

# Occupational Diseases Among Office Workers and Prevention Strategies

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**Objective:** In this review we discuss the health effects among office workers.

**Background:** Even if office workers are not exposed hazardous or harmful environment frequently, some problems could be happened to the office workers. Although serious occupational diseases rarely occur to the office workers, it is important to consider occupational risk factors for the office worker because the portion of the office workers is relatively high in all industries.

**Method:** We divided possible health effects for the office workers into three categories; musculoskeletal disorders, indoor environment, and cerebro-cardiovascular diseases. We reviewed related articles, textbooks, and statistical materials non-systematically and described risk factors, related illnesses, and prevention strategies on each category.

**Results:** Office workers have various musculoskeletal disorders to be intervened. By medical treatment, improving working environment, and ergonomic intervention, office workers can be prevented from musculoskeletal injuries. Poor indoor environment can cause many building-related illnesses or sick building syndrome. Although the etiology of some problems by poor indoor environment is not clear, it helps to maintain adequate humidity, temperature, and clarity of indoor air. Cerebro-cardiovascular diseases are a rising issue because office workers in Korea tend to work for a lot of time. To prevent the diseases, it is needed to work for adequate time, lengthen activity level, and manage other medical risk factors for the diseases.

**Conclusion:** There is no distinct occupational disease for office workers. However, there are some aspects to consider the health effects of office workers and it is important to prevent the possible health problems.

**Application:** A strategy against occupational diseases among office workers can be established by reviewing this article.

**Keywords:** Office workers, Musculoskeletal disorders, Indoor air pollution, Cerebro-cardiovascular diseases

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## 1. Introduction

Office workers exist everywhere in modern societies. They are found in every industry, especially office workers are exclusively employed in some fields of industry including insurance and finance. On the other hands, even though industries employ manual workers rather than office workers such as manufacturing, construction, and transportation, they also employ clerks working in office (Mohr and Shalat, 2005).

The group "clerical support workers" is listed as a major group in the International Standard Classification of Occupations (ISCO-08). It is subdivided into "general and keyboard clerks", "customer services clerks", "numerical and material recording clerks", and "other clerical support workers" such as librarian, mail sorters, coders, personal clerks and so on (ILO, 2007). The group "office worker" is defined as a major group in the Korean Standard Classification of Occupations (KSCO), but other groups as "managers", "professions and related workers", and "military" are expected to have amounts of workers in office.

More than one fourth of working population is expected to be working as office workers nowadays in Korea (MOEL, 2014b). And industrial accidents have been occurred to office workers and a few of them have been compensated. Annual number of the compensated industrial accident cases among office workers in Korea was around five hundred per year. Most of them (about 90%) were accidental, whereas cases of occupational disease also exist. Death rate is estimated to five to seven cases annually (Jeong, 2012).

Most of the compensated occupational disease was musculoskeletal disease. The second one was cerebro-cardiovascular disease, and the others were also compensated. Because the portion of compensated occupational disease is relatively small compared to the other occupational categories, the office workers had not received much attention from health professions. And it is true that the office workers are not exposed to occupational hazards from physical, chemical, or biological aspects not so much. But regarding the number of current office workers is vast; we should focus on the health problems of the office workers.

The working conditions of office workers have been changed for tens of years so much; most of them became to use computer while sitting statically, to work in massive buildings with air conditioning and refrigerating equipment (Mohr and Shalat, 2005). The change of economic situation is enforcing more office workers to work longer hours; the problems of sudden cerebro-cardiovascular diseases from excessive work are rising. So we will discuss occupational diseases among office workers on some categories; musculoskeletal diseases, cerebro-cardiovascular diseases, and diseases from the office environment. The occupational stress among office workers would be one of the main issues, but we will not deal with it because it will be discussed elsewhere on the same journal.

## 2. Musculoskeletal Disorders

Musculoskeletal disorders are occurred more commonly than any other occupational diseases or work-related diseases (MOEL, 2014a and Leroyer et al., 2006). It is well known that the musculoskeletal disorders among the office workers are affected by using electronic devices statically, especially using desktop computers. The posture using mouse or keyboard, the position of visual display devices, and repetitive work are the ergonomic issues we should consider. The most common affected sites were shoulders (Seo, 2007), back (Lee et al., 2007), or neck (Sim et al., 2009) to Korean office workers.

### 2.1 Risk factors

Feuerstein et al. (1997) suggested a model that excessive work demands, psychosocial work stressors and behavioral/physiological responses in computerized work environment influence each other simultaneously. These factors affect increasing risk of upper body musculoskeletal symptoms. Using VDTs for long duration, a very crowded workplace, or stressful work are known as risk factors for musculoskeletal symptoms (Marcus and Gerr, 1996).

First of all, long duration of computer use is a major risk factor of musculoskeletal symptoms. Palmer et al. (2001) reported that use of keyboard more than four hours as an important risk factor for neck and upper limb pain. The most affected sites were shoulders, wrists and hands. But the relatedness was lower in elbows. In another study, the physical symptoms including headache, eyestrain, arthralgia, stiff shoulders, low back pain, and general fatigue increase with duration of daily VDTs use without threshold

(Nakazawa et al., 2002). Longer duration of computer use was related to more prevalent hand-wrist symptoms (Jensen, 2003 and Lassen et al., 2004) and forearm pain (Kryger et al., 2003). A systematic review summarized the dose-response relationship between duration of computer use and musculoskeletal symptoms (Jmker et al., 2007). But although many journals report that use of computer is related to wrist symptoms, the relation between use of computer and carpal tunnel syndrome was not clear (Andersen et al., 2003).

Posture is another important risk factor for musculoskeletal symptoms. Awkward postures during use of computer are thought to be related to the mismatches between the worker and the workstation that can lead musculoskeletal symptoms. Correlations were observed that larger discrepancies in keyboard heights were associated with greater shoulder postures and smaller elbow and wrist postures that would cause pains on related sites (Baker and Moehling, 2013). A similar report also described that cervical symptoms were also related to too-high keyboard's position (Kanchanomai et al., 2012). Sustained position during computer work can change the scapular position in the stretched upper trapezius. The positional changes are observed before and after computer keyboard work statistically significantly (Park and Yoo, 2013).

Psychosocial factors also affect musculoskeletal symptoms. Bruno Garza et al. (2013) reported that the interaction of reward and over-commitment can affect upper extremity muscle activity and postures during computer use in the real environment. And they also commented that the interaction would explain the pathway between workplace psychosocial factors and musculoskeletal symptoms. A previous research also reported that psychosocial work stress factors measured by Job Content Instrument model were related to high prevalence of musculoskeletal symptoms (Faucett and Rempel, 1994).

## 2.2 Prevention strategy

It is important for the management of newly onset musculoskeletal pains to make an accurate diagnosis. Physical therapy, use of analgesics, and trigger point injection could be considered as treatment options for musculoskeletal symptoms. But most of the musculoskeletal symptoms among office worker go to chronic stage; it is more important to have an appropriate prevention strategy.

It is known that long duration of work is related to musculoskeletal symptoms by many researches above; an appropriate strategy should include limitation of working hours and offering appropriate resting hours to office workers. Workers with regular resting time tended to have little prevalence of musculoskeletal symptoms on most of body parts (Yun et al., 2001). Jensen (2003) recommended limiting computer use to less than three-fourths of the work time would help to prevent hand-wrist symptoms.

Because awkward postures that may be sustained with distorted muscle status are caused by ergonomically inappropriate environment, ergonomic interventions are needed to prevent musculoskeletal symptoms. Esmailzadeh et al. (2014) conducted a randomized controlled trial to show the effectiveness of a multicomponent ergonomic intervention program. The research revealed that body posture and workstation layout improved over six months in the intervention group. The intervention included a comprehensive ergonomic training, an ergonomic training brochure, and workplace visits with workstation adjustments. A systematic review compromised the evidences of workplace modulations; the use of arm support with alternative mouse reduced the incidence of upper limb, neck and shoulder pains. But there is no evidence of using an alternative mouse alone or an arm support alone (Hoe et al., 2012). Therefore, a multifactorial intervention rather than a single modification is respected to have effects on improvements of musculoskeletal symptoms among office workers.

Self-exercise is a good method to prevent musculoskeletal symptoms. Exercise programs including stretching and joint mobilization exercises helped to reduce call-center operators' musculoskeletal discomforts and fatigue (Lacaze et al., 2010). Besides the stretching exercise, both strength and endurance training were effective for women with chronic neck pain (Ylinen et al., 2003).

### 3. Indoor Environment

Office workers are working in indoor environment generally by which a lot of illnesses could be caused. The indoor air pollution has concerned from 1980's (Spengler and Sexton, 1983), and it is remaining one of the attractive issues for public health now. It is well known that there are differences of various pollutants between the indoor and the outdoor environment (Lee et al., 2001). And the difference could be greater if the indoor air is not able to be emitted due to air conditioning devices.

#### 3.1 Sick building syndrome

Sick building syndrome is defined as a syndrome combining non-specific symptoms such as headache, fatigue, rash, and irritation (Redlich et al., 1997). The exact etiology is not known, therefore the incidence is elusive. It is suggested that there are various contributing factors; building factors, host factors, and work factors. Numerous indoor pollutants are frequently reported as trigger factors for sick building syndrome. Building factors include formaldehyde (Glas et al., 2014), airborne molds, bacteria (Sahlberg et al., 2013), dust (Zhang et al., 2011), and so on. Besides, personal and psychosocial factors can also aggregate or trigger sick building syndrome (Runeson et al., 2006). Factors such as history of immunologic diseases (atopy or asthma), gender (female), job stress, job satisfaction, speed of work may be contributing factors for sick building syndrome. These factors could be classified into host factors or work factors.

#### 3.2 Building-related illnesses

Building-related illnesses are illnesses or diseases that have specific causes and are able to be diagnosed by physicians objectively. The examples are hypersensitivity pneumonitis, asthma, legionnaire's disease, chemical intoxication, and so on. Unlike sick building syndrome, the building-related illnesses are often clinically serious.

#### 3.3 Prevention

Although the etiology of sick building syndrome is not specific and predicting the specific cause for a building-related illness is hard, some strategies could be applied to prevent problems from indoor environments. Wet, humid, and damp environments are thought as the main cause for building-related illnesses (Park and Cox-Ganser, 2011). So, remediating water damage is an important strategy against the dampness. Volatile organic compounds and formaldehyde are the main cause for sick building syndrome. The concentration of these chemicals is relatively high from new buildings or furniture. Nowadays strategies such as baking-out and biological treatment are suggested to reduce the chemicals (Lu et al., 2010).

### 4. Cerebro-Cardiovascular Diseases

There were sudden death cases to the workers with overwork, which were a social problem in Japan so the term 'karoshi' became popular both socially and academically. Most of the causes of the 'karoshi' are considered cerebrovascular diseases such as stroke and cerebral hemorrhage, or cardiovascular diseases such as myocardial infarction, arrhythmias and anginas. The cerebro-cardiovascular diseases have some risk factors common in office workers we should consider.

#### 4.1 Long working hours

The working hours of the office workers are long in general. Although it had not been revealed that the actual working hours of the office workers, some studies reported that the working hours of the office workers were quite long (Cho, 2012). The office workers had to frequently exceed the settled working hours for many reasons; work in urgency, manpower shortage, rigid

atmosphere of office, work of difficulty, and so on.

Long working hours are associated with the risk of cerebro-cardiovascular diseases. A meta-analysis proved that the effect of long working hours was associated with the risk of cardiovascular disease by analyzing previous eleven studies (Kang et al., 2012).

The long working hours had an effect to blood pressure. Those who did overtime work showed higher 24-hour ambulatory blood pressure than who did not (Hayashi et al., 1996). Furthermore, obesity is common to workers with long working hours (Jang et al., 2014); this can act as one pathway to the increase of cerebro-cardiovascular diseases. Another pathway we should consider is sleep disturbances; the workers with long working hours had risks for the development of shortened sleeping hours and difficulty falling asleep (Virtanen et al., 2009).

#### 4.2 Sedentary work

Physical fit is an important factor that is preventive for cerebro-cardiovascular diseases. Men with low physical fitness showed increased risk for ischemic heart disease mortality (Holtermann et al., 2010). This effect was important especially for the workers with long working hours.

Like long working hours, sedentary work is a risk factor of obesity (Choi et al., 2010). Because the energy expenditure is decreased in worker with low physical activity, the energy can be accumulated in body.

#### 4.3 Psychosocial aspects

Psychological stressors may also induce cerebro-cardiovascular diseases. A current review from Australia suggests that perceived chronic job strain and shift work can be associated with an increase of developing coronary heart disease (Glozier et al., 2013). But the aspects regarded in job stress models such as job insecurity, job satisfaction, working hours, or effort-reward imbalance (ERI) were not conclusive to cause coronary heart disease. The preventive occupational factors against myocardial infarction include certain responsibility, social interaction, reasonable job demands, appropriate external resources, and so on (Sihm et al., 1991).

Stress itself can be act as a risk factor of obesity that is a main risk factor of cerebro-cardiovascular diseases. Björntorp (2001) suggested a model of altered activity of autonomic nervous system, endocrine system, and circadian system in relation to lipid metabolisms.

#### 4.4 Prevention strategy

Although sedentary work is a risk factor, a new concept is rising recently to separate the physical activity into occupational physical activity and leisure time physical activity. Leisure time physical activity can reduce the risk of coronary heart disease and the benefit was best for the workers with sedentary work (Clays et al., 2013). The similar effect was observed in all-cause mortality rather than coronary heart disease (Clays et al., 2014). Much portion of cerebro-cardiovascular diseases is related to metabolic syndrome. Because office workers tend to have low activity level, it is important to promote them to exercise and not to intake too much calories to prevent cerebro-cardiovascular diseases.

### 5. Conclusion

There is no typical occupational disease for the office workers because they are not exposed hazardous environment often. But even though the office environment is relatively safe, some problems or illnesses are caused to the office workers. We discussed

some problems that can be happened to the office workers. Even if the impacts are somewhat ambiguous, the impact of those could be remarkable regarding the number of the office workers is huge. In those aspects, health effects to the office workers should be treated more in the field of occupational and environmental medicine.

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