CHAPTER V

DISCUSSION

5.1. Prevalence of foot pain during the past month in pre-retirement aged

The first aim of the study was to determine the prevalence of foot pain during the past month in pre-retirement aged of Chulalongkorn University personnel. The result showed high prevalence of foot pain (47.5%) when compared with other studies. Garrow et al., (2004) reported the prevalence of foot pain approximately 10% in the population survey. In addition, the highest prevalence of foot pain was found at aged 55-64 years (15%). Similarly, the study of Hill et al., (2008) found the prevalence of foot pain approximately 17.4% in a population-based study with the highest rate at aged more than 55 years. The previous study showed the highest prevalence of foot pain among the group with aged more than 50 years. Therefore, the present study recruited only older adult group with aged more than 50 years.

The findings indicate higher prevalence of foot pain. The plausible explanation is due to the inclusion criteria of our study which focused on the working population with the shorten range of age 50-60. The participants were voluntary; therefore, the persons with foot pain had inclination to attend the study in the higher proportion than the samples in previous studies. Considering work-related factors, the previous studies showed high prevalence of foot pain among working population if compared with the studies among general population. For example, the study of Pensri et al., (2009) found the prevalence of foot pain with 35% among salespersons workers. Messing et al., (2008) reported the higher prevalence of foot pain (51%) among assembly plant workers. In addition, working duration more than 40 hours per week and working experience more than 20 years were also the risk factors to increase the prevalence of foot pain same as our findings. Obviously, the mean of body mass index and waist hip ratio ± SD were almost reached the higher level (24.8 ± 4.3 and 0.87 ± 0.1, respectively) when compared with the cut-off point for overweight of 25.0-29.9, abdominal obesity of

0.85 for female, and 0.90 for male. These finding were supported with the study of Hill et al., (2008) that the high prevalence of foot pain was associated with high body mass index and high waist hip ratio. The association between obesity and foot pain can be explained by the increasing forces under the foot during walking. As a result, the obese group is more likely to have chronic heel pain and flat foot than the normal group (Birtane and Tuna, 2004; Irving et al., 2007).

In general, female have high prevalence of foot pain more than male. The previous studies revealed that the poor shoewear style i.e. heel height more than 2.5 cm affected high plantar pressure which induced foot pain and the risk of falling in older women (Tencer et al., 2004; Mickle et al., 2010). Interestingly, the present study showed high prevalence of foot pain in male (50.0%) more than female (47.1%). The plausible explanation may be due to the obesity and the small sample size in male group. The result showed that the mean of body mass index ± SD in male were group into the overweight group (25.1 ± 3.8) and the mean of waist hip ratio ± SD were group into the abdominal obesity group (0.91± 0.1).

5.2. The comparison in health-related quality of life between two groups

The present study found the SF-12 PCS and SF-12 MCS lower than 50 scores among pre-retirement aged group of Chulalongkorn University personnel. The average score of each component among general population is approximately 50 (Wilson et al., 2002). The positive significant differences between participants with foot pain and without foot pain were found in the present study. Similarly to the result from the previous studies, for example, Hill et al., (2008) found that the impact of foot pain decreased overall health-related quality of life. The study of Menz et al., (2006) also found the association between foot pain and the reduction of scores in physical component summary and mental component summary of SF-36. The plausible explanation is that the condition of foot pain restricted the activity of daily life i.e. the limitation of walking long distance, standing, avoiding hard or rough surfaces. As a result, the presence of foot pain reduces not only functional

capacity but also the overall quality of life including mental health status, social function, and vitality (Mickle et al., 2010).

5.3. Factors associated with foot pain in pre-retirement aged

The final modeling of backward stepwise logistics regression showed the factors associated with foot pain using the last step of analysis. The significant factors were composed of history of low back pain, history of knee pain, prolong standing, the presence of hallux valgus, reduced ankle plantarflexors strength, and pronated foot type. The adjusted odds ratios and 95% confidence interval were used to explain the factors related with foot pain because the model had already control confounding factors.

5.3.1 History of low back pain

The significant association between history of low back pain and foot pain was found in the present study with the adjusted OR of 2.04 (95% CI = 1.06-3.95). The previous studies also supported our result. For example, Hill et al., (2008) found the association between foot pain and low back pain with adjusted OR of 2.36 (95% CI = 1.94-2.86). Similarly to the study of Garrow et al., (2004), they found the association between disabling foot pain and axial skeleton pain with adjusted OR of 3.40 (95% CI = 2.7-4.3). The mechanism of low back pain might be connected with distal disturbances of lower extremities in the locomotor system (Rothbart et al., 1988). In addition, the foot problem altered the normal gait and normal alignment resulting in the loss of shock absorption which stimulated the emergence of locomotor conditions i.e. low back pain. The previous studies found that the limitation of ankle dorsiflexion movement during weight-bearing posture was related with chronic mechanical low back pain (Brantingham et al., 2006). However, we could not find the causal relationship from this cross-sectional study; the finding can be used to explain only the association between foot pain and low back pain which may be benefit for further studies about the treatment at foot region

i.e. custom-made shoe orthotics to decrease musculoskeletal disorders at lower back and lower extremities.

5.3.2 History of knee pain

The significant association between history of knee pain and foot pain was found in the analysis model with adjusted OR of 3.24 (95% CI = 1.67-6.31). Similarly to the study of Hill et al., (2008), they found the significant association between knee pain and foot pain with adjusted OR of 2.40 (95% CI = 1.92-3.01). Likewise the study of Garrow et al., (2004), they found the significant association with adjusted OR of 3.10 (95% CI = 2.4-4.0). The excessive loading of the knee can increase the compressive stress of patellofemoral or tibiofemeoral joint led to the mechanical stress of ankle joint during ground contact. During the weight-bearing activities, the posture and motion of the knee and foot are coupled within the closed kinematics chain (Gross et al., 2011). The excessive rotation of the lower limb at the articulation of knee joint and ankle joint cause knee and ankle/foot pain from overuse injury that may lead to the osteoarthritis of both foot and knee region in the long term effect (McDaniel et al., 2011).

5.3.3 Prolong standing

The presence of foot pain related with occupational factors. Our results showed significant association between foot pain and prolong standing more than 2 hours with adjusted OR of 2.12 (95% CI = 0.998-4.49). Pensri et al., (2010) also found the significant association between foot pain and static standing posture among salesperson workers. Similarly to the study of Messing et al., (2008), they found that fixed standing posture had higher risk for foot pain with adjusted OR of 3.95 (95% CI = 2.56-6.10). Prolong standing for more than 2 hours increased the risk of blood circulation restriction leading to the swelling at calf muscle and lower extremities injury (Madeleine et al., 1988). In addition, the study of Lin et al., (2012) among prolong standing workers found that the static posture without ankles and hips movement caused the swelling of leg muscles. The high risk factor of foot pain also increased as a result of the joint compression at lower limb for long time in

static standing posture. In sum, the workers should move ankles and hips for the short time period during static standing for 30 minutes to decrease lower leg muscles discomfort (Lin et al., 2012).

5.3.4 The presence of hallux valgus (HV)

The result showed negative significant association between the prevalence of mild hallux valgus and foot pain with the adjusted OR of 0.37 (95% CI = 0.17-0.79). Similarly to the study of Nguyen et al., (2009), they found negative association between HV and foot pain among men. In general, HV is positively related with foot pain (Menz et al., 2005; Nix et al., 2012). It is the risk factor to develop foot pain since the progressive foot deformity from lateral deviation of the hallux increased subluxation of the first metatarsophalangeal joint leading to the presence of osteoarthritis and foot pain (D'Arcangelo et al., 2010). In contrast, our result showed a negative association i.e. participants who had hallux valgus were more likely to not suffer from foot pain. The current result was similar to that of Nguyen's study. The previous study could not explain any reasons for the negative association (Nguyen et al., 2009). However, the possible explanation for the present study may be related to the data that the participants without foot pain tended to choose more appropriate shoewear. As recognizably, appropriate shoewear can reduce the risk of foot pain. Those participants with hallux valgus might previously had the experience of foot pain and thus chose more appropriate shoewear to reduce their foot pain. The study of Nix et al., (2012) revealed that participants with HV had significant concerns about footwear and foot appearance more than the participants without HV. This notion might explain the reduction of risk factor for foot pain in HV group.

5.3.5 Reduced ankle plantarflexors strength

The findings showed significant association between foot pain and fair degree of ankle plantarflexors strength with adjusted OR of 3.60 (95% CI = 1.17-11.1). The results of previous studies supported that a decrease in muscle strength led to the risk factor of foot pain. (Mickle et al., 2010). To our knowledge, the fair

degree of ankle plantarflexors strength is not enough to maintain body weight during walking because the push off phase in gait cycle needs higher strength i.e. the good and normal degree to resist the gravity to raise the heel. The reduction of muscle strength would increase fatigue level to maintain body weight during weight-bearing activities, leading to the foot pain related to overuse injury (Ciubotariu et al., 2007).

Considering the result from table 4.5, the result showed almost significant association ($p = 0.052$) between foot pain and pronated foot type with adjusted OR of 1.97 (95% CI = 0.994-3.92). Even take into the consideration, the plausible explanation is that the normal pronation of subtalar joint occurs after heel strike with the normal range between 4° and 8° in each gait cycle. The abnormal pronated foot can affect the compression force acting on subtalar joint, and generate the abnormal tibial rotation, causing overuse injury on the lower extremities (Hetsroni et al., 2006). In addition, excessive foot pronation when normally it should be supination would result in the development of slight discomfort and foot pain or postural symptom (Sgarlato, 1971). The study of Reinking et al., (2012) found the higher percentage of exercise-related leg pain in the athletes with pronated group than the athletes with supinated and neutral foot type. Evidence from some clinical trials showed that the correction of excessive pronated foot posture by foot orthotics might reduce the knee and foot pain intensity (Shih et al., 2011).

5.4. Strength/Limitation of this study and suggestion for further study

This is the first study to determine the factors associated with foot pain among pre-retirement aged group. The major strength of the present study is that the measurement tools using for the study included not only self-reported questionnaire but also physical examination by physical therapist. The factors related with foot pain generalize the individual factor, work-related physical factor, health behavioral factor, anthropometric factor and also the consequence of foot pain related with psychological factor. The information regarding to the association with foot pain is

useful for further studies about the prevention and treatment of foot pain. The pilot study showed high reliability of measurement tools both the questionnaire and the physical examination test. However, the weak points of our study were found in some measurement tools such as manual muscle strength testing both of the extrinsic and instrinsic muscles. The next study should use hand-held dynamometer to test the muscle strength in kilogram unit. The limitations of the present study were also found in several points. First, the cross-sectional design could not determine the causal relationship or the risk factors of foot pain. The current result can present only the association among particular factors and foot pain. And due to the limitation of time, we could not reach the target number of sample size because the activity for one participant took time for almost 1 hour. The consequence of small sample size may reduce the statistics power. Further studies should use the prospective design to determine the risk factor of foot pain. Second, the recall bias of self-reported questionnaire may be found in the present study. Therefore, the observation or interview method should be used in the future study to decrease wrong recall and wrong understanding of each question. Third, the diagnosis of foot pain was subjective, thus it may lead to the weakness of data. The objective information should be included in the dependent variable to increase more strength of the data and pain scale measurement should be added in the examination. Last, the participants have the main general working posture of prolong sitting that might not be directly related with foot pain. The future study should emphasize on the workers with prolong standing posture which may be more directly related to the risk of foot pain.

5.5. Conclusion

Foot pain is one of the musculoskeletal problems commonly found among older workers. 47.5% of this sample of pre-retirement aged personnel at Chulalongkorn University reported MSDs during the past month at foot region. The factors significantly associated with foot pain consist of the history of MSDs at lower back region and knee region, pronated foot type, the presence of hallux

valgus, and the ankle plantarflexors strength. In addition, occupational factors are also associated with foot pain especially in general working posture with prolong standing for more than 2 hours. The consequence of foot pain decreases the overall quality of life in the term of both physical and mental components. The findings about factors associated with foot pain provide useful information for the development of the prevention strategies for musculoskeletal foot pain in this age group. Future studies to determine the cause-effect relationship between foot pain and those important factors are required.