RESEARCH ARTICLE

Hallux Valgus as an Occupational Disease among Indonesian Female Workers: A Study Using Seven Steps of Occupational Diagnosis Approach

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Abstract

Shoes are a necessity for female workers. Not only they are used as footwear, they also play role in workers' appearance. Company policies sometimes require female workers to use high heels, which could consequently lead to frequent foot problems such as hallux valgus (HV). This cross-sectional study was conducted to determine the prevalence of HV as an occupational disease among female workers at M department store, in Bekasi City West Java on May to June 2018, using a seven steps of occupational diagnosis approach. Female workers with HV were included as study subjects and were given questionnaires. Data was analyzed using the seven steps of occupational diagnosis method to establish the diagnosis of HV as an occupational disease or work-related disease or non-occupational disease. A total of 35 subjects were diagnosed with HV by the orthopedic specialist, 19 subjects of whom had an occupational disease and 8 subjects of work-related HV and 8 subjects of non-occupational HV. The majority of HV cases among the female workers at the department store was an occupational disease.
***Keywords**: occupational disease, seven steps of occupational diagnosis, female workers, hallux valgus.*

Hallux Valgus Akibat Kerja di Pekerja Perempuan Indonesia: Suatu Studi Menggunakan 7 Langkah Diagnosis Okupasi

Abstrak

Sepatu sangat penting untuk pekerja perempuan, selain sebagai alas kaki, sepatu juga menambah penampilan. Kebijakan perusahaan kadang menghendaki pekerja perempuan menggunakan sepatu berhak tinggi sehingga menimbulkan masalah kaki antara lain hallux valgus (HV). Studi potong lintang ini bertujuan mengetahui prevalensi HV akibat kerja di M departemen store, di Kota Bekasi Jawa Barat pada bulan Mei sampai Juni 2018, menggunakan tujuh langkah diagnosis okupasi. Pekerja perempuan dengan HV dikumpulkan sebagai subjek, diberikan kuesioner dan dikaji dengan metode tujuh langkah diagnosis okupasi untuk menentukan HV akibat kerja atau HV berhubungan dengan pekerjaan atau HV bukan akibat kerja. Terdapat 35 subjek didiagnosis HV oleh spesialis ortopedi; 19 subjek termasuk HV akibat kerja dan 8 subjek masing-masing untuk HV berhubungan dengan pekerjaan dan HV bukan akibat kerja. Sebagian besar HV yang timbul di pekerja perempuan yang bekerja di department store adalah HV akibat kerja.
***Kata kunci**: penyakit akibat kerja, tujuh langkah diagnosis okupasi, pekerja perempuan, hallux valgus.*

Introduction

In general, female workers are required to pay attention to their appearance while working. One of the factors supporting appearance is the shoes. Several foot problems experienced by workers are caused by inappropriate types of shoes or footwear. These risks can actually be avoided and eliminated. Unfortunately, several types of jobs, especially those dealing with consumers directly, require workers to wear certain uniforms, including shoes. Occasionally, these uniforms are not comfortable along with inappropriate footwear. Inappropriate uniforms can lead to foot problems in the future among the workers.[1]

Female workers working at a department store are required to wear high heels while working.[2] Wearing high heels for a long time can cause pathological changes in the anatomy of the foot. One of the most frequent and significant problems occurring in a woman's foot is hallux valgus (HV).[3,4] It is a chronic condition characterized by the presence of deformity in the first metatarsophalangeal joint, which is caused due to the lateral drift of the great toe[5] due to joint subluxation,[6] which turns the toe out of the body axis midline. Clinical findings of HV include an erythematous and swollen appearance of the great toe and the surrounding areas, with pain on the inside of the foot.[4] Several cross-sectional studies have indicated that wearing high heels is strongly associated with HV.[7]

The seven steps of occupational diagnosis approach is a systematic and directed strategy to determine whether the medical condition is an occupational diseases or not.[8] Occupational diseases are those that have a specific cause or a strong association with work and generally consist of one known etiological factor.[9] The stages involved in the seven steps of occupational diagnosis approach include determining the clinical diagnosis, determining the exposure during work, determining the relationship between exposure and disease, determining the amount of exposure that is adequate to cause the disease, determining the contributing individual factors, determining other factors outside of work, and determining the occupational diagnosis. The final step is determining the occupational diagnosis based on the previous clinical diagnosis and identifying whether it is an occupational disease, work-related disease, or non-occupational disease.[8]

All information collected from the above mentioned previous steps was analyzed and reviewed, based on references, and it was decided whether the disease occurring in the subjects were occupational or not. Occupational diagnosis can be made if from the 1st to 6th step there is a causal relationship between exposure and the disease, and occupational factor is the main factor in the occurrence of the disease, although there are any individual factors or other factors that also play a role in the onset of the disease. The final diagnosis is determined as follows: HV occupational disease, if step number 1 to 4 are fulfilled; HV work-related disease, if step number 1 to 4 are fulfilled and step number 5 and/or 6 are fulfilled. In an occupational diagnosis, occupational diseases and work-related diseases are considered as occupational; HV non-occupational disease, if step number 1 and 2 and also step number 5 and/or 6 are fulfilled.[8]

To our knowledge, there is a lack of research on HV as an occupational disease in Indonesia. Therefore, this study was conducted to determine HV as an occupational disease using the seven steps of occupational diagnosis approach.

Methods

This cross-sectional study included 35 female workers with HV who were working as salespersons in various sections at M department store, in Bekasi City, West Java on May to June 2018. They were provided with a questionnaire that included the identity, work history (work period, duration of work per day, part-time job and previous jobs), type of shoes used during work, habits/hobbies, past medical history, current disease, and history of the same disease in the family. Height and weight of the subjects were measured, by microtoise (One Med) and digital scale (Camry), which were used to calculate the body mass index (BMI).

Subjects who were diagnosed with HV based on the results of an orthopedic specialist examination with the criteria that there are foot deformities, the toes are pointing toward the second toes, and there is enlargement of the inner part of the first metatarsal head.[9] The diagnosis was also supported by the results of radiological evaluation of the foot in the form of HV angle (>15°) and intermetatarsal I–II (>9°) angle changes.

Data were analyzed in a step-by-step manner using the seven steps of occupational diagnosis approach to determine whether HV was an occupational diagnosis. Occupational diagnosis of HV was presented descriptively, comprising HV as an occupational disease, HV as a work-related disease, or HV as a non-occupational disease.

HV as an occupational disease and the type

of shoes used during work were analyzed as variables. In the analysis, the occupational disease and the work-related disease were combined into one group, HV occupational disease. The type of shoes was categorized as high heels when the height was ≥5 cm and as flat shoes when the height was <5 cm (including flat shoes without heels). The SPSS version 20.0 software was used for data processing, analysis, and presentation. Data were analyzed as univariate and bivariate, using Chi square test. All the procedures undertaken in this study were approved by Faculty Medicine Universitas Indonesia Ethical Committee, no: 0508/UN2.F1/ETIK/2018.

Results

A total of 35 subjects had a clinical diagnosis of HV. The seven steps of occupational diagnosis approach were implemented on all subjects and the characteristics of subjects shown in Table 1. HV as an occupational disease was present in 19 from 35 of subjects, whereas the prevalence of both work-related HV and non-occupational HV was 8 from 35 subjects, respectively.

Table 1. Characteristics of Subjects Based on 7 Steps Of Occupational Diagnosis Analysis

Seven Steps of Occupational Diagnosis	n = 35
Diagnosis	
Bilateral HV	27
HV pedis dextra	2
HV pedis sinistra	6
Exposure at workplace	
High heels	25
Flat shoes	10
Relationship between exposure and disease	
High heels related to HV	27
Flat shoe is not related to HV	8
Mean of amount of exposure (hour)	29,952
Individual factors	
Genetic factor	9
Overweight/obese	11
Having HV before work	5
Other factors (Wearing high heel outside of work)	1
Occupational diagnosis of HV	
HV occupational disease	19
HV work-related disease	8
HV non-occupational disease	8

HV as an occupational disease was present in 17 subjects wearing high heels and in 2 subjects of those wearing flat shoes. However, work-related HV was detected in all subjects wearing high heels (8 subjects). In this analysis, HV as an occupational disease and work-related HV were combined into one group, i.e., HV occupational disease, so that analysis can be performed by cross tabulation using the chi-squared test. The combined analysis showed that HV as an occupational disease was found in 25 of 27 from subjects wearing high heels and in 2 of 27 from those wearing flat shoes, whereas all cases of non-occupational HV were found in subjects wearing flat shoes (8 subjects). This difference was statistically significant ($p<0.001$) between the two groups (Table 2).

Table 2. Hallux Valgus Occupational Disease According to Type of Shoes

Type of Shoes	Occupational Disease (n = 19)*	Work-related disease (n = 8)*	Non-occupational disease (n = 8)	p
High heels	17	8	0	<0.001
Flat shoes	2	0	8	

*Analysis combined

Discussion

In this study, the seven steps of occupational diagnosis approach is used to determine whether HV was an occupational disease. This method can distinguish HV as an occupational disease, work-related disease, or non-occupational disease. Occupational diagnosis cannot be established if the clinical diagnosis has not been previously established. Establishing a clinical diagnosis may require medical examination and often involves specialists associated with the disease diagnosis.[8]

To identify the exposure or which type of work is important and may affect an individual's health, it is necessary to understand the job history and the exposure carefully.[8] Subjects working as salespersons in the cosmetic and fashion section are required to wear high heels, which therefore indicates an exposure at the workplace. Subjects working in other sections are not required to wear high heels, so that they can wear flat shoes.

This relationship between exposure and disease must be evaluated based on the results of epidemiological research or according to an evidence base. The relationship between exposure and disease can be determined by reviewing existing references. When there is no evidence indicating that an exposure is related to a disease, then it is difficult to establish the diagnosis of an occupational disease.[8] Cross-sectional studies have shown that wearing high heels is associated with HV.[7] Shoes are an extrinsic factor that can cause HV,[10,11], especially high heels, and increase its severity[12,13] because high heels cause an increase loading of the first metatarsal and valgus events.[11]

To assess whether the exposure is large enough to cause certain diseases, it is necessary to understand the pathophysiology of the disease and the epidemiological evidence. The amount of an exposure can be assessed qualitatively, that is, by exploring information about the job (methods, processes, and condition of the work environment) from workers, including details regarding the duration, and quantitatively using work environment measurement data on existing exposure, which has been conducted periodically by the company or using biological monitoring data, if there are any.[8]

The development of HV is a gradual phenomenon, indicating the result of a repetitive trauma process. The perception that work is a contributing factor cannot be eliminated as there is a difference in the metatarsal load in the case of HV.[11] The long duration of work with wearing high heels by female workers at the department store associated with the prolonged exposure of metatarsal load can increase the risk of HV incidence. Most of the subjects with HV have worked at the department store for more than 4 years and have worn shoes for 8 or 9 h per day.

For every disease other than that caused by environmental factors and/or work-related factors, there must also be individual factors that play a role. Therefore, it is necessary to assess the extent to which individual factors play a role in causing the disease, which could help in understanding why certain individual workers and not all workers at the same workplace are affected by the disease. Individual factors that may contribute in this regard include history of atopy or allergy, family history, personal hygiene, and so on. The presence of such contributing individual factors does not mean that the diagnosis of an occupational disease can be ruled out, but it is necessary to assess the extent to which individual factors contribute toward causing the disease.[8]

Factors that cause HV can be divided into extrinsic (shoes, excessive loads such as weight body) and intrinsic (genetic, age, sexual dimorphism, flexibility of ligaments, and flat feet).[11,12] Individual factors that contribute to the incidence of HV were obtained from the family history about the same disease or genetic factors, flat feet, coworkers who have the same symptoms, and BMI.

Other factors outside of work include other exposures that can also cause the same disease, but are not from occupational factors such as cigarettes, exposure at home, and hobbies.[8] These data were collected in the form of whether the study subjects had any part-time jobs or habits that involve the use of high heels or other activities such as jogging. It has been reported that jogging can increase pressure on the first metatarsophalangeal joint, which can increase the incidence of HV.[14]

The results of the seven steps of occupational diagnosis analysis of the 35 subjects with HV revealed 19 subjects with occupational HV, 8 subjects with work-related HV, and 8 subjects with non-occupational HV disease.

There were 25 subjects with HV in the high heels group, among whom there were 17 subjects with occupational HV and 8 with work-related HV. Those 8 with work-related HV subjects were categorized as such because the fifth step was fulfilled such as having a family history of HV, nutritional status above normal, and having HV before working in the department store. Based on the literature, genetic factors are one of the intrinsic factors and the primary predisposition to HV.[13] Nutritional status is

directly proportional to body weight, and weight is a contributing factor in HV cases related to increased load on the first metatarsal head.[11]

Furthermore, one subject also fulfilled the sixth step, i.e. always using high heels outside the workplace. Fulfillment of the fifth and sixth steps makes HV on subject becoming more severe, so that it became HV work-related disease because not only the occupational factor that causes the HV but also the individual factors and other factors outside of work.

There were 10 subjects with HV who were wearing flat shoes, including 2 subjects with occupational HV and 8 with non-occupational HV. These two subjects were categorized as having occupational disease because of the history of wearing high heels for a long time, before wearing flat shoes at the end. The eight subjects were diagnosed with non-occupational HV because they did not fulfill steps 3 and 4.

According to the results of the cross tabulation using the chi-squared test. The combined analysis showed that HV as an occupational disease was found in 25 of 27 from subjects wearing high heels and in 2 of 27 from those wearing flat shoes, whereas all cases of non-occupational HV were found in subjects wearing flat shoes (8 subjects). The risk value could not be analyzed (because there were cells with zero values); however, this difference was statistically significant ($p<0.001$) between the two groups.

Cathcart et al (in Coughlin et al[10]) have implicated work as the cause for HV, but in only 17% of the patients who associated the deformity with their work. Objective evidence indicated that the percentage of patients who claimed that their work contributed to the development of HV was also very less. However, the results of the present study indicated that HV that developed in female workers was largely due to work.

Conclusion

Most of HV that developed among female workers at the department store was an occupational disease, where in wearing high heels during work was a chronic exposure to these workers. Further investigation is needed about the duration of wearing high heels at work that can lead to the development HV, so that precautions or preventive measures can be implemented in advance.

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