacher who taught in urban area [16].

## LIMITATION
This study had a few limitations. Although, the finding of this study showed influences of SES on MSDs. However, some variables such as health behaviors and some working conditions were not included in the study. It is recommended to collect the health-related behavioral information in upcoming nationwide survey.

## CONCLUSION
The study observed that the highest prevalence of MSDs was in the North of Thailand. The socioeconomic status factors that were associated with MSDs in Thai population in 2010 were low education attainment, worked in agricultural sectors/fishing, aged 40 years old or greater and were females. However, the factors that associated with MSDs in 2012 were residing in the North region of Thailand, worked in agricultural sectors /fishing, had low education and aged 40 year old or greater. Therefore, the findings from this study can be used to develop relevant health promotion and health prevention policies as well as in improving the efficiency of health services system to reduce consequences of MSDs.

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