



Research

Occupational Health Literacy Level and Related Factors in Casting Factory Workers

Bir Döküm Fabrikası Çalışanlarında İş Sağlığı Okuryazarlık Düzeyi ve İlişkili Faktörler

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ABSTRACT

Objective: Occupational health literacy (OHL) is associated with the actions and decisions of employees in the workplace and with various occupational health outcomes. Prior studies specific to OHL are limited. The aim of this study was to determine the level of OHL and related factors.

Methods: A descriptive cross-sectional study was performed among the employees in a metal foundry factory operating as a supplier of steel castings, steel forgings, and machined parts to several industries. All employees over the age of 18 were invited to participate. Data were collected through a web-based questionnaire including demographic characteristics of the employees and the OHL scale. Independent sample t-test, One-Way ANOVA, and Tukey multiple comparison tests were performed for data analysis. A p-value of <0.05 was considered statistically significant.

Results: Among the 860 employees, 334 participated in the survey (38.9%). The mean age of participants was 35.60±8.96 (range: 21-67 years). 98.5% were male; 57.8% were married, 21.6% were working for over 16 years. Most participants were high school graduates (71.1%). The participants' mean OHL scale score was 84.27±15.46 (range: 49-114). The mean scores of OHL significantly differed by participants' age, educational level, working time in the factory, number of Occupational Health and Safety (OHS) training sessions received, job collar type, presence of occupational accident history in the past 3 years, and age at first work in an income generating job (p<0.05).

Conclusion: The study results contribute to our understanding of the factors that influence OHL and can guide OHS providers and employers, factory management, and union representations in planning intervention points for healthy and safe workplaces. More studies are needed to close the gap in the field.

Keywords: Occupational health literacy, employees, occupational health, casting factory

ÖZ

Amaç: İş sağlığı okuryazarlığı (İSO), çalışanların iş yerindeki eylem ve kararlarıyla ve çeşitli iş sağlığı sonuçlarıyla ilişkilidir. İSO'ya özgü önceki araştırmalar sınırlıdır. Bu çalışmanın amacı, İSO düzeyini ve ilişkili faktörleri belirlemektir.

Gereç ve Yöntem: Tanımlayıcı kesitsel tipte planlanmış olan çalışma, çeşitli endüstrilere çelik döküm, çelik dövme ve işlenmiş parça tedarikçisi olarak faaliyet gösteren bir metal döküm fabrikasında çalışanlar arasında gerçekleştirilmiştir. Çalışmaya 18 yaş üstü tüm çalışanlar davet edilmiştir. Veriler, çalışanların demografik özelliklerini ve İSO ölçeğini içeren çevrimiçi bir anket aracılığıyla toplanmıştır. Veri analizi t-testi, Tek-Yönlü ANOVA ve Tukey çoklu karşılaştırma testleriyle yapılmıştır.

Bulgular: Sekiz yüz altmış çalışandan 334'ü ankete katılmıştır (%38,9). Katılımcıların yaş ortalaması 35,60±8,96 (aralık: 21-67 yıl), 98,5'i erkek; %57,8'i evli ve %21,6'sı 16 yıldan uzun süredir çalışmaktadır. Katılımcıların çoğu lise mezunudur (%71,1). Katılımcıların OHL ölçek ortalaması puanı 84,27±15,46 (aralık: 49-114). İSO ortalaması puanları katılımcıların yaşı, eğitim düzeyi, fabrikada çalışma süresi, alınan İş Sağlığı ve Güvenliği (İSG) eğitimi sayısı, iş yaka tipi, son 3 yılda iş kazası öyküsü varlığı ve gelir getirici bir işte ilk çalışma yaşına göre istatistiksel olarak anlamlı farklılık göstermiştir (p<0,05).

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Cite as: Torun SD. Occupational Health Literacy Level and Related Factors in Casting Factory Workers. Med J Bakirkoy 2023;19:229-235

Received: 24.04.2023
Accepted: 13.06.2023



Sonuç: Çalışma sonuçları, İSG'yi etkileyen faktörleri anlamamıza katkıda bulunmakta ve sağlıklı ve güvenli işyerleri için müdahale noktalarının planlanmasında İSG profesyonellerine, işverenlere, fabrika yönetimlerine ve sendika temsilciliklerine rehberlik edebilmektedir. Alandaki daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: İş sağlığı okuryazarlığı, çalışanlar, iş sağlığı, döküm fabrikası

INTRODUCTION

Since the proposition of the concept "health literacy" in 1974, different definitions have been proposed. Most were limited to health literacy within the health care context, and their focus was on understanding health information and acting accordingly. Nowadays, the concept and means to measure have considerably evolved (1). The World Health Organization (WHO) defined health literacy as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" and placed the concept in the context of health promotion which is the process of enabling people, individually and collectively, to increase control over the determinants of health and thereby improve their health (2,3). WHO recently modified the definition of health literacy and stated that personal knowledge and competencies are mediated by organizational structures and availability of resources (4). Health literacy is influenced and shaped by individual, situational, cultural, and social factors. As a social factor influencing the health of a large proportion of the adult population worldwide, work environment and occupation represent important settings for determinants of health literacy (2,5).

Occupational health is defined as "the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations" (6). Health promotion is increasingly gaining ground in occupational safety and health (7). WHO called on countries to develop policies and institutions to promote occupational health, to intervene more in the workplace to prevent accidents at work and work-related diseases (8).

Health literacy can be assigned to both occupational health and safety and workplace health promotion because workers are often confronted with health information from occupational health professionals about occupational hazards, occupational injuries/diseases (9,10). Safety and health skills and knowledge are key qualifications in occupational health and safety and workplace health promotion. The extent to which employees possess these competencies has a significant influence on their behavior in the workplace. Increasing workers' individual health literacy can enable them to independently shape their working

conditions as a behavioral preventive measure and thus contribute to the implementation of structural preventive measures. Improving literacy skills in the workplace is a tool to empower individuals to make safe choices. Employees with higher literacy skills can better understand instructions for using equipment and materials, and they are more likely to comprehend and practice workplace health and safety procedures (11,12).

Occupational health literacy (OHL) has emerged as a part of health literacy, with the concept of Occupational Health and Safety (OHS) gaining more importance as a result of increasing industrialization, expanding business lines, developing technology, and increasing worker population worldwide (13). OHL refers to the degree to which individuals have the capacity to receive, process, and understand basic OHS information and services necessary to make appropriate decisions regarding health and safety in the workplace. It is specifically an important aspect in the prevention of work-related diseases and injuries (13-15).

Studies among the working population regarding occupational health issues and literacy are available in the literature. However, literacy studies conducted with employees in different business lines are mostly based on the concept of health literacy (16-19). Researchers state "lack of attention to factors affecting prevention" as one of the reasons for the high prevalence of occupational diseases and accidents. One of the factors affecting the prevention of occupational diseases and accidents is the ability of employees to adequately understand and implement measures and interventions related to OHS, that is, their OHL (13). Prior studies addressing OHL are limited (13,20), thereby creating an important gap regarding studies that evaluate OHL and influencing factors in the literature.

The primary aim of this study was to evaluate OHL levels and related factors among employees of a metal foundry factory. As there is a gap in the literature, the secondary aim is to contribute to the literature in the field.

METHODS

Study Design, Study Population

A descriptive cross-sectional study was conducted among the employees of a metal foundry factory in Mersin, Türkiye, which operates as a supplier of steel castings, steel forgings,

and machined parts to the automotive, construction equipment, and railway industries. For data collection, all 860 employees of the factory over the age of 18 were invited to participate in the web-based survey. Participation was voluntary, and informed consent was obtained from the participants at the beginning of the survey.

Data Collection

Data were collected in cooperation with factory management and union representation between March 20-31, 2022. The link of the web-based survey was first announced to the employees via official e-mails with invitations to participate in the survey. The day after, reminder messages with sms were sent to all employees by the human resources department. Then, the survey link was shared twice with a reminder message through WhatsApp groups in cooperation with the union representative. The structured web-based questionnaire consists of two parts. The first part of the questionnaire included demographic information and the second part included the OHL scale.

Sociodemographic Information Form

The first part of the questionnaire included demographic information (sex, age, the highest level of education, marital status, presence of chronic disease) and additional questions that are thought to be decisive age at first work in an income generating job, work length time at current factory, presence of occupational accident and occupational disease history in the past 3 years, number of OHS training sessions, and sources of information on OHS.

OHL Scale

To assess OHL, the OHL scale (21) was used for which Turkish validity and reliability studies were conducted. The Turkish form of the scale has been reported as a highly valid and reliable measurement tool to determine the OHL levels of employees (Cronbach's $\alpha = 0.93$) (22).

The OHL scale consists of 38 items within 4 dimensions: Ability to gain access, understanding, evaluation, and use of OHS information. Each item is evaluated on a 3 point scale (1 point = "not relevant", 2 point = "somewhat relevant", 3 point = "high relevant"). Evaluation is made on the total score. The lowest score that can be obtained from the scale is 38, and the highest score is 114. A high score is considered a high level of OHL.

Statistical Analysis

Statistical analyses were performed using SPSS version 25.0 (SPSS Inc., Chicago, IL, USA). The consistency of OHL scale scores with normal distribution was examined with the skewness and kurtosis values of the dataset. Both values

varied between -1 and +1, so it was assumed that data is normally distributed (23). The sample characteristics were described by performing descriptive analyses. Variables were defined by number (n), percentage (%), mean, standard deviation, and median (minimum:maximum) values. For comparison of mean OHL score between the groups of each independent variable, depending on the number of independent variable groups compared, independent sample t-test and One-Way ANOVA were performed for statistical analyses. For multiple comparisons between groups, the Tukey HSD test was used for further analysis. A p-value of <0.05 was considered statistically significant for all statistical comparisons.

Ethics Committee Approval

The study was approved by the Bahçeşehir University Clinical Research Ethics Committee (decision no: 2023-06/05, date: 15.03.2023).

RESULTS

Characteristics of Participants

The survey was completed by 334 employees, with an overall response rate of 38.8%. The mean age of the participants was 35.60 ± 8.96 years (range: 21-67 years). Of the respondents 98.5% (n=329) were male; 57.8% (n=193) were married, 21.6% (n=90) were working for over 11 years, and 15.6% (n=52) were in their first working year in the factory. In terms of education level, 71.1% (n=237) of the participants had completed high school, 13.8% (n=46) had completed secondary school or less, and 15.3% (n=51) had completed bachelor's or higher education. Participants reporting occupational accident and occupational disease history in the past three years were 39.2% (n=131) and 1.5% (n=5) respectively. Characteristics of the participants are presented in Table 1.

Regarding the source of information about OHS in which the participants could give multiple answers, 282 participants stated occupational safety specialist, 268 OHS trainings, 187 safety signs in the workplace, 162 occupational physicians, 106 co-workers/friends, 101 internet, 91 managers/supervisors as their main sources of information. As presented in Table 2 the occupational safety specialist (23.6%), OHS training at workplace (22.4%), health and safety signs at workplace (15.6%) and workplace physician (13.5%) were the most relevant sources of OHS information among participants.

Associations Between the OHL Score

The participants' mean OHL score was 84.27 ± 15.46 (range: 49-114). One-Way ANOVA was performed to compare

Table 1. Characteristics of the study population and relationship between the study variables and the occupational health literacy through bivariate analyses

Variables	n	%	Mean ± SD	test	p
Age group (years)					
20-29	109	32.6	79.88±13.78	4.87	0.002*
30-39	120	35.9	85.45±16.18		
40-49	76	22.8	87.17±16.36		
50+	29	8.7	88.31±12.63		
Gender					
Female	5	1.5	91.60±0.34	1.06	0.268**
Male	329	98.5	84.16±15.51		
Marital status					
Single	141	42.2	86.72±15.93	-2.48	0.013**
Married	193	57.8	82.49±14.86		
Level of education					
Secondary school or less	46	13.8	71.81±13.42	21.42	0.000*
High school	237	71.0	85.08±15.33		
Bachelor's or higher	51	15.3	90.98±11.62		
Presence of chronic disease					
Yes	66	19.8	82.91±15.24	0.79	0.425**
No	268	80.2	84.61±16.35		
Type of job collars					
White-collar	48	14.4	90.52±13.35	3.06	0.002**
Blue-collar	286	85.6	83.22±15.56		
Age at first work in an income generating job					
10-14	31	9.3	91.58±12.75	4.65	0.010*
15-17	80	24.0	85.33±15.94		
≥18	223	66.8	82.88±15.37		
Working time in the factory (years)					
≤1	52	15.6	86.35±15.89	7.06	0.000*
2-5	112	33.5	80.35±15.50		
6-10	80	24.0	82.40±15.05		
≥11	90	26.9	89.62±13.95		
Occupational accident history in past 3 years					
Yes	131	39.2	89.40±13.69	5.188	0.000**
No	203	60.8	80.97±15.66		
Occupational disease history in past 3 years					
Yes	5	1.5	84.20±9.41	-0.01	0.992**
No	329	98.5	84.27±15.54		
Number of OHS trainings received					
1	94	28.1	78.81±12.68	11.17	0.000*
2	65	19.5	82.17±15.48		
3	57	17.1	83.33±16.11		
≥4	118	35.3	90.24±15.30		

SD: Standard deviation, OHS: Occupational Health and Safety, *One-Way ANOVA test; **independent sample Student's t-test

Table 2. Source of information about Occupational Safety and Health*

Source of information about Occupational Safety and Health*	n	%
OHS trainings	268	22.4
Workplace physician	162	13.5
Occupational safety specialist	282	23.6
Health and safety signs at workplace	187	15.6
Co-workers/friends	101	8.4
Internet	106	8.9
Managers/supervisors	91	7.6

*Multiple responses. OHS: Occupational Health and Safety

the effect of education, age group, age at first work in an income generating job, and number of OHS training sessions received on the total OHL score. As presented in Table 1 One-Way ANOVA test revealed that there is a statistically significant difference in mean OHL between at least two groups for age groups ($F=4.87$, $p=0.002$), for level of education ($F=21$, 42 , $p=0.000$), for working time in the factory ($F=7.06$, $p=0.000$), for number of OHS training sessions received ($F=11.17$, $p=0.000$), and for age group at first work in an income generating job ($F=4.65$, $p=0.01$). The mean scores of OHL does not differed statistically with the presence of chronic disease, presence of occupational disease history in the past three years, and gender ($p>0.05$).

In further analysis according to the results of Tukey's HSD test for multiple comparisons, the mean value of OHL was significantly different between bachelors' degree or higher education and secondary school or less education [$p=0.000$, 95% confidence interval (CI) = (12.05, 26.28)]. There was no significant difference in means of OHL between secondary school or less education and high school education ($p>0.05$). OHL was significantly higher for participants who were working for at least 11 years in the factory compared to the participants working for 2-5 years [$p=0.000$, 95% CI = (3.77, 14.78)] and 6-10 years [$p=0.011$, 95% CI = (1.25, 13.20)]. There was no significant difference in OHL between participants who were working for at least 11 years in the factory compared to the participants who were within their first year in the factory ($p=0.596$). OHL was significantly lower in the age group 20-29 compared to the age groups 30-39, 40-49 and 50 and higher [$p=0.030$, 95% CI = (-10.76, 10.38); ($p=0.008$, 95% CI = (-13.16, -1.43)] and [$p=0.041$, 95% CI = (-16.63, -0.23) respectively]. There was no significant difference in mean value of OHL between the age groups 30-39, 40-49 and 50 and higher ($p>0.05$). OHL was significantly higher in 10-14 age group at first work in

an income generating job and ≥ 18 age group [$p=0.009$, 95% CI = (1.80, 16.60)]. There was no statistically significant difference in mean OHL between age group 10-14 and age group 15-17 ($p=0.131$) or between age group 15-17 and ≥ 18 age group ($p=0.438$). OHL among participants who received at least four OHS trainings was significantly higher compared to those who received less OHS trainings ($p<0.05$). There was no significant difference in the mean value of OHL between the other three groups who received less than 4 OHS trainings ($p>0.05$).

DISCUSSION

As mentioned earlier, prior international and national studies specific to OHL are limited. Also, there is a lack of reliable and valid measurement instruments for OHL. As far as is known, this is the first study addressing the OHL and related factors among workers with reliable and valid measurement instruments in our country. The use of the recently developed and adapted OHL scale makes it difficult to compare and relate the results of the study to other national and international studies.

Considering that the range that can be obtained from the OHL scale is between 38 and 114, the OHL level among the participants was moderate to high with a mean score of 84.27 ± 15.46 (range: 49 -114). The most relevant sources of OHS information among participants are OHS trainings, occupational safety specialists, and workplace physicians. Thereason why the participants' OHL was moderate to high may be explained by the effects of mandatory OHS training. Also, assignment of occupational safety specialist and workplace physician may provide a communication way to receive information on OHS they need. The assignment of occupational safety specialist and workplace physician in the factory and OHS training at workplace is thought to be the impact of the legal regulations. In Türkiye, workplaces are categorized into three hazard classes: very hazardous, hazardous, and less hazardous. This classification is based on the type of work performed, the materials used or produced at each step, work equipment, types and methods of production, as well as other aspects related to the working environment and working conditions. Many issues such as employee training hours and frequency on OHS, assignment and working hours of OHS professionals, and risk assessment are determined according to the hazard class of the workplace. According to this classification, the factory in which the study is conducted (the metal casting industry) is considered very hazardous (24). The law 6331 (25) mandates employers to inform employees about the health and safety risks of the workplace, the rights

and obligations of employees, take protective measures against the workplace risks, provide workplace doctors and occupational safety professionals, medical examinations for their employees on a routine basis etc. The principles and procedures (e.g. the subjects, hours and frequency) of OSH training to be provided to employees are set out by the regulation (26).

As expected in the metal manufacturing industry, most participants (98.5%) were male. Gender segregation is an expected finding in the metal manufacturing industry. The labor market is highly gender-segregated by industry and occupation in most countries of the world, with men dominating the industrial sector in every region of the world (27).

The data showed that OHL was significantly associated with some factors. OHL was significantly higher in participants with a bachelors degree or higher education compared with participants with a lower degree education. The influence of educational level is proven in many health literacy studies (16,17,19,28). Therefore, it is reasonable to assume that the educational level of employees will have significant effects on their OHL.

The finding that the OHL was significantly high in participants who were white-collar workers compared to blue-collar workers is most likely related to the educational attainment of the participants. OECD reports that across all countries the percentage of adults with tertiary education is higher among occupations requiring advanced skills (white-collars) (29).

Participants who received at least four OHS trainings had a significantly higher mean value of OHL compared with those who received less OHS trainings. This result agrees with studies reporting that regular OHS education increases knowledge regarding OSH (30,31).

The OHL level of the participants who had been working in the factory for at least 11 years was significantly higher compared to the participants who had been working for 2-5 years and 6-10 years, while no difference was found when compared to the participants who were in their first year in the factory. Also, no statistical difference was found when the OHL level of the participants who were in their first year in the factory was compared with the participants who had been working for 2-5 years and 6-10 years. This result agrees with the results of a study conducted with 150 sasirangan workers in South Calitmantan on OHL, which reported that a longer period of working is related to good OHL (20).

Another result of the study is that the participants with an occupational accident history in the past three years have higher OHL. The unexpected result of the positive

association between the presence of a work accident history and higher OHL may be due to the possibility that injured workers were provided with OHS information after they had an occupational accident. Another explanation could be that respondents with a history of occupational accidents tend to seek more OHS information by themselves than those without a history of occupational accidents

In the study where the concept of OHL was first introduced, it was reported that there was a positive association between OHL and occupational accidents among US adolescents (13). They explained this result with the possibility of inappropriate, incomplete or inadequately delivered safety training, thereby limiting its ability to have a preventative impact.

Considering that workers' OHL of the employees needs to be assessed with appropriate, reliable and validated tools to contribute and guide OSH professionals, employers, factory managements and union representatives when deciding on the method, content and level of measures and/or interventions to be taken to protect workers from health hazards they are exposed to at work, this study is one of the pioneering studies highlighting occupational health-specific literacy and contributing to our understanding of some of the factors that influence OHL.

This study should be interpreted in the context of its limitations. First, the cross-sectional design of the current study only offers information on association and cannot provide any information about causality. The second limitation concerns that the study was conducted online and employees participated voluntarily. Although the precise characteristics of a sample (i.e. number of target employees, their possibilities of accessing the web-based survey) were well known by the researcher previously, the employees who participated in the survey may have responded in the desired way, misrepresenting their true status about the content of the survey, and a respondent bias might have occurred. In addition, an online data collection may have led to selection bias in which employees with low literacy levels may have participated less than those with high literacy levels. The third limitation might be the participation rate in the study, which may lead to a non-response bias. Finally, since all participants were employees of the same factory, the results of the research may be unique to that factory, and the results of this study may not necessarily be generalized to other employees or industries.

CONCLUSION

Despite its limitations, the study found that the OHL of factory employees is influenced by factors such as employee

educational level, job collar type, number of OHS trainings, and presence of occupational accident history in the last three years. Interventions based on influencing factors of OHL can be more effective in improving the OHL of employees. Evaluating and understanding the level of OHL and influencing factors is the first step to develop evidence-based interventions to protect workers from workplace hazards and promote their health. To identify more factors influencing OHL of employees, future studies conducted in different workplaces and appropriate evaluation instruments are suggested.

ETHICS

Ethics Committee Approval: The study was approved by the Bahçeşehir University Clinical Research Ethics Committee (decision no: 2023-06/05, date: 15.03.2023).

Informed Consent: Participation was voluntary, and informed consent was obtained from the participants at the beginning of the survey.

Financial Disclosure: The author declare that this study received no financial support.

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