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Prevalence and Risk Factors of Low Back Pain among Thai and Myanmar Migrant Seafood Processing Factory Workers in Samut Sakorn Province, Thailand

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Abstract: This study assessed the prevalence of low back pain (LBP) and investigated risk factors for LBP among seafood processing factory workers in Thailand including migrant workers. The subjects were Thai and Myanmar workers in the typical seafood processing factory. A cross-sectional study was carried out with a self-administered questionnaire. Prevalence of LBP, general characteristics, life style, and working condition were investigated. The associations between LBP and risk factors were estimated by multiple logistic regression models. Of 254 workers, 165 completed the questionnaire. Half of these workers were Thai, the others were from Myanmar. The point prevalence of LBP was 28.5%. Risk factors for LBP were age over 40 yr, poor health status, history of back injury, twisting posture at work, and slipping on wet floors. The results suggest that health promotion should focus on working conditions rather than individual life style in order to prevent LBP. Furthermore, greater attention to other risk factors such as history of back injury and perception of health status after regular health check up, especially in older age groups may be needed.

Key words: Low back pain, Food processing worker, Working condition, Cross-sectional study, Migrant worker

Introduction

Low back pain (LBP) is one of the most common health problems all over the world. The lifetime prevalence of low back pain is reported to be over 70% in European countries and the peak prevalence occurred between ages 35 and 55 in the working population[1)]. Despite its benign nature, LBP is the leading cause of disability and the highest cost for workers' compensation in industrialized countries[2–6)]. In Thailand as well, high prevalence of LBP is reported. The six month prevalence of LBP was more than 50% in the study population over 50 yr old[7)].

Risk factors for LBP have not been completely elucidated. The most frequently reported risk factor for LBP is heavy physical workload such as lifting, awkward posture, and whole body vibration[8–10)]. Life style is also considered a risk factor of LBP. Smoking behavior[8, 11, 12)], lack of physical exercise[8)], and short sleep hours[13)] increase the risk of LBP. A systematic review showed that there was no evident relationship between alcohol consumption and LBP[14)]. An association between LBP and psychosocial factors has also been reported[8, 15, 16)]. Food processing workers are known to be a high risk population for LBP because they work in awkward postures, with lifting and manual handling of heavy

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materials, on the wet floor, and in hard temperature[12, 13, 17, 18]. Epidemiological reports on LBP among food processing workers are limited to those from developed countries, although the food processing industry is one of the major industries in Southeastern Asia like Samut Sakorn province in Thailand. Migrant workers were also reported to be a high risk group for LBP in European countries[19]. In Thailand, the number of foreign migrant workers increased dramatically from 700,000 in 1996 to 1,800,000 in 2007. Among registered foreign migrants in Thailand, 91% were from Myanmar in 2007[20]. Health care including treatment of LBP for foreign migrant workers has become an important social issue in Thailand[20].

In this study, we had focused on seafood processing workers including many Myanmar migrants at a typical factory in Thailand. The first aim of this study was to estimate the prevalence of LBP among seafood processing factory workers in Thailand. The second was to identify the association between LBP and risk factors such as general characteristics, life style, and working condition.

Method

The design of this study was a cross-sectional survey using a self-administered questionnaire to investigate the prevalence of LBP and to identify risk factors among seafood processing factory workers.

Subjects

One typical seafood processing factory, which was possible to investigate Thai and Myanmar workers at the same time, was selected in Samut Sakorn province, Thailand. The study population consisted of 254 workers including 88 Thai workers and 166 Myanmar migrant workers. All workers who had worked at least for six weeks in this factory were invited to participate in this survey. Samut Sakorn province is a seaside town located about 30 kilometers southwest of Bangkok. The population of Samut Sakorn was 452,017 and the population of foreign migrants was 103,426 in 2006. And there are over 2,900 seafood factories in this area.

The principal task of the workers was to produce canned seafood such as tinned sardines. The work consisted of carrying containers of fish, washing fish, cutting and packing fish, steaming and sealing cans, and packing the products. Workers prepared fish, gathering around the work table in a continuous standing position. The floor was wet by water and melted ice in some places. Unlike a frozen food factory, there was no work under refrigeration. As for steaming, cans were stepped on a belt conveyor and carried into a steamer automatically. Part of the work involved labeling the finished products in a sitting position and then to carry the labeled tins to the next work station. Workers worked for 8 h per day including one-hour lunch break, and had one day holiday per week regularly. There was not shift-work in the factory.

Questionnaire

We devised a structured self-administered questionnaire including questions on LBP, general characteristics, life style, and working conditions. In addition, those who could not read the questionnaire were interviewed verbally using the same questionnaire. We investigated LBP at the current time point, during the recent 7 d, and the recent 12 months. Information on general characteristics consisted of demographic, social, and health related factors; i.e., age, gender, nationality, education, length of employment, health insurance, utilization of health care, body mass index (BMI), perception of health status, and past history of back injury. Life style factors included smoking status, alcohol consumption, sleeping time, and regular physical exercise. We devised 10 items to measure working conditions based on the Dutch Musculoskeletal Questionnaire[21], modifying the items according to actual conditions in the factory being investigated. All of the questions were reviewed and translated from English to Thai and the Myanmar by bilingual health specialists. Then, back-translation was done by different bilingual specialists and the final versions in both Thai and Myanmar were pretested at another seafood processing factory prior to data collection.

Data collection

First, orientation for both Thai and Myanmar workers in the factory was performed by the researchers. Thai and Myanmar health specialists explained each item on the questionnaire for participants in their mother language using common panels with pictures and figures as well as words. All data were collected in the factory during the workers' lunch breaks on the 16th and 17th February, 2009. Informed consent was obtained after explanations were given in their own language. All participants were free to refuse to respond to the questionnaire at anytime. This study was approved by Human Ethics Committee, Faculty of Public Health, Mahidol University.

Data analysis

We calculated the frequencies of each risk factor, the point prevalence, 7-d prevalence, and 12-month prevalence among Thai and Myanmar workers, respectively. We also compared these frequencies and the prevalence among Thai workers with those among Myanmar workers using χ^2 test. The associations between each risk factor and LBP were analyzed by logistic regression analy-

sis adjusting for age and gender. All variables that were significantly associated with LBP after adjusting for age and gender were selected as independent variables in the multiple logistic regression model. Nationality, health status, history of back injury, regular physical exercise, lifting heavy loads, twisting, over exertion, and slipping on wet floor were simultaneously entered in the model together with age and gender, which had biological plausibility. We used SPSS (Ver. 12.0J) computer package for statistical analysis.

Results

Of 254 workers, 165 workers (65.0%) completed the questionnaire. Regarding nationality, 85 of 88 Thai workers (95.6%) responded and 80 of 166 Myanmar workers (48.2%) responded. The mean age ± SD was 30.3 ± 10.4 overall, 36.1 ± 10.6 among Thai and 24.2 ± 5.6 among Myanmar workers.

Table 1 shows the distribution of general characteristics, life style factors and work-related factors among

Table 1. Characteristics of Thai and Myanmar seafood processing factory workers

	Total (n=165)		Thai (n=85)		Myanmar (n=80)		
	n	%	n	%	n	%	*p**
General characteristics							
Age (yr)							<0.001
<30	91	55.2	27	31.8	64	80.0	
30–39	38	23.0	23	27.1	15	18.8	
≥40	36	21.8	35	41.2	1	1.3	
Female	113	68.5	63	74.1	50	62.5	0.108
Education							<0.01
None	11	6.7	4	4.7	7	8.8	
Primary	76	46.1	43	50.6	33	41.3	
Secondary	42	25.5	12	14.1	30	37.5	
High school or more	36	21.8	26	30.6	10	12.5	
Employment period ≥12 months	53	32.1	31	36.5	22	27.5	0.217
Having Health insurance	119	72.1	82	96.5	37	46.3	<0.001
Utilization of health care							<0.001
Hospital	71	43.0	63	74.1	8	10.0	
Clinic (company clinic)	73	44.2	19	22.4	54	67.5	
Others	21	12.7	3	3.5	18	22.5	
Obese (≥25 kg/m^2)	19	11.5	15	17.6	4	5.0	<0.01
Healthy (perception)	129	78.2	50	58.8	79	98.8	<0.001
Chronic diseases	18	10.9	15	17.6	3	3.8	<0.01
History of back injury	27	16.4	16	18.8	11	13.8	0.379
Life Style							
Smoker	20	12.1	11	12.9	9	11.3	0.944
Drinking alcohol	24	14.5	15	17.6	9	11.3	0.244
Short sleep (<6 h/d)	5	3.0	5	5.9	0	0.0	0.059
Regular physical exercise	45	27.3	32	37.6	13	16.3	<0.01
Working condition							
Lifting heavy loads (5 kg)	101	61.2	54	63.5	47	58.8	0.529
Lifting very heavy loads (25 kg)	52	31.5	27	31.8	25	31.3	0.943
Lifting very heavy loads (50 kg)	29	17.6	13	15.3	16	20.0	0.427
Bending	133	80.6	77	90.6	56	70.0	0.001
Twisting	137	83.0	72	84.7	65	81.3	0.554
Over exertion	134	81.2	72	84.7	62	77.5	0.236
Prolonged standing	146	88.5	78	91.8	68	85.0	0.174
Prolonged sitting	89	53.9	57	67.1	32	40.0	<0.001
Kneeling or squatting	54	32.7	23	27.1	31	38.8	0.110
Slipping on wet floor	44	26.7	24	28.2	20	25.0	0.639

*χ^2 test.

total, Thai, and Myanmar workers, respectively. Compared with Thai workers, Myanmar workers were younger, did not have health insurance, did not utilize the hospital, not fat, considered themselves healthy and did not have chronic diseases other than LBP. Regarding life style factors, Myanmar workers were less likely to perform regular physical exercise compared with Thai workers. Regarding work-related factors, Myanmar workers were less likely to work while bending over or prolonged sitting. The point prevalence of LBP was 28.5% among all subjects. The 7-d and 12-month prevalence of LBP were 32.1% and 44.8% respectively. Thai workers showed a relatively higher prevalence compared with Myanmar workers (Table 2).

Table 3 shows age- and gender- adjusted odds ratios for LBP in relation to general characteristic factors. Four factors were significantly associated with LBP, which were age, nationality, perception of health status, and history of back injury. As for lifestyle factors, only regular physical exercise was significantly associated with LBP as shown in Table 4. Table 5 illustrates the association between each work-related factor and LBP. Four out of ten factors were significantly associated with LBP. Those were lifting very heavy loads (50 kg), twisting posture at

Table 2. Prevalence of low back pain in Thai and Myanmar workers

	Total		Thai		Myanmar		
	n	%	n	%	n	%	*p**
Present symptom	47	28.5	36	42.4	11	13.8	<0.001
Past 7 d	53	32.1	40	47.1	13	16.3	<0.001
Past 12 months	74	44.8	58	68.2	16	20.0	<0.001

*χ^2 test.

Table 3. Prevalences and odds ratios for LBP in relation to each general characteristic

	Total	Prevalence (%)	adj. OR	95%CI
Age (yr)				
<30	91	16.5	1.00	
30–39	38	34.2	2.61	1.09–6.24
≥40	36	52.8	5.38	2.21–13.09
Gender				
Male	52	21.2	1.00	
Female	113	31.9	1.19	0.52–2.75
Nationality				
Myanmar	80	13.8	1.00	
Thai	85	42.4	2.84	1.17–6.90
Education				
None or primary	87	33.3	1.00	
Secondary or more	78	23.1	1.20	0.52–2.75
Employment period (month)				
<12	112	24.1	1.00	
≥12	53	37.7	1.40	0.65–3.00
BMI (kg/m^2)				
Underweight (<18.50)	25	24.0	1.16	0.39–3.46
Normal weight (18.50–22.99)	91	25.3	1.00	
Overweight (≥23.00)	30	26.7	0.76	0.28–2.07
Obese (≥25.00)	19	52.6	1.77	0.58–5.43
Health status				
Healthy or reasonably healthy	129	21.7	1.00	
Not too bad or poor	36	52.8	2.74	1.18–6.41
Chronic diseases				
No	147	25.9	1.00	
Yes	18	50.0	1.84	0.62–5.43
History of back injury				
No	138	22.5	1.00	
Yes	27	59.3	8.55	3.17–23.00

The odds ratio (OR) was adjusted for age and/or gender by logistic regression analysis (Age was adjusted for gender, and gender was adjusted for age).

Table 4. Prevalences and odds ratios for LBP in relation to each life style factor

	Total	Prevalence (%)	adj. OR	95%CI
Smoking				
Non-smoker	133	30.8	1.00	
Former smoker	12	25.0	0.99	0.22–4.45
Smoker	20	15.0	0.58	0.12–2.67
Drinking alcohol				
Non-drinker	141	29.8	1.00	
Drinker	24	20.8	1.01	0.27–3.75
Sleeping time				
≥6	160	28.1	1.00	
<6	5	40.0	1.12	0.16–7.68
Regular physical exercise				
Yes	45	35.6	2.63	1.08–6.43
No	120	25.8	1.00	

The odds ratio (OR) was adjusted for age and gender by logistic regression analysis.

Table 5. Prevalences and odds ratios for LBP in relation to each work related factor

	Total	Prevalence (%)	adj. OR	95%CI
Lifting heavy loads (5 kg)				
Seldom or never	64	21.9	1.00	
Sometimes, often or most of the time	105	31.4	2.05	0.90–4.64
Lifting very heavy loads (25 kg)				
Seldom or never	115	27.8	1.00	
Sometimes, often or most of the time	54	27.8	1.38	0.60–3.20
Lifting very heavy loads (50 kg)				
Seldom or never	139	25.9	1.00	
Sometimes, often or most of the time	30	36.7	3.52	1.28–9.70
Bending				
Seldom or never	32	21.9	1.00	
Sometimes, often or most of the time	137	29.2	1.16	0.44–3.06
Twisting				
Seldom or never	28	14.3	1.00	
Sometimes, often or most of the time	141	30.5	3.34	1.03–10.81
Over exertion				
Seldom or never	31	12.9	1.00	
Sometimes, often or most of the time	138	31.2	3.23	1.02–10.25
Standing				
Seldom or never	20	10.0	1.00	
Sometimes, often or most of the time	149	30.2	3.07	0.65–14.51
Sitting				
Seldom or never	80	31.3	1.00	
Sometimes, often or most of the time	89	24.7	0.80	0.39–1.67
Kneeling or squatting				
Seldom or never	115	28.7	1.00	
Sometimes, often or most of the time	54	25.9	1.22	0.55–2.73
Slipping with wet floor				
Seldom or never	125	20.8	1.00	
Sometimes, often or most of the time	44	47.7	2.94	1.34–6.44

The odds ratio (OR) was adjusted for age and gender by logistic regression analysis.

Table 6. Multiple logistic regression analysis for risk factors for LBP

Variable	adj. OR	95%CI
Age (yr)		
30–39	2.56	0.84–7.81
≥40	4.31	1.17–15.83
Gender		
Female	2.77	0.79–9.75
Nationality		
Thai	1.39	0.41–4.74
Health status		
Not too bad or poor	3.15	1.09–9.13
History of back injury	7.82	2.54–24.07
Regular physical exercise	2.04	0.61–6.81
Lifting very heavy loads (50 kg)	1.10	0.30–4.10
Twisting	4.70	1.09–20.19
Over exertion	2.10	0.55–7.96
Slipping with wet floor	2.91	1.06–7.99

Odds ratios (OR) were adjusted for all items and referred to the following groups: age <30, male, Myanmar, healthy or reasonably healthy, no history of back injury, no regular physical exercise, seldom or never experienced lifting very heavy loads, twisting, over exertion, or slipping with wet floor.

work, over exertion of the arms at work, and slipping on wet floors.

These nine variables were simultaneously entered together with gender into a multiple logistic regression model (Table 6). The results of multiple logistic regression analysis confirmed the significance of the association among many of these factors. Among general characteristics, workers aged ≥40 yr (OR 4.31, 95%CI 1.17–15.83) were significantly more likely to develop LBP independently. In addition, those who did not have a perception of a healthy or reasonably healthy status were three times more likely to have LBP, while those who had history of back injury were nearly eight times more likely to have LBP compared to those without such history. Regarding working conditions, those who experienced a twisting posture at work sometimes or more frequently were nearly five times more likely to have LBP compared to those who experienced a twisting posture at work seldom or never. Furthermore, those who slipped on wet floor had an approximately three times higher rate of LBP. Nationality, regular physical exercise, lifting very heavy loads (50 kg), and over exertion of arms were not significantly associated with LBP, although those factors showed a significantly increased age- and gender-adjusted OR.

Discussion

This cross-sectional study showed that the prevalence of LBP was high among seafood processing workers. The results indicated that LBP was independently associated with older age, perception of health status, history of back injury, twisting posture at work, and slipping on wet floor. These findings are important as this study was the first study of LBP conducted among both Thai and Myanmar workers at a single seafood processing factory at the same time.

Although point prevalence should provide a better estimation of the association with risk factors in cross-sectional study, most epidemiologic studies about LBP used the period prevalence as the outcome. In this study, both point and period prevalence were investigated. The point prevalence, 7-d prevalence, and 12-months prevalence were 28.5%, 32.1% and 44.8% respectively. There are not many information existed in the literature regarding the epidemiology of LBP in tropical countries. Chaiamnuay *et al.*[22] reported that the 7-d prevalence of back pain among Thai rural population was 12.8%, and Darmawan *et al.*[23] showed a higher point prevalence of LBP among the Indonesian rural population at 15.1%, in comparison with studies those in the Philippines, which showed a prevalence of 7.5%. Meta analysis[9] of 40 studies mainly from developed countries, showed that the 12-month prevalence of LBP was 22% for the population under 35 yr old. Compared with these general populations, seafood processing factory workers in this study had a higher prevalence of LBP as the mean age was around 30 yr old. Overall, the results of this study showed that seafood processing factory workers in Thailand had a high prevalence of LBP, the same as shown in previous studies of food processing workers[12, 13, 18] in industrialized countries.

Aging is a well known risk factor of LBP as degenerative changes in the spine and disc are one of the major causes of LBP[24]. Previous studies reported the association between age and LBP among the Thai population[7] as well as the western population[8, 9]. The findings of this study were consistent with those of these previous studies. The majority of seafood processing workers in this study were female like other reported food processing workers such as cooks[12, 25] and frozen food processing workers[13]. Although the association between gender and LBP had been reported by previous studies[11, 12], there was no significant association in this study. The subjects in this series were relatively young compared with those in previous studies. Therefore, future study among middle-aged and older workers would be necessary.

Nationality was not significantly associated with LBP after adjusting for all other confounding factors in contrast with reports from western countries, which have shown that foreign migrant workers were at high risk of

musculoskeletal disorders[19, 26, 27]. In this study, there was not much difference in life style and working conditions between the two ethnic groups. However, there were differences in health insurance coverage and utilization of health care services between two ethnic groups, the same as there are in industrialized countries[28–31].

There were only 19 (11.5%) obese (BMI≥25 kg/m^2) workers and obesity was not associated with LBP in this study. Miranda *et al*. reported that workers with a BMI≥30 kg/m^2 had a 1.9 times higher incidence of LBP among forest industry workers under 40 yr old in Finland. In the elderly Thai population, BMI was identified as a predictive factor for spondylosis of the lower back[7]. Compared with these previous studies, there were few workers who had a BMI≥30 kg/m^2 and the mean age was younger in this study. Regarding the health status, those who did not considered themselves to be healthy were three times more likely to have LBP. Alexopoulos[32] reported that workers who had health problems had a higher risk of developing LBP and Nagasu *et al*.[12] also showed an association between health-related problems and LBP among Japanese school lunch cooks. Our findings were similar to those of these previous studies. Establishment of a counseling and education system after annual physical examinations may be important to advise workers regarding health problems that could lead to a higher prevalence of LBP. Workers with other health problems may need to pay more attention to preventing LBP as well after annual health check-up for all workers. It is noteworthy that workers with a history of back injury had the highest adjusted OR. A Canadian population-based survey[33] showed that a history of work-related low back injury was positively associated with severe disability due to LBP (OR 6.76, 95%CI 3.80–12.01). Our finding is consistent with that survey and indicates that prevention of back injury is necessary in order to reduce the prevalence of LBP in seafood processing factory.

In this study, there was no apparent association between life style factors and LBP. Gilgil *et al*.[11] reported that those who smoked for 15 yr were more likely to develop LBP. Miranda *et al*.[8] showed an association between smoking and LBP among subjects over 50 yr old. In addition, another study[34] showed an association between smoking and decreased bone mineral density in women. As participants in our study were young compared to the study populations in these reports, long-term evaluation of the influence of smoking might be necessary. Although short sleep hours were reported to be a risk factor for LBP in previous studies[12, 13], only five workers slept less than six hours on average and sleep duration was not associated with LBP in this study. There was no association between regular physical exercise and LBP in contrast with previous studies which reported the association between a lack of physical exercise or activity and LBP[8, 12, 35]. In this study, there might be a lack of knowledge about appropriate exercises to prevent LBP among workers. In fact, there had not been any health promotion program focusing on physical exercise in the factory. In order to prevent LBP, education on appropriate exercise methods would be necessary.

As for working condition, lifting very heavy loads of 50 kg, twisting posture, over exertion of arms, and slipping on a wet floor were associated with LBP after adjusting for age and sex. After adjusting for all confounding factors by multiple logistic regression analysis, two factors, twisting posture at work and slipping on a wet floor, showed significant independent associations with LBP. Lifting heavy loads, a well known as a risk factor of LBP in the workplace, was reported by previous studies[8–10, 17, 36], but was not major contributing factor among the relatively young and short-term workers in this study. However, twisting posture at work had a significant association with LBP in this study. Lotters *et al*.[9] showed that OR for frequent bending or twisting of the trunk was 1.68 (95%CI 1.41–2.01) on Meta analysis. Another recent study[37] showed that the association between twisting posture and LBP and ORs were distributed between 1.2 and 2.2. In comparison with these reports, our study showed a higher odds ratio 3.34 (95%CI 1.03–10.81). Most of the seafood processing workers were performing their work in a limited space around the worktable. In addition, the floor often got wet making it easy to slip. For these reason, it is thought that they more frequently assumed postures in which they twisted their trunk. Slipping on wet floor was also significantly associated with LBP similar to the finding in a previous study for cooks[12]. In this study, there was a clear association between factors related to working conditions and LBP. Previous studies have confirmed that work-related injuries and disorders can be prevented by appropriate risk assessment and employee training[38, 39]. The result of this study shows the possibility of reducing the prevalence of LBP among seafood processing workers by appropriate training and improvement of the work environment such as securing a sufficient work space for appropriate postures and adequate floor management.

There are several limitations in this study. As the employment period of subjects was relatively short, the long-term influence of these work conditions could not be assessed. And lower response rate among Myanmar workers might be a bias, since there is a possibility that those with anxieties regarding health or registration tended not to participate which might lead to an underestimation of LBP. In addition to non-respondent bias, a healthy migrant effect should be taken into account. Reports from western countries have shown that migrant

mortality was lower than the mortality of the host population[40, 41]. As one of the explanations, self-selection at the time of immigration was considered[42]. There was a possibility that Myanmar migrant workers in this study were relatively healthy and had less LBP at the time of immigration because of self-selection. There is also a limitation in generalization of these results to workers of other nationalities and occupations. Besides, only one factory was selected in this study. This limits to generalize results to other factories in this area. Furthermore, because the factory in this study was comparatively new, built two years ago and designed to use pushcarts, generalizability of the result might be limited.

Our findings, however, show the first evidence of a high prevalence of LBP among food processing workers and the need for workplace health promotion focusing on prevention of LBP in a tropical country that is becoming industrialized.

Conclusion

Seafood processing workers had high prevalence of LBP. We confirmed that factors such as age, perception of health status, history of back injury, twisting posture, and wet floor were associated with LBP. The findings show the necessity of preventive measure focusing on LBP and health promotion should focus on the working environment and working posture. Furthermore, more attention should be paid to other factors such as health status, especially for older age groups. Counseling and education after annual physical examination in the workplace may be important for this group. Further longitudinal study is required with a longer work history.

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