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국내외 직업성 근골격계질환에 관한 연구

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Work-related Musculoskeletal Disorders (WMSDs) in Korea and Other Countries

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국내외의 근골격계질환에 대한 현황과 자료를 검토하였다. 국내의 자료는 지난 수년간 대학 연구소에서 수행한 유해요인조사 및 예방사업 과정에서 수집된 자료들이다. 제조업에서 서비스업에 이르는 다양한 업종의 현황을 비교하였다. 외국의 자료와 비교할 때 가장 큰 특징은 국내의 근골격계질환 자료는 발생건수에서도 실제 생산현장에서의 현황보다 축소되어져 있지만, 전체 산업재해나 직업병에서의 비율로 볼 때도 매년 그 발생 비율이 불안정하게 등락함으로서 아직도 국내의 근골격계질환의 발생비율은 여전히 정확한 현황 파악이 되지 못하고 있는 것으로 평가된다. 국내외 자료를 비교분석한 결과 국내의 근골격계질환 현황은 외국의 평균치와 비교하여 10배 이상 저평가되어 있는 것으로 분석된다. 또한 업종별로 평균 유병율은 적게는 5%에서 많게는 10% 이상에 이르는 것으로 추정되어진다.

Keywords : WMDSs, Korea, Other Countries

1. Introduction

Development in technology and management techniques such as automation and structural reforming in modern industrial society have changed and replaced subjective work into simple meaningless repetitive tasks and also increased the intensity of labor for workers. As a consequence, incidence rate of work-related musculoskeletal disorders (WMSDs) is increasing and WMSDs have become a major problem in many industrialized countries.

Especially after the foreign currency crisis (called IMF Crisis) in Korea in 1997, many companies carried out the reforming of the enterprise and company that was mainly focused on downsizing of company such as lay-off of workers. As the result, labor intensity for each remained workers has increased and workers exposed to more hazardous work environment and likelihood of onset of WMSDs is expected to be very high.

As shown in <Figure 1>, the explosive increase in the incidence rate of WMSDs in Korea reported by Ministry of Labor in last 10 years clearly shows seriousness of WMSDs situation in Korean industries. However, the relatively small numbers of WMSDs cases in Korea compare to the rate and incidence cases of other countries show that the real incidence rate and situation of WMSDs in Korea has not been surveyed and reported correctly.

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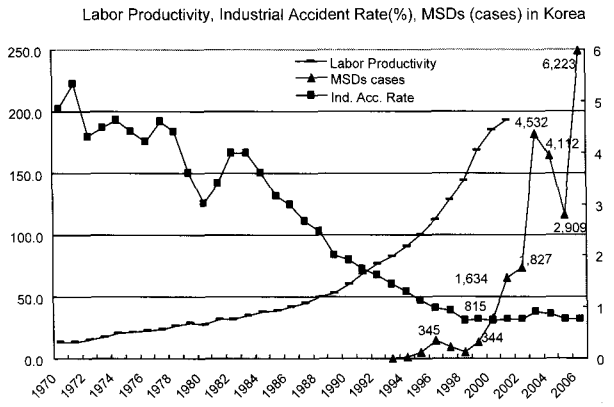

Note) Data based on KPA and KMOL, 2007.

<Figure 1> Trends of labor productivity, industrial accident rate, and MDSs cases in Korea

Just like incorrect situation and related data, WMSDs in Korea, in spite of the serious situation, have not gathered attentions of the society until the labor unions and progressive NGOs have made WMSDs as one of the important issues in industries in Korea by means of collective struggles for the right of healthy working environments. This collaborative and struggle and campaign forced government to amend existing Industrial Safety and Health Law which became effective on July 1, 2003. After four years of enforcing the amended regulation, the evaluation on the effectiveness of the regulation is not very promising.

Hence, the objective of this paper was to review the situation of WMSDs in Korea and other countries and to suggest policy reform and alternatives for effective prevention of WMSDs in Korea.

2. WMSDs Situation in Korea and Other Countries

Like many other countries in the world, Korea is confronting tremendous changes in terms of flexibility of work and labor market in response to macro trends like globalization and neo-liberalism and resulting fierce market competition. Work organization and work patterns are constantly changing.

Flexible employment system such as part-time jobs and temporary employment have been increased every year and it is estimated to be approximately 60% of total employment in Korea are part-time. All these changes in production system can contribute to a deterioration of working condition. Especially in Korea, after foreign currency crisis in 1997 (called IMF crisis), many companies carried out extensive reforming of the company which mainly focused on lay off of employees.

As consequence, the remained employees had to suffer from ever increased labor intensity. <Figure 1> shows changes in last 35 years in terms of labor productivity (production capacity per worker), industrial accident rate, and number of WMSDs cases. As it can be seen in <Figure 1>, increased productivity which accomplished by technological development reduced number of classical industrial accident (i.e., introduction of safety beam reduced hand cutting accident radically).

However, on the other hands, increase productivity demanded increased labor intensity to individual workers which can lead increased incidence rate of WMSDs. WMSDs in Korea have increased tremendously in last 10 years and had huge impact not only on health and well-being of workers but socioeconomically as well. It is estimated that average cost of one WMSDs case will be 40~50 million Won (equivalent to $35,000 to $45,000) by many case studies and researches from employers association (Kim et al., 2001).

<Table 1> shows WMSDs incidence data in Korea and the USA. In Korea, after only two cases of WMSDs were reported as occupational disease in 1993, the incidence rate of WMSDs has been increased exponentially every year resulting 4,523 cases in 2003 and 6,233 cases were reported in 2006 and formed 49.6% and 58.5% of all occupational disorders, respectively (KMOL, 2007).

<Table 1> WMSDs cases in Korea and USA

YEAR	USA		KOREA	
	Occupational Diseases (cases)	WMSDs cases (% of OD)	Occupational Diseases (cases)	WMSDs cases (% of OD)
1993	482,100	302,360(62.7%)	1,413	2(0.1%)
1994	514,700	332,095(64.5%)	918	20(2.2%)
1995	494,500	308,223(62.3%)	1,120	128(11.4%)
1996	439,900	281,128(64.0%)	1,927	345(22.6%)
1997	429,800	276,600(64.4%)	2,119	221(10.4%)
1998	391,900	253,300(64.6%)	1,838	123(6.7%)
1999	372,300	246,700(66.3%)	2,732	344(12.6%)
2000	362,500	241,800(66.7%)	3,414	815(23.9%)
2001	333,800	216,400(64.8%)	5,653	1,634(28.9%)
2002	-	-	5,417	1,827(33.7%)
2003	-	-	9,130	4,532(49.6%)
2004	-	-	9,129	4,112(44.8%)
2005	-	-	7,495	2,901(38.7%)
2006	-	-	10,235	6,233(60.9%)

주) Data based on BLS and KMOL in 2007.

However, these data for WMSDs in Korea seems not reflect the real situation of WMSDs in Korea. Possible incidence rate and number of the incidence which are more realistic can be predicted by comparing WMSDs data of the USA to Korean data. Theoretically, when 1% of incidence rate of WMSDs in the USA is applied to number of workers in Korean manufacturing industry, Korea should experience at least of 50,000 cases of WMSDs per year.

However, the real incident rate of WMSDs in Korea is only 1/10 of the predicted value. Also the percentage value of WMSDs in all occupational diseases in Korea fluctuates every year whereas, same value in USA depicts stabilized trend. It means situation of WMSDs in Korea has been revealed correctly yet.

Also european data from EC shows WMSDs consists of more than 50% of total occupational diseases which is similar value as in USA. <Table 2> shows percentage(%) of WMSDs in total occupational diseases in EU countries.

In Korea, increasing incidence number of WMSDs itself is a serious problem. However, the real problem is in content of the incidences. Most of the cases of WMSDs in Korea are reported from big-sized manufacturing industries where labor unions are organized. It means that the exact number of WMSDs and situation for whole industries in Korea has not been investigated correctly. Therefore, more extensive and accurate surveys of WMSDs on various types of industries are necessary for establishing radical policy for the prevention of WMSDs. However, government did not performed any survey, while most of the surveys and researches have been conducted partially by NGOs or collaborative form among labor unions, NGOs, and universities.

Some of research and survey results conducted by Institute of Labor Science on various manufacturing industries are presented in <Table 3> in terms of prevalence rate and medical examination results. It showed that in manufacturing industries, average of 87.7% of workers complained WMSDs related pains on at least one part of their bodies. More in-depth cross-sectional analysis of risk factors considering the severity of symptoms, duration, and frequency of pain were performed for further analysis and to decide level of surveillance, ergonomic intervention, and medical management.

An average of 77.6% of workers were considered as surveillance level 1 based upon NIOSH criteria that pain persists at least for one week and repeats at least once a month. Surveillance level 1 needs continuous monitoring for their symptoms and further evaluation for their working environment.

And 48.6% of workers were classified as surveillance level 2 based upon criteria developed by ILS (Institute of labor Science at University of Incheon). The criteria were; 1) pain severity of greater or equal to 3 points in 5 point scale, 2) duration of pain persistence of at least one day after having pain, 3) frequency of having pain at least once a month. Workers in this level II need to see medical specialists to examine their symptoms and prompt ergonomic interventions for improvement of their working conditions. After medical examination by industrial medicine doctors for the workers classifies as Surveillance level II, workers were classified into three groups (Class A, B, and C) according to the severity of their symptom. The result of medical examination showed that average of 23.2% of workers was classified as a Class B who need close and continuous monitoring for symptoms and 7.5% of workers were considered as a class C who need immediate medical treatments. Therefore, based upon data from survey and medical examination, it is assumed that incident rate of WMSDs in Korea could be as high as 5%~10% in overall industries.

Risk factor analysis for tasks performed by workers who complained WMSDs related pains were performed using various ergonomic assessment techniques and ergonomic hazard evaluation tools such as RULA, REBA, and NIOSH Lifting Equation. Awkward posture, forceful exertion, manual handling of heavy objects and repetitive nature of the

<Table 2> Percentage(%) of WMSDs in Total Occupational Diseases in EU (Unit : %)

Type of Occupational Disease		Denmark	Greece	Spain	Italy	Rusemburg	Portugal	Finland	Sweden	England	EU
Male	WMSDs	57.3%	38.8	53.0	50.3	44.3	45.6	58.6	59.7	44.1	51.4
	Stress	8.4	10.7	7.3	12.6	7.3	15.2	11.2	14.2	30.5	16.5
Female	WMSDs	63.4	-	66.1	48.3	33.6	26.8	63.9	60.7	40.4	54.4
	Stress	9.3	-	8.7	17.0	13.7	34.3	11.5	20.6	36.5	20.2

Source: EC, Eurostat(2002).

<Table 3> Pain complain rate and prevalence rate by industries

Industry type	No. of workers surveyed	Pain complain rate (%)			Surveillance level I (NIOSH criteria)	Surveillance level II (ILS Criteria)	Result of medical examination	
		At least one part	More than two parts	More than three parts			Class B[1]	Class C[2]
Subway repair plant	273	260(95.2%)	237(86.8%)	178(65.2%)	237(86.8%)	156(57.1%)	N/A	33(12.1%)
Food industry	99	89 (89.9%)	80(80.8)	61(61.6%)	83(83.8%)	52(52.5%)	N/A	N/A
Food Industry	288	261(90.6%)	221(76.7%)	167(58.0%)	220(76.4%)	102(35.4%)	N/A	N/A
Light assembly (auto parts)	326	269(82.5%)	217(66.6%)	154(47.2%)	243(75%)	116(35.6%)	77(23.6%)	16(4.9%)
Light assembly (auto parts)	284	239(84.2%)	200(70.4%)	163(57.4%)	156(74%)	69(32.9%)	28(9.9%)	19(6.7%)
Light assembly (auto parts)	210	169(80.5%)	139(66.2%)	103(49.0%)	210(74%)	115(40.5%)	44(21.0%)	14(6.7%)
Light assembly (auto parts)	155	130(83.9%)	103(66.5%)	78(50.3%)	113(72.9%)	56(36.1%)	N/A	N/A
Medium assembly (auto parts)	215	186(86.5%)	158(73.5%)	113(52.6%)	154(71.6%)	72(33.5%)	N/A	N/A
Die-casting industry	114	102(89.5%)	85(74.6%)	62(54.4%)	95(83.3%)	49(43.0%)	41(36.0%)	10(8.8%)
Light assembly (auto parts)	231	219(94.8%)	143(79.2%)	144(62.3%)	205(88.7%)	110(47.6%)	80(34.6%)	16(6.9%)
Hospital Workers	1,064	989(93.0%)	918(86.3%)	805(75.7%)	868(81.6%)	658(61.8%)	N/A	N/A
School teachers	434	334(77.0%)	259(59.7%)	189(43.5%)	283(65.2%)	148(34.1%)	N/A	N/A
Total	3,693	3,247 (87.9%)	2,760 (74.7%)	2,217 (60.0%)	2,867 (77.6%)	1,793 (48.6%)	270 (23.2%)	108 (7.5%)

주) 1. Patients who need continuous monitoring on the symptoms and prompt ergonomic intervention.
2. Patients who need immediate medical treatments and ergonomic intervention for their jobs.

task were most common risk factors that were found in metal industries and assembly lines. Also poor level of job satisfaction and psychological stress such as job insecurity were turned out to be additional risk factors that escalate risk levels of previously mentioned task-related risk factors (Kim et al., 2004)

3. Campaign and struggle for healthy working right by trade unions and NGOs

Before 1993, WMSDs were not considered as an occupational disease in Korea. In 1993, two cases of WMSDs for the typist in a newspaper company were approved as occupational diseases. After 1993, number of WMSDs has increased tremendously every year. In year 2003, 4,532 cases reported and 6,223 cases of WMSDs in 2006 were reported as shown in <Table 1>.

However, despite of seriousness and continuous increase of WMSDs, laborers had to struggle to be approved as occupational diseases and to get proper medical treatment and worker compensation. In Korea, in case of industrial disease or accident, it has to be approved by government agency (Worker's welfare foundation) to get medical treatment and worker's compensation and to be included in industrial accident statistics officially.

Otherwise, it is not counted and not recorded as industrial accident case in official labor statistics. Hence, employers of companies always try to hide the accident or occupational disease by means of private compensation or even sometimes threat for the job insecurity or other type of dis-

advantages.

As result of ignorance and irresponsibility of employers and government, the rights for healthy working environments of the workers have been seriously violated. Hence, nation-wide campaign and struggle for the rights of healthy working environment have been under way for several years.

One of the most effective way of struggle was a collective struggle for the approval of industrial disease. Labor unions collaborated with NGOs (Non Government Organizations) working for the rights of laborers have filed collective medical treatment and worker compensation for their union members who were examined as WMSDs patients by medical doctors with evidence of work-relatedness of the symptoms investigated by professional ergonomists.

Also labor unions and NGO have held series of public hearing and seminar to propagate the seriousness of WMSDs in Korea and to demand preventive program and legal system to enforce the duties of employers. This collective struggle was very effective in terms of gathering attention from the society about serious situation of WMSDs in Korea and importance of rights to work in healthy working environments. Also the collective organizations demanded systematic mechanism to clarify duties of employers in prevention of WMSDs.

As a successful result of the collective struggle, Industrial Safety and Health Law was amended and clarified the duties employers and contents prevention program to prevent WMSDs on July 1, 2003.

4. Amendment of Industrial Safety and Health Law

The amended Industrial Safety and Health Law consisted of three main parts: (1) Definition and concept of WMSDs and prevention program, (2) Risk factor investigation and intervention, and (3) Guidelines for MMH (KOSHA, 2003).

Part I of the law defines WMSDs as disorders of upper extremities and low back that are caused by various occupational risk factors (awkward postures, high repetition, excessive exertion, inadequate work/rest cycle) and also suggest prevention program that includes education on WMSDs for employees, risk factor investigation, medical examination, working environment improvement, and validation.

Part II of the law defines duties of employers regarding risk factor investigation and working environment improvement. Employers must perform risk factor investigation which should cover conditions on facility, production line, workload, task speed, cycle time, working posture, work method, and symptom of WMSDs for employees.

The very first risk factor investigation must be conducted in one year from the announcement date of the law (i.e. by June 30, 2004) and in every 3 years on regular base and on demand such as when WMSDs patients are reported, when new jobs and facilities were introduced, and when workload and working environment were changed and modified. The law also states that representatives or trade union members must be participated in the investigation procedure. Also employers must carry out a prevention program when there are more than 10 WMSDs patients reported or more 10% of total employees in their companies.

Part III of the law defines specific guidelines for manual material handling jobs. It recommends to limit weight of material with consideration of frequency, transferring distance and speed, and to determine proper work/rest ratio. It also recommends employers to notify the exact weight of material, proper handling method when the weight of material is heavier than 5kg.

The amended law itself is quite radical in terms of extensive content and clarifying the duties of employers. However, the Department of Labor announced Notification of 11 strenuous tasks for WMSDs to be used as a screening tool for risk factor investigation. This 11 strenuous tasks notification (It is very similar in contents with the Washington State Ergonomic Rules in the USA) have brought lots of controversy and opposition struggles from labor unions and NGOs since this notification has been abused by employers who try to minimized level of risk factors in their companies and government bodies connived and even abetted abuse of notification by employers.

The collective organizations are demanding repeal of the notification on 11 strenuous tasks because, the notification has been a major obstacle in stead of intended use as a guideline in effective enforcement of amended law and executing successful prevention programs.

5. Evaluation for the First three Year Period of Law Enforcement

Implementation rate of employers duties in risk factor

investigation have been surveyed to evaluate the effectiveness and strictness of the law. The result was very disappointing as expected. Korean Confederation of Trade Unions (KCTU) investigated companies which are members of KCTU in Korea. Results of implementation rate survey for various types of industry showed that implementation rate was estimated less than 10%.

However, the real situation is expected to be more disappointing. Since KCTU represents only 12% of companies in Korea, the real situation in terms of implementation rate is expected much less than 10%. Therefore it is not difficult to imagine workers in companies without organized labor union and part-time temporary employees would suffer from much worse working conditions and violation in their rights for healthy working environment. More surprising but anticipated result is none of the employers who did not fulfill their duties have been accused in accordance with the penalty article which clearly mentioned in the law.

Overall analysis for the first three year period of law enforcement has been held at a university hosted public seminar.

Representatives and experts from the KCTU, Korean Employer's Federation, Korean OSHA, industrial medicine doctors, ergonomists were participated in the seminar.

Some of main problems that were obstacles in effective enforcement of the law pointed out by the participators in the seminar were as following. First, notification of 11 strenuous tasks has been obstacles for effective enforcement of the law instead of proper guidelines. Hence, the notification should be repealed as soon as possible. Second, lack of manpower with expertise and knowledge to perform risk factor investigation for hundreds of thousands of companies in Korea was another reason why the law could not enforced effectively and strictly. Also biased and not strict enforcement of the law by the government was pointed out as another cause that even encouraged employers not to implement their duties.

6. Suggestions and Prospect

Musculoskeletal disorders in Korea is one of the most serious issue and is expected to be more serious issue that will affect the health and well-being of workers. In stead of enactment of relatively radical law for the prevention of WMSDs, there are still many obstacles to achieve healthy working environment. Some of the suggestions by the experts for more effective ways of WMSDs prevention were as following.

First, repeal of notification for 11 strenuous tasks was one of the most urgent issue for effective and proper enforcement of the amended industrial safety and health law that has been was agreed among most of the experts. Extensive survey and investigation to assess correct situation of WMSDs in Korea are needed for establishment of proper and radical policies for the prevention. Enlargement of manpower with expertise in ergonomics and industrial medicine, and industrial hygiene area to investigate and to solve the problems is most urgent and essential issue to be solved. A national certified ergonomists system has been suggested and now approved.

However, most of all, continuous effort by laborers as the concerned party to grow capabilities to surveille deterioration of working condition and to suggest alternatives for improvement of working environment will be ultimate solution of the problems. A continuing education and training program for the workers(called School for Labor Safety and Health) that has been conducted by Institute of Labor Science and a local NGO can been a successful program to produce safety and health experts from the scene of labor.

7. Conclusions and Remarks

Every development is double-faced. In the capitalism society the bright side of development has been emphasized, but the seamy side is usually neglected. Increased labor intensity which is a consequence of increased productivity is a typical example of seamy side of technological development. Some of the main conclusions that can be derived from the study are followings.

(1) It is difficult to predict accurate incident rate of WMSDs and there could be different criteria and argument in prediction. However, based upon data from survey and medical examination, it is assumed that incident rate of WMSDs in Korea could be as high as 5% to 10% in overall industries.
(2) Awkward posture due to improper design of workplace, forceful exertion, manual handling of heavy objects and repetitive nature of the task were most common risk factors that were found in surveyed industries. Also

poor level of job satisfaction and psychological stress such as job insecurity were turned out to be additional risk factors that can escalate the risk levels of previously mentioned task-related risk factors

(3) Also increasing flexibility on the labor market, that can create new jobs as positive aspects, can contribute to a deterioration of working conditions. WMSDs are one visible health result of intensification of work currently characterizing working life.

(4) Educated and trained workers are essential in achieving healthy working right. Collective movement by labor unions and progressive NGOs to propagate the seriousness of WMSDs and struggle for law making were proved to be effective means to achieve this goal.

(5) Regulations and government policy should be amended reformed so as to reflect real situations of WMSDs and to be applied as preventive tools instead of obstacles for the prevention such as notification for 11 strenuous tasks.

(6) However, more continued efforts to monitor right launching of spirits of the amended law and grow capabilities to prevent WMSDs are needed. Ergonomics and ergonomists must play key roles to prevent WMSDs and have to work together with suffering laborers for better working condition and better life.

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