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Status of Preventive Measures against Heat Disorders at Enterprises Employing 50 or More Workers in Japan

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Abstract

An anonymous self-administered questionnaire survey was conducted among 1,352 enterprises employing 50 or more workers, to evaluate the status of preventive measures against heat disorders. The response rate was 36.7%. Concerning working environment management, the most enforced item (in terms of percentage) was “securing a resting place with air conditioners or a cool resting place near the working place with high temperature and humidity” (80.9%). Regarding work management, the most enforced item was “instructing workers to drink water and take salty food before, during, and after work regularly with or without subjective symptoms” (80.6%). Concerning health administration, the most enforced item was “an understanding of workers’ health conditions at morning assemblies” (82.9%). Concerning occupational health education, the most enforced item was “education for workers on preventive measures against heat disorders” (74.0%). The implementation rates of many measures to prevent heat disorders were significantly higher in enterprises whose workplaces were mainly outdoor or both indoor and outdoor with high occurrence of heat disorders. In general, enforcement rates of preventive measures against heat disorders were significantly higher in the enterprises with the occurrence of heat disorders than in those without them. Thus, it is necessary to further improve all of the above-mentioned management to prevent heat disorders at enterprises with 50 or more workers.

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—Key words—

Implementation status, Preventive measures, Heat disorders

Introduction

In Japan, a new notification concerning the prevention against heat disorders in the workplace was given in June, 2009 by Ministry of Health, Labour and Welfare¹⁾. The notification specifies that the Wet Bulb Globe Temperature (WBGT) must be measured in the workplace and multifaceted preventive measures for heat disorders must be taken²⁾ if it exceeds the standard values defined by ISO7243³⁾ and ACGIH TLVs which includes training programs, heat stress hygiene practices, and environmental and medical surveillance⁴⁾⁵⁾. The contents of preventive measures described in the notification are also similar to those in the OSHA · NIOSH INFOSHEET: Protecting workers from heat illness⁶⁾.

However, intense heat continued in the summer of 2010 and death considered to be related to heat disorders occurred frequently in construction industry and manufacturing industry.

We surveyed the implementation status of several items for preventive measures against heat disorders among construction companies in 1998⁷⁾ and 2001⁸⁾. As a result, enforcement rates of “securing a resting place with sunshades near the outdoor workplace” and “installing a thermometer in the workplace” were about 80% and 50%, respectively. The education rate of preventive measures against heat disorders for workers was only about 55%. In addition, we surveyed the implementation status of individual preventive measures against heat disorders among outdoor workers such as workers engaged in excavating ancient objects⁹⁾, construction workers¹⁰⁾¹¹⁾, traffic control workers¹¹⁾, postal agency staffs¹²⁾, electricians¹³⁾, wreckers¹⁴⁾ and workers engaged in maintenance of golf course¹⁵⁾. From these surveys, we found that individual preventive measures against heat disorders

ders among outdoor workers were not necessarily enough. It is considered that these results are attributed to lack of enough instructions on preventive measures against heat disorders from management directors, health supervisors, etc. to outdoor workers, and that the lack of enough instructions from directors and supervisors may be resulted from lack of knowledge about preventive measures against heat disorders among themselves.

Therefore, we carried out the detailed questionnaire survey for health supervisors on the implementation status of preventive measures against heat disorders based on the new notification¹⁾ among enterprises with 50 or more workers, to make a basic document to improve instructions to workers in future as well as to publicize the notification to the enterprises.

Subjects and Methods

An anonymous self-administered questionnaire survey was conducted from July to September 2011 among 1,352 enterprises except those belonging to “wholesale and retail trade,” “finance and insurance,” “information and communications,” or “medical, health administration and welfare” in “A” prefecture, where enterprises regularly employing 50 or more workers are registered at “A” Occupational Health Promotion Center. “A” prefecture locates in the central part of Japan. Each subject was explained the contents of the survey by letter and was allowed to refuse to answer any questions when he or she desired.

The questionnaire consists of the number of workers, type of industry, location of workplace, occupational safety and health management system such as decision of the basic policy of occupational safety and health management, appointment of a occupational health physician, health supervisors, etc., occurrences of heat disorders in 2009 and 2010, and items regarding the implementation status of preventive measures against heat disorders according to the new notification concerning the prevention against heat disorders in the workplaces given in June, 2009 by Ministry of Health, Labour and Welfare¹⁾.

The questionnaire was distributed and then collected by mail. One health supervisor in each enterprise was asked to answer the questions, and 39.2% of the subjects (N=530) replied to the questionnaire.

Deaths due to heat disorders occurred frequently among enterprises with outdoor workplaces in Japan¹⁾. So, the enforcement rate of preventive measures against heat disorders might be affected by the location of working places in the enterprises. Thus, enterprises were grouped into three categories on the basis of location: mainly outdoor (N=30), mainly indoor (N=347), and both indoor and outdoor (N=99) (no answer, N=54).

In addition, we analyzed the differences in the enforcement rate of preventive measures against heat disorders between enterprises with the occurrence of heat disorders (N=39) and those without them (N=340) (no answer, N=151).

Relationship between the number of the enforced items of preventive measures against heat disorders and the proportion of workers without occurrence of heat disorders in the enterprise was also analyzed.

In this survey, to publicize the new notification concerning the prevention against heat disorders in the workplaces¹⁾, a leaflet prepared in accordance with the notification by the “A” Occupational Health Promotion Center as well as the questionnaire was mailed to each enterprise.

The study was approved by the Ethical Committee for Occupational Health Studies of the Japan Labour Health and Welfare Organization.

Statistics

The item of no answer was excluded from analysis. The significance of differences among values was tested using one way analysis of variance (ANOVA) or χ^2 test. When the frequency was low (below 5), Fisher’s exact test was used. The significance level was set at $p < 0.05$. Statistical analysis was conducted with the SPSS software, version 11.5 (SPSS, Inc., Chicago, IL).

Results

There was the largest number of workers in mainly indoor enterprises (150.0 ± 172.6 in mean \pm SD, 103 in median), followed by both indoor and outdoor ones (124.2 ± 100.0 , 88), and mainly outdoor ones (79.9 ± 34.8 , 74) (one way ANOVA, $p < 0.01$).

There were no significant differences in any items concerning occupational safety and health management system among the three groups of enterprises.

The percentage of enterprises experienced one or more heat disorder cases between 2009 and 2010 was highest in mainly outdoor enterprises ($5/21=23.8\%$) among the three groups of enterprises with 50 or more workers (those of mainly indoor ones, both indoor and outdoor ones, and total: $24/265=9.1\%$, $8/79=10.1\%$, and $37/365=10.1\%$, respectively). However, there were no significant differences in the percentages among these three groups of enterprises.

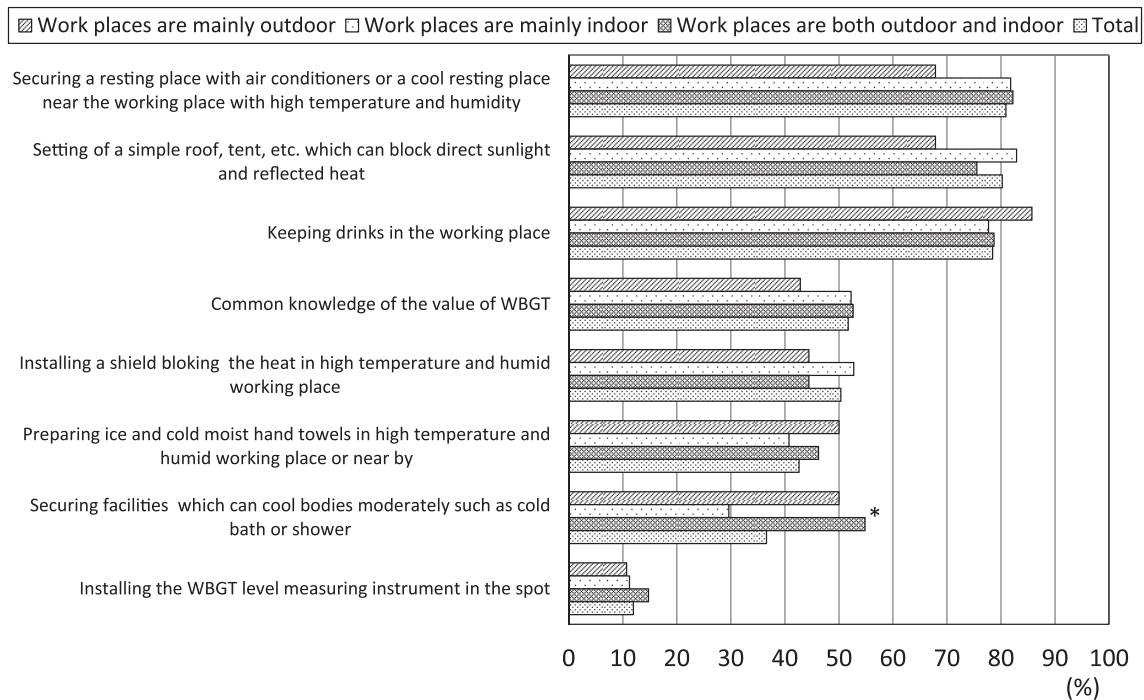


Fig. 1 Implementation status of the working environment management of 8 items to prevent heat disorders among three groups of enterprises with 50 or more workers. Significant differences among the three groups; * $p < 0.01$.

Fig. 1 shows the implementation status of 8 items concerning working environment management to prevent heat disorders among the three groups of enterprises with 50 or more workers. In total, the most enforced item (in terms of percentage) was “securing a resting place with air conditioners or a cool resting place near the working place with high temperature and humidity” (80.9%), followed by “setting of a simple roof, tent, etc. which can block direct sunlight and reflected heat” (80.2%), and “keeping drinks in the working place” (78.5%). On the other hand, the least enforced item was “installing the WBGT level measuring instrument in the spot” (12.0%) followed by “securing facilities which can cool bodies moderately such as cold bath or shower” (36.6%) and “preparing ice and cold moist hand towels in high temperature and humid working place or near by” (42.6%). There was significant difference only in the percentage of enforcement of “securing facilities which can cool bodies moderately such as cold bath or shower” among the three groups of enterprises ($p < 0.01$).

Fig. 2 shows the setting situation of air conditioners, electric fans and spot coolers in the working place among three groups of enterprises with 50 or more workers. In total, the item which had been installed in the highest percentage was air conditioners (74.5%), followed by electric fans (66.2%) and spot coolers (55.1%). There was significant difference only in the percentage of “installing spot coolers” among the three groups of enterprises ($p < 0.01$).

Fig. 3 shows the implementation status of work management (16 items) to prevent heat disorders among three groups of enterprises with 50 or more workers. In total, the most enforced item was “instructing workers to drink water and take salty food before, during, and after work regularly with or without subjective symptoms” (80.6%), followed by “letting workers wear good moisture-permeable and air permeable clothes” (71.8%) and “instructing workers to avoid wearing clothes that are heat absorbent or easily keep heat” (58.3%). On the other hand, the least enforced item was “shortening working hours” (7.1%) followed by “shortening the consecutive working hours” (14.6%) and “change of working place” (14.9%). There were significant differences in the percentages of “shortening working hours”, “extension of break time”, “increasing the frequency of breaks”, “shortening the consecutive working hour”, “arranging the period for a beginner’s adapting to heat premeditatedly”, “instructing workers to drink water and take salty food before, during, and after work regularly with or without subjective symptoms”, “putting up a posters promoting water and salt intake”, “confirmation of the intake of salt and water by a round of inspection during work” and “prohibition of the work alone” (9 items in total) among three groups of enterprises ($p < 0.05$ or $p < 0.01$).

Fig. 4 shows the implementation status of health administration of 3 items to prevent heat disorders among three groups of enterprises with 50 or more workers. In total, the most enforced item was “an under-



Fig. 2 Setting situation of air conditioners, electric fans and spot coolers in the working places among three groups of enterprises with 50 or more workers. Significant differences among the three groups; * * $p < 0.01$.

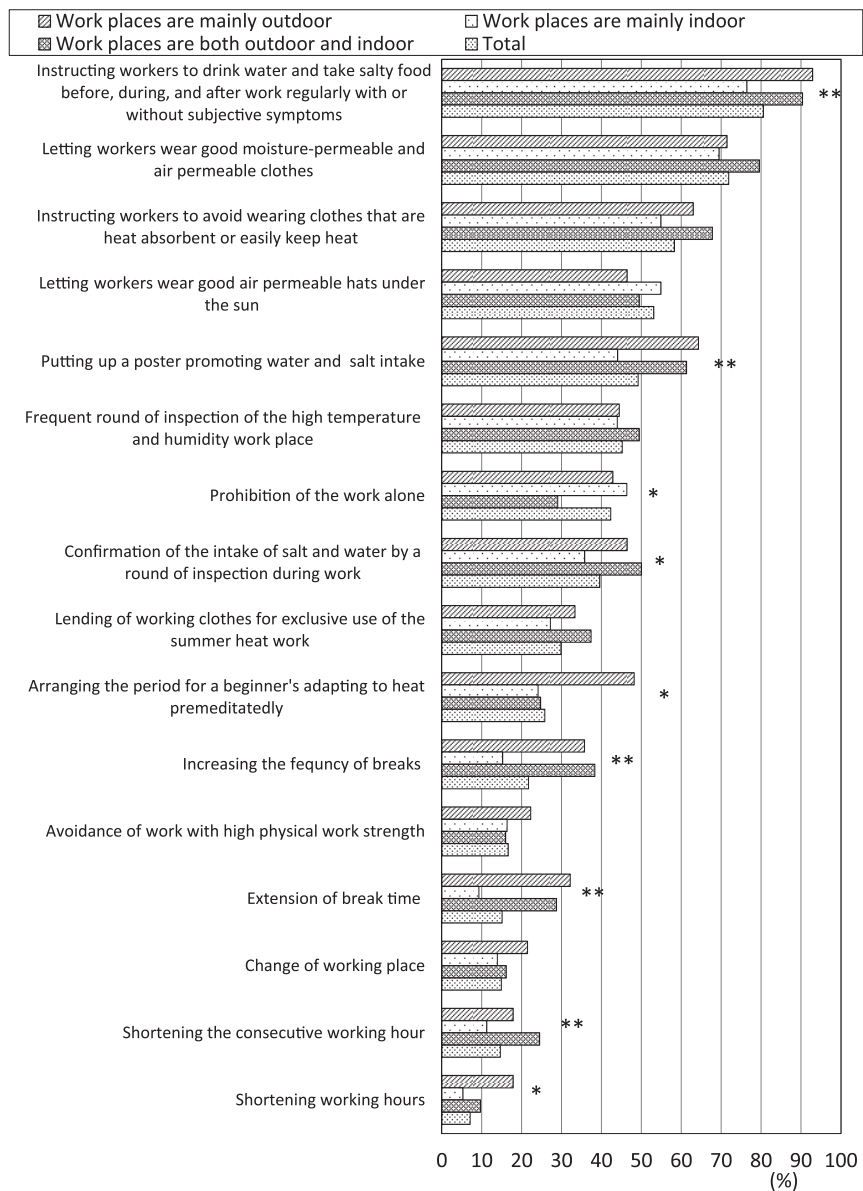


Fig. 3 Implementation status of work management to prevent heat disorders among three groups of enterprises with 50 or more workers. Significant differences among the three groups; * $p < 0.05$, * * $p < 0.01$.

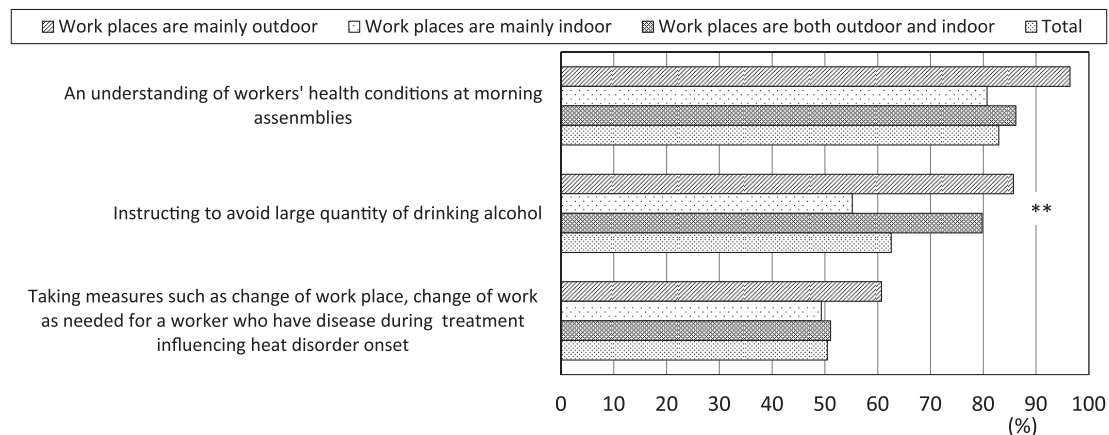


Fig. 4 Implementation status of the health administration to prevent heat disorders among three groups of enterprises with 50 or more workers.
Significant differences among the three groups; * * $p < 0.01$.

standing of workers' health conditions at morning assemblies" (82.9%), followed by "instructing to avoid large quantity of drinking alcohol" (62.6%) and "taking measures such as change of work place, change of work as needed for a worker who have disease during treatment influencing heat disorder onset" (50.5%). There was significant difference only in the percentage of "instruction for workers to avoid a large quantity of drinking" among the three groups of enterprises ($p < 0.01$).

Fig. 5 shows the contents (6 items) concerning the worker's health condition grasped at morning assemblies in the working place among three groups of enterprises with 50 or more workers. In total, the most grasped item was "poor physical condition" (90.7%), followed by "lack of the sleep" (33.8%) and "fever due to common cold, etc." (26.5%). On the other hand, the least grasped item was "non-intake of breakfast" (5.1%), followed by "diarrhea" (17.5%) and "poor mental health" (19.2%). There were significant differences in the percentages of "lack of sleep" and "non-intake of breakfast" among the three groups of enterprises ($p < 0.01$).

Fig. 6 shows the implementation status of occupational health education of 2 items to prevent heat disorders among three groups of enterprises with 50 or more workers. In total, the most enforced item was "education of preventive measures against heat disorders for workers" (74.0%), followed by "education of emergency measures against heat disorders for workers" (54.9%). There were significant differences in the percentages of these two items among the three groups of enterprises ($p < 0.01$).

Enforcement rates of "common knowledge of the value of WBGT" (69.2%), "installing of the WBGT level measuring instrument in the spot" (28.2%), "preparing ice and cold moist hand towels in high temperature and humid working place or near by" (56.4%), "arranging the period for a beginner's adapting to heat premeditatedly" (41.0%), "instructing workers to drink water and take salty food before, during, and after work regularly with or without subjective symptoms" (94.9%), "putting up a poster promoting water and salt intake" (69.2%), and "education of preventive measures against heat disorders for workers" (89.7%) were significantly higher in the enterprises with the occurrence of heat disorders than in those without it (50.7%, 10.0%, 39.3%, 24.2%, 79.7%, 49.8%, 71.3%, respectively) ($p < 0.05$ or $p < 0.01$), although data are not shown. On the other hand, only enforcement rate of "setting air conditioners" was significantly lower in the enterprises with the occurrence of heat disorders (53.8%) than in those without it (75.7%) ($p < 0.01$).

Number of the enforced items of preventive measures against heat disorders was not significantly related to the proportion of workers without occurrence of heat disorders in the enterprise with 50 or more workers ($r = -0.052$).

Discussion

In Japan, the number of workers, mainly construction workers, who die from heat disorders, has been increasing rapidly from 1994 owing to intense summer heat¹⁶⁾. Actually, we observed in the present study that percentage of occurrences of heat disorders between 2009 and 2010 in the mainly outdoor enterprises was the highest among the three groups of enterprises although there was the smallest number of the workers in the mainly outdoor enterprises.

Concerning the implementation status of working environment management to prevent heat disorders among the enterprises with 50 or more workers, the items enforced at a percentage of more than 70% out of 8

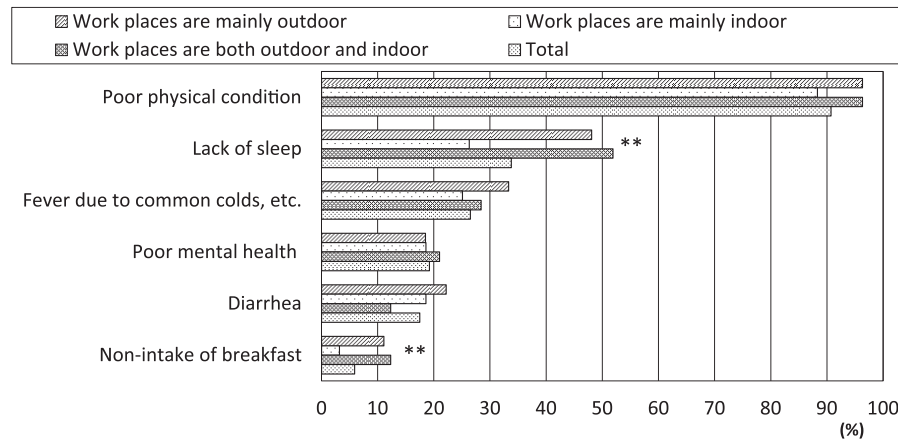


Fig. 5 Contents concerning the worker's health condition grasped at morning assemblies in the working place among three groups of enterprises with 50 or more workers. Significant differences among the three groups; * * $p < 0.01$.

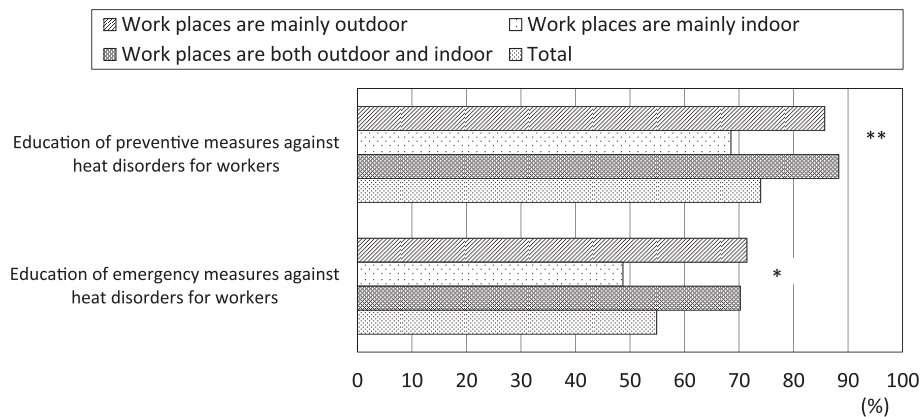


Fig. 6 Implementation status of occupational health education to prevent heat disorders among three groups of enterprises with 50 or more workers. Significant differences among the three groups; * * $p < 0.01$.

items were “securing a resting places with air conditioners or a cool resting place near the working place” and “setting of a simple roof, tent, etc.” and “keeping drinks in the working place”. However, enforcement rate of “setting of the WBGT level measuring instrument” relating to the measurement of work environment was the lowest in 12.0%. It is considered, as causes of this result, that not only the percentage of the subjects who know the value of WBGT was relatively low (51.7%) but also the price of a WBGT meter is still more expensive than a thermometer. The item which was enforced in the second lowest percentage was “securing facilities which can cool bodies moderately such as cold bath or shower” (36.6%), and especially, its percentage was the lowest (29.6%) in the mainly indoor enterprises among the three groups of enterprises. It is considered that it is necessary to introduce grants as well as to carry out occupational health education in future to promote setting of a WBGT meter, a shower, a cold bath, etc.

Setting rates of air conditioners and electric fans were over 55% among all of the three groups of enterprises. Air conditioners seem to be set in the rest room or office of the enterprises with outdoor workplaces. It is interesting that the only setting rate of air conditioners was significantly lower in the enterprises with the occurrence of heat disorders than in those without it. Therefore, it is considered that setting air conditioners in the working place is a very useful preventive measure against heat disorders. However, a setting rate of spot coolers in the enterprises whose workplaces were mainly outdoor ones was significantly low in 21.4%, probably because it is necessary to move the machine depending on the movement of workers in the working place. Therefore, it is considered that it is necessary to improve more the work environment management to prevent heat disorders in the enterprises employing 50 or more workers in future.

In the present study, in general, enforcement rates were significantly higher in the enterprises whose working places were mainly outdoor or both indoor and outdoor with high percentage of the occurrence of

heat disorder described before. We observed that the items which were enforced in a percentage of more than 70% among the work managements of 16 items were “instructing workers to drink water and take salty food before, during, and after work regularly with or without subjective symptoms” and “letting workers wear good moisture-permeable and air permeable clothes”. On the other hand, the items which were enforced in a percentage of less than 30% were “shortening working hours, shortening the consecutive working hour and change of working lace”, “extension of break time”, “avoidance of work with high physical work strength” and “increasing the frequency of breaks”, these percentages were especially lower in the enterprises whose working places were mainly indoor. Implementation of these items is considered be related to increase in labor cost.

Therefore, it is considered that it is necessary to improve more the work management, especially the items in conjunction with the increase in labor cost, to prevent heat disorders among the enterprises with 50 or more workers in future.

In this study, the most enforced item in the health administration of 3 items was understanding of workers' health conditions at morning assemblies (82.9%), followed by instructing to avoid large quantity of drinking alcohol causing dehydration¹⁾ (62.6%). Concerning instruction for workers to avoid a large quantity of drinking, the enforcement rate in the mainly outdoor enterprises, where heat disorders occur frequently¹¹⁾, was the highest in 85.7% among the three groups of enterprises.

Concerning the worker's health condition of 6 items grasped at morning assemblies, the grasp rate of poor physical condition was the highest in 90.7%. However, grasp rates of non-intake of breakfast and diarrhea to estimate lack of salt and dehydration¹⁾ were extremely low (5.1% and 17.5%, respectively). In addition, grasp rates of lack of sleep and fever due to common cold, etc. were only 33.8% and 26.5%, respectively. There were significant differences in the grasp rates of lack of sleep and non-intake of breakfast among the three groups of enterprises. These percentages were the highest in the enterprises whose work places were both outdoor and indoor (51.9% and 12.3%, respectively).

Therefore, to prevent heat disorders in enterprises with 50 or more workers, in particular, occupational health education should be provided to workers at morning assemblies, which is essential for enhancing health administration. Concerning occupational health education of 2 items, the item enforced in a percentage of more than 70% was “education of preventive measures against heat disorders for workers”. The enforcement rate was higher than those of our past studies in construction companies⁷⁸⁾.

In this study, the implementation rates of many measures concerning, in particular, work management, health administration and occupational health education to prevent heat disorders at enterprises employing 50 or more workers were significantly higher in the workplaces that were mainly outdoor or both indoor and outdoor ones with high percentage of the occurrence of heat disorder. In general, enforcement rates of preventive measures against heat disorders were significantly higher in the enterprises with the occurrence of heat disorders than in those without them. In addition, the number of enforced items of preventive measures against heat disorders was not significantly related to the proportion of workers without occurrence of heat disorders in the enterprise. Therefore, it is considered that the outbreak of heat disorders at workplaces results in the enforcement of many preventive measures. In other words, preventive measures against heat disorders in the workplaces other than mainly indoor ones have not been yet enough.

The limitations of this study are that this study was cross-sectional study and the response rate was low, etc. It can be assumed that good companies are more likely to respond than bad ones. In future, we will survey again of the implementation status of preventive measures against heat disorders at enterprises employing 50 or more workers to assess necessity to inform the enterprises the new notification¹⁾.

Anyhow, in conclusion, it is necessary to further improve all of the above-mentioned management to prevent heat disorders at enterprises employing 50 or more workers.

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利益相反：利益相反基準に該当無し

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わが国の規模 50 人以上の事業場における熱中症予防対策実施状況

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キーワード

実施状況, 予防対策, 熱中症

熱中症予防対策の実施状況を把握する目的で, 規模 50 名以上の 1,352 事業場を対象に, 自記式アンケート調査を行った。回収率は 36.7% であった。作業環境管理で最も実施率が高かった項目は, 「高温多湿な作業場所の近隣に冷房を備えた休憩場所または涼しい休憩場所が確保されている」(80.9%) であった。作業管理で最も実施率が高かった項目は, 「自覚症状の有無にかかわらず, 水分, 塩分を作業前後, 作業中の定期的な摂取を指導している」(80.6%) であった。健康管理で最も実施率が高かった項目は, 「朝礼などで労働者の健康状態を把握している」(82.9%) であった。健康教育で最も実施率が高かった項目は, 「労働者に対して熱中症の予防方法の教育を実施している」(74.0%) であった。多くの熱中症予防対策の実施率は, 熱中症が高頻度で発生している労働場所が主に屋外または屋外, 屋内両方の事業場で有意に高かった。また, 概して, 熱中症の発生した事業場は, そうでない事業場より, 熱中症対策の実施率が有意に高かった。したがって, 規模 50 名以上の事業場では熱中症予防のための上記全ての管理について更に改善する必要がある。

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