TEHRAN UNIVERSITY OF MEDICAL SCIENCES

IJOH INTERNATIONAL JOURNAL OF OCCUPATIONAL HYGIENE

eISSN: 2008-5435

IRANIAN OCCUPATIONAL HEALTH ASSOCIATION IOHA

ORIGINAL ARTICLE

Descriptive Study of Safety and Health Training Content in Iranian Universities and Higher Education Institutes

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Received April 13, 2021; Revised June 11, 2021; Accepted June 19, 2021

This paper is available on-line at http://ijoh.tums.ac.ir

ABSTRACT

The root cause of many workplace incidents is the lack of knowledge on occupational safety and health principles. Despite the safety and health authorities in organizations, safety and health is the general responsibility of all other experts working in an organization. Experts and managers are expected to think, decide and work safely in workplaces. However, we don't have enough information about the level of safety and health-related education when they were in universities. In addition, there is not too much reliable published reports on the academic teaching of safety and health courses and syllabus in higher education in Iran. Therefore, the current study was aimed to provide a general view of the status of occupational safety and health teaching subjects in different academic disciplines (excluding specialized fields in occupational safety and health) in the Iranian higher educational system. Firstly, the latest edition of the entire program (curricula) of all academic disciplines held in Iranian universities was downloaded. Secondly, the required information, including discipline title, program's degree, number of required (core) and elective (non-core) courses, and program's date of approval, were recorded in an Excel sheet. Every course's title and syllabus were then studied to find out any safety and health-related topics. Finally, data were analyzed and reported. 251 academic disciplines in the Ministry of Health and Medical Education (MOHME) and 771 disciplines in the Ministry of Science, Research and Technology (MSRT) were investigated. Most of the curriculums have been revised by both ministries since 2011. Results showed that 20 percent of the MOHME disciplines and 10.4 percent of MSRT disciplines were included in the occupational safety and health courses. The number of courses with health and safety content (syllabus outline) in the MOHME and the MSRT were 168 and 173. Most health and safety courses presented in the MOHME academic majors were in the basic medical sciences category of disciplines. A majority of MSRT covered academic safety and health courses and topics were presented in the engineering category of disciplines. Presenting lessons with health and safety content at the MOHME was more practical than that of the MSRT. The quality and quantity of teaching on safety and health topic were not at satisfactory levels. Revising the course syllabus of the academic disciplines and adding theoretical and practical courses related to each field's specific health and safety curriculum can make a significant contribution in improving the general knowledge of the safety and health of the university graduates. In turn, it improves future workplace safety and health conditions, managers' insights and decision-makers on the importance of safety and health at work. It protects the people's life and the property of the organization.

KEYWORD: *Safety and Health; Discipline; Syllabus; Higher Education; Course; Iran*

INTRODUCTION

The higher education system in Iran:

Two main groups of universities in Iran, including non-medical universities and medical schools, work under the supervision of the Ministry of Science, Research and Technology (MSRT), and the Ministry of Health and Medical Education (MOHME), respectively. Every year, thousands of students compete in the national entrance exam to be accepted in their desired academic discipline i at undergraduate or postgraduate levels. Almost 190 state universities and 530 private universities [1-2] enroll those accepted in this big competition. Currently, 2,500,000 students are studying at state and private universities [3].

An academic major is the entire program of studies required to complete a university degree in Iran. Each academic program is included a set of required (core) and elective (non-core) courses approved by the ministry. A course is a unit of teaching that typically lasts one academic term. The value of every course is identified by its units. Every unit equals 17 hours of lecture classes or 34 hours of laboratory classes. So, the two-unit lecture course is held in seventeen two-hour classes during a term. About 130 teaching units must be passed in bachelor degrees to finish the program. Responsible ministries approve the curriculum of all academic disciplines (academic program) and the content of courses (syllabus outline).

The Higher Education Planning Council of two ministries plans and revises the education curricula of the various disciplines in collaboration with the scientific board of each major. Each board consists of faculty members of universities. In a curriculum renewal process, scientific board of any major calls all faculty members around the country to send their suggestions for improving the curricula, including adding a new course into the program, deleting an existing course, or recommending a new syllabus for an existing course. Revised curricula are communicated to universities after they are approved for implementation.

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In the two ministries, academic disciplines were classified into several categories; each discipline falls into one of these categories according to its content. In the present study, four categories, including pharmacy, medicine, dentistry, and basic medical sciences in the MOHME and five categories, including basic Sciences, veterinary medicine, art, and engineering in the MSRT, were investigated.

University-level studies in Iran were divided into six stages, associate's degree, discontinuous bachelor, bachelor's degree, master's degree, and doctorate. Also, post-doc programs were established in some universities. Some other limited programs like Master of Public Health (MPH) are implemented in some universities. The executive issues of these kinds of academic programs are different from conventional programs. However, at the undergraduate level, there are differences, depending on whether or not the student desires to continue to the graduate level. A student desiring an associate's degree must complete two years of study. A student must then complete another two or three years of study to receive a discontinuous bachelor's degree.

A master's degree requires two more years of study and requires typically a previous study at the bachelor's level. At the doctoral level, specialized degrees (or professional doctorates) are offered in the areas of medicine (Medical Doctor/MD), dentistry, pharmacy, and veterinary medicine. In doctor of philosophy (Ph.D.), applicants must hold a master's degree or a professional doctorate and pass an entrance test. Then, the Ph.D. usually is completed in four-and-a-half years.

Safety and health in academic education of Iran:

Safety and health are the key concepts in the development of societies, and it is one of the criteria of growth in the Human Development Index (HDI). The United Nations calculates the Human Development Index based on three key indices of life expectancy, education, and per-capita income index and annually announces the ranking of countries [4].

Published online: June 30, 2021

In Iran's Twenty-Year Perspective Document and the five-year development plans, Iran should have a good ranking among the region's countries and neighboring countries in health, safety, and environmental indicators. According to the administration labor inspection's annual report in 2015, 10544 occupational accidents occurred in Iran's workplaces, and 903 people died because of these events. Also, more people suffered from a wide range of permanent or temporary disabilities [5].

There is no clear report of the direct and indirect costs of these events on the country's economy, but it is estimated that the costs of these events would consume a large share of Iran's Gross Domestic Product (GDP) [6]. Therefore, promoting occupational safety and health in workplaces and protecting the workforce as the most valuable element of work has a particularly significant effect on the development of the country [6].

Promoting safety and health in workplaces attainable by training professionals in the field and following to use them in industries and organizations and supportive laws legislated to make these professionals effective in the workplace. Chapter IV of Iran's Labor Law, including the 22 section approved in 1990, has assigned the two ministries, MOHME and Ministry of Cooperatives, Labor, and Social Welfare (MCLSW), to provide and promote health and safety at workplaces in Iran [7].

Industrial health major was established in 1972 in Iran's higher education system [8]. Later, this academic discipline was renamed occupational health and safety engineering and continued to admit students in three-degree levels, including bachelor, master, and Ph.D. Other related academic majors like ergonomics were established in the past two decades to better cover topics related to health and safety at work. The graduates of these academic majors in industries and organizations have had a great effect on providing a safe and healthy workplace and protecting the workforce. Usually, big industries and manufacturers have an organizational structure for safety and health and recruit relevant professionals to ensure the preservation of accidents and promote safety and health in their organization. However, for multiple reasons, many organizations in Iran, especially small and medium-sized businesses, do not have the required structure and occupational health and safety professionals to address health and safety subjects. Therefore, these organizations must rely on the knowledge of other specialists in other areas to handle these subjects at the first level of preventing occupational accidents and diseases. If these experts did not learn the principles of health and safety subjects, the likelihood of incidents would increase. Specialists in other fields with a basic knowledge of health and safety will also help better the performance of the health and safety experts in big organizations with formal structures in this area. Achieving this long-term goal in addition to training relevant professionals, requires long-term planning to promote the general level of health and safety knowledge among graduates of all academic disciplines.

Industrial accidents are caused by ignoring health and safety laws, lack of health and safety knowledge of managers, experts, and engineers about these laws, and lack of awareness and mastery of planners and legislators from basic and fundamental concepts of safety and health. A close look at the lack of safety and health in the workplace brings us to its roots, namely the lack of adequate and fundamental education in these areas, especially at the university level [9]. Karapantsios et al. investigated the perceptions of food industry students about chemical safety labels. The results of their study showed that only 4 percent of people were able to identify all the signs used in chemical safety labels correctly, and 23 percent of them forgot all the information about chemical safety labels [10]. Fayyazi et al. in a survey among three Iranian occupational groups, showed that a meaningful correlation exists between the age/education of the participants (chemical retailers, chemicals manufacturing workers, and occupational health and safety professionals) and their chemical safety knowledge [11].

Since the 1980s, the US National Science Council has mandated all engineering fields at US universities to incorporate a health and safety course into the curriculum and ensure that students pass this course to graduate [12]. In many other prestigious universities worldwide, such programs and courses are included in the course syllabi [13]. Students cannot enter laboratories or internship courses without obtaining a health and safety certificate in some universities [10-

13]. European Agency for Safety and Health at Work has also stressed the need to strengthen the culture of accident prevention through education and training. One of the EU's health and safety strategies from 2007 to 2013 was to integrate health and safety education programs at all levels and in all fields of vocational and academic training [14]. Many engineers do not have sufficient safety and health skills, and they require specific training that is not provided during their university education [15-16]. In addition to engineers and designers, physicians and other healthcare professionals also need safety and health-related training in their future careers. Therefore, the health and safety course should be included in all academic levels as a required (core) course of curricula [14]. Many polytechnic schools in Europe have embedded safety and health courses into their curricula [15].

Since 1985, safety training in chemical engineering courses has been included in the Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers (AIChE)[17]. Chemistry students should have comprehensive knowledge and skill about safety subjects to ensure the safety of work processes in the future careers [18]. Many educational institutions integrate health and safety courses in undergraduate and postgraduate programs in chemical engineering. Their basis is to provide the learner with a framework of inherently safety design principles. Kletz (1988) stated this for the following three purposes [19]:

- Safety should be an integral part of the designing process.
- Any chemical engineer will be involved in safety subjects.
- Prevention and safety are fundamental principles.

There are hazards that should be considered when students are working in research laboratories of the university, in addition to what students should know about the occupational safety and health issues in their future work. Academic laboratories and research institutes are more dangerous than industries, and more accidents occur. However, accidents are generally not reported if they have not human injuries or have small property damages. These laboratories are generally stocked with expensive and unique equipment. Destruction of this equipment can halt the research process of the research group for a long time. Also, new technologies and materials developed in research laboratories have unknown hazards that can lead to accidents. Thus, contrary to the awareness of the growing risks in research and academic laboratories, risk management in these environments is often more complicated than in industries. It is more challenging to create a safety culture in these environments [10-20-21]. Whether chemical, biological, or radiological, most laboratories use chemicals that are either hazardous themselves or by some chemical reactions that can cause danger. Therefore, it is necessary to identify, evaluate, and control these potential hazards to achieve a safe environment and prevent any possible harm [22]. Following the accident in 2007 at the T2 Chemicals Laboratory in Jacksonville, United States, the US Chemical Safety and Hazard Investigation Board (CSB) recommended that laboratory safety should have a high priority and an integral part of chemical and laboratory training programs [20]. In Iran, information about the incidents of research laboratories generally published in the public media. Some of these accidents have been presented in Table 1.

Published online: June 30, 2021

Table 1. Examples of accidents in research and educational laboratories in Iran

The scene of the accident	Year	Accident cause	Number of injured people
Tarbiat Modarres University, Tehran [23]	2006	An explosion of hydrogen gas cylinder in a chemistry laboratory	1 died and 1 injured
Hamedan BouAli University [24]	2012	Put the solvent-containing container close to the source of heat and explode the container	6 injured
Girls' High School Shahed Oswah in Mobarak city [25]	2016	An explosion in the chemistry lab	2 injured
Fasa University Laboratory [26]	2017	An explosion of one of the mechanical laboratory devices	6 injured
Hormozgan Steel Company Lab [27]	2018	Gas leaks and explosions	4 injured

Aside from the dangers that threaten chemistry students in laboratories, students in fields such as civil engineering, architecture, laboratory science, mechanics, electricity, physics, and even some art disciplines such as sculpture, music, or paintings are exposed to work-related accidents and illnesses. The root cause of many of these accidents and diseases is the lack of basic knowledge of the safety and health of working processes due to the lack of proper training during college. Unfortunately, there are no exact statistics on the number of specialists involved in work-related illnesses or even accidents.

Purpose of this study:

In the current study, we seek to provide a comprehensive overview of the status of occupational safety and health training to students of different fields (except occupational health and safety-related disciplines) in the higher education system in Iran. Therefore, in this study, the educational syllabuses of different academic levels approved by the Ministry of Science, Research and Technology and the Ministry of Health and Medical Education were reviewed to obtain the health and safety contents. Finally, reporting on the current state of health and safety education at Iran universities, to provide a set of suggestions for revising the curricula of academic programs in accordance with the students' need to learn about safety and health topics related to their expertise. This change in curricula will improve the effectiveness of all safety and health interventions in workplaces.

METHODS AND MATERIALS

The last version of all majors' curriculums in the two ministries (MOHME and MSRT) downloaded from their websites. On the website of the two ministries, in the higher education planning office, these curricula are available based on the educational group and degree. After the initial survey of the educational groups, the basic sciences, veterinary medicine, art, and engineering groups in the MSRT were selected. Pharmacy, medicine, dentistry, and basic medical sciences groups were also selected in the MOHME for further study. Then program's information for 251 courses of MOHME and 771 courses of MSRT including the discipline name, degree, courses name, total number of courses, the total number of specific courses (versus general courses like English, math, history and literature, social sciences, etc.), type of course (elective, required, etc.), number and type of courses dedicated to health and safety subjects, date of program's approval, and the revision date were recorded into an excel sheet. This information was assessed in two ministries and compared in terms of frequency.

Occupational health and safety engineering, industrial safety, ergonomics, health and environmental management disciplines were excluded from the study as their main goal is to train professionals in the health and safety-related issues. So, the remaining majors were those that health and safety courses or syllabuses are necessary as an ancillary topic to the empowerment of students to think and work safely in their college

period and future jobs. We extracted all of the courses whose title is related to health and safety topics for each discipline in the next step. The content of other courses (syllabus outline) was studied by content analysis method to find related safety and health topics in the disciplines that did not have a separate course for safety and health in their program. All headings were studied, and any heading in which the words health and safety (in Persian) were used or the meaning of the heading indicated the presentation of health and safety-related content to the student were extracted. Data entered in an Excel sheet and reported using proper statistical analysis.

RESULTS

The program of study of 1022 academic disciplines was studied. This number belonged to all levels of academic educations (undergraduate and postgraduate programs). Of this, 251 belonged to the majors supervised by Iran's Ministry of Health and Medical Education and 771 belonged to the majors supervised by Iran's Ministry of Science, Research and Technology.

The number of disciplines with health and safety contents in the MOHME and MSRT universities was 50 (20%) and 80 (10.4%) (130 disciplines in total). Safety and health topics were embedded within 341 courses in 130 disciplines. The number of courses with health and safety topics was 168 in the MOHME study programs and 173 in the MSRT study programs. By dividing this number (number of courses) to the number of disciplines with safety and health topics, the portion of each discipline in the MOHME and the MSRT supervised disciplines were 3.3 and 2.2 courses with safety and health topics.

Table 2 shows the frequency of disciplines with health and safety topics in different educational categories in the two ministries. The MOHME had the most health and safety topics in the category of basic medical sciences study programs and the least in dentistry. The MSRT also offers the highest number of health and safety topics or headings in engineering disciplines and the lowest in veterinary disciplines.

Table 2. Disciplines with health and safety topics in different educational categories

Ministry	Educational categories	Number of disciplines	Frequency of disciplines with health and safety topics (%)
MOHME	Pharmacy	19	4 (21)
	Medicine	1	1(100)
	Dentistry	8	2 (25)
	Basic Medical Sciences	223	43 (20)
	Total	251	50 (19.9)
MSRT	Basic Sciences	233	23 (9.9)
	Veterinary Medicine	41	9 (22)
	Art	163	12 (7.4)
	Engineering	334	36 (10.8)
	Total	771	80 (10.38)

Published online: June 30, 2021

Table 3 shows health and safety topics in practical and theoretical courses in different educational categories. The results showed that health and safety subjects were more practically taught in the MOHME, with 88.7% of health and safety topics being presented in practical courses. The MSRT offers 26.6% health and safety topics in practical and 60.7% of health and safety topics in theoretical courses.

Table 3. Frequency of practical and theoretical courses with safety and health topics in different educational categories (n=341)

Ministry	Educational category	Number of courses with health and safety topics (%)	Number of practical courses	Number of theoretical courses	Number of practical and – theoretical (hybrid) courses
MOHME	Pharmacy	23 (6.7)	23	0	0
	Medicine	21 (6)	21	0	0
	Dentistry	11 (3.2)	11	0	0
	Basic Medical Sciences	113 (33.2)	94	13	6
MSRT	Basic Sciences	52 (15.3)	22	27	3
	Veterinary Medicine	15 (4.4)	7	4	4
	Art	25 (7.3)	12	4	9
	Engineering	81 (23.7)	5	70	6

Figure 1 presents the frequency of courses with health and safety topics at different degree levels. The MOHME offers the highest number of health and safety topics at the master and doctoral degrees, and the least number of safety and health topics at the discontinuous bachelor's degree. The MSRT also offers the highest number of health and safety topics at the master's degree and the lowest number of safety and health subjects at the associate degree.

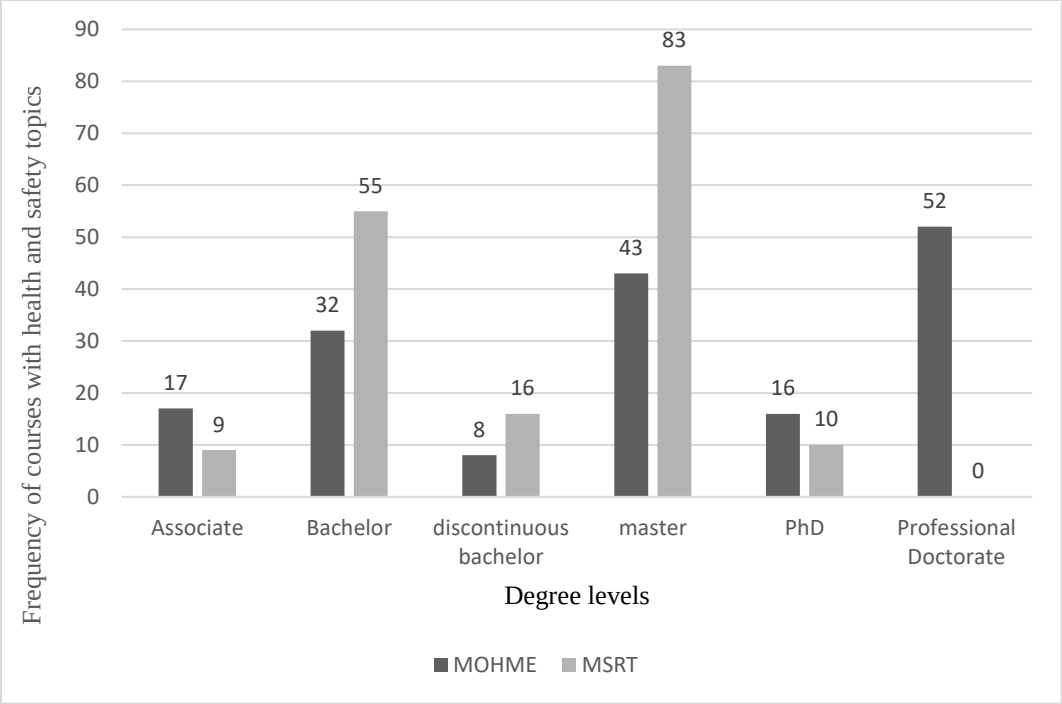

Fig 1. Courses with safety and health topics at different degrees of education

The required (core) and elective (non-core) courses has been presented in Table 4. In the MOHME, 97.6% of the courses with health and safety topics were required courses, while in the MSRT 55.5% of safety and health courses were required and 44.5% were elective.

The ratio of the number of health and safety topics to all topics of course was calculated to examine the quantity of health and safety topics in syllabus outlines in a course that included health and safety topics as part of the course content. In the MSRT and the MOHME, the average value of 0.13 ± 0.09 (13% syllabus) and 0.098 ± 0.099(9.8% syllabus) was devoted to safety and health topic, respectively. In addition to courses on health and safety topics, there were specific safety and health courses in both ministries dedicated to health and safety education exclusively, that existed ten courses at the MOHME and in the MSRT had defined 50 courses (32 elective courses and 18 required courses).

Published online: June 30, 2021

Table 4. Frequency of core and non-core courses in different educational categories

Ministry	Educational category	Core courses	Elective courses
MOHME	Pharmacy	23	0
	Medicine	21	0
	Dentistry	11	0
	Basic Medical Sciences	109	4
	Total	164	4
MSRT	Basic Sciences	36	16
	Veterinary Medicine	11	4
	Art	21	4
	Engineering	28	53
	Total	96	77

The results of the assessment of the course revised dates have been presented in Figure 2. The results showed that the most revisions in curricula had been carried out after 2011 in the MOHME and MSRT. The number of the revised curriculum in the MOHME from 2001 to 2011 was also higher than that of the MSRT. Most of the curriculum renewals in both ministries were done in 2016. The oldest curriculum revision was in the MSRT in 1983 and the MOHME in 1995.

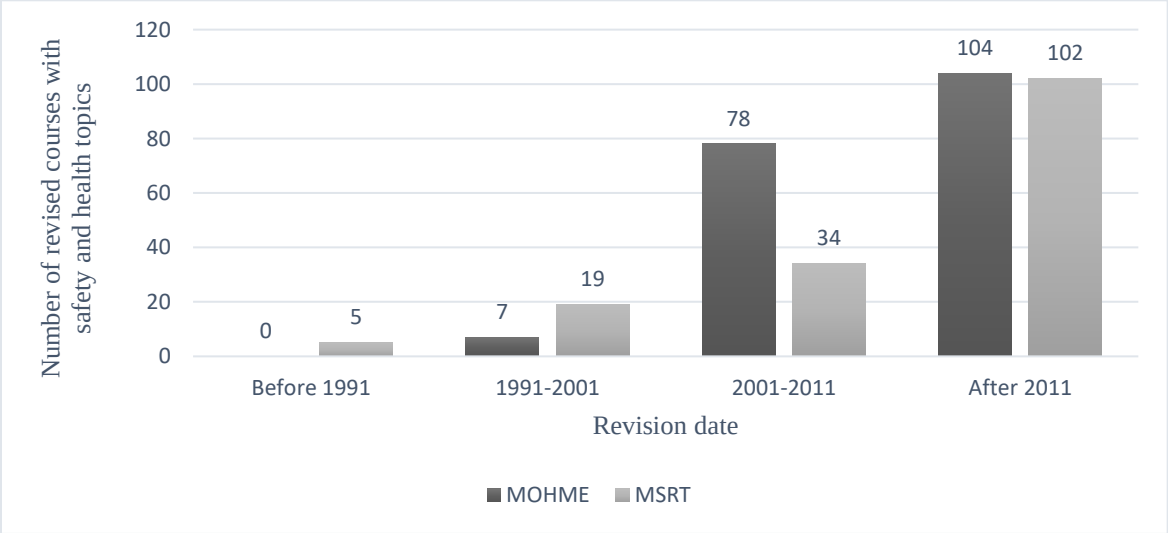

Fig 2. Curriculum revision dates in the Ministries of Health and Science

Published online: June 30, 2021

DISCUSSION

This study was aimed to provide a general overview of the status of education of health and safety issues to students of different disciplines in the Iranian higher education system. This study showed that in both ministries responsible for the higher education of Iran, the percentage of disciplines with health and safety courses in their curriculums is very low. However, most disciplines in two ministries were exposed to various health and safety risks in their laboratories, training centers, workshops, and real work situations.

This creates the urgent need to revise the curricula of various disciplines in both ministries to incorporating safety and health courses into the curriculum. Hill examined the safety status in the chemistry teaching curriculum. The results of this study showed that safety in the educational process has been forgotten or not sufficiently considered. He recommended that chemical safety requirements be identified and included in training courses and attempted to incorporate these safety issues into books and articles. To achieve this, Hill suggests that chemists should use the comments of safety experts in the development of a chemistry curriculum [28].

The European Agency for Safety and Health at Work reported in 2009 that occupational safety and health is systematically incorporated into university-level training courses, but it is a most challenging educational issue at the university level that is not well developed. One of the obstacles in European countries is the lack of common educational curricula. Universities and higher education institutions in Europe, unlike schools are not under the direct supervision of the government and are highly independent, with each university providing its curricula.

There is also a lack of safety and health curriculum resources and safety teachers and lecturers for various disciplines [14]. In Iran, the curricula of various disciplines are planned and revised by the Higher Education Planning Council of the Ministries of Health and Medical Education and Science, Research and Technology. Thus, universities across the country are required to implement the same curricula for every educational program and cannot independently adopt and incorporate safety and health courses into academic disciplines. This type of supervision in higher education can create a good capacity for unifying and enhancing safety and health training at Iranian universities. This improves the safety knowledge among the workforce, prevents accidents by deliberately planning, design appropriate training courses, and provide proper scientific resources. However, it should be considered that this kind of mechanism can be a time-consuming process due to the bureaucratic process of curriculum renewal.

Comparison of the two ministries in terms of the number of disciplines having health and safety topics in curriculums showed that 20% of disciplines of MOHME and 10.4% of disciplines of MSRT had safety and health topics in their curriculum. The portion of each discipline with safety and health topics in the MOHME and the MSRT was 3.3 and 2.2 courses. Hence, it seems that the status of the MOHME was more favorable than the MSRT in providing health and safety topics, that could be due to the MOHME's inherent mission to develop health and safety sciences as well as the attention of the scientific board of each major in revising courses and considering safety and health topics in revised versions.

In this study, 13% syllabus of MSRT and 9.8% syllabus of MOHME was dedicated to safety and health topic, which had a small portion of syllabus and these topics should be increased in the curriculum. The assessment of the frequency of health and safety topics in different educational categories also showed that most health and safety subjects were in the category of basic medical sciences majors in the MOHME and the category of engineering majors in the MSRT. This was due to the greater number of disciplines in these two categories.

In Europe, safety and health courses in technical colleges have also received more attention. The Faculty of Science and Technology at the New University of Lisbon offers occupational safety and health courses for undergraduate and postgraduate engineering students. Health and safety skills were taught in both theory and practical classes by conducting risk analysis activities in the real work

environment in different fields of activity according to each student's vocational area [14].

The presentation of health and safety topics in practical and theoretical courses in different educational groups showed that in the MOHME, 88% of safety and health topics were taught practically while teaching these topics was 26% practically in MSRT. MOHME teaches health and safety topics more practically and students learn safety and health topics along with other laboratory topics. This contributes to embedding health and safety science in laboratory activities. However, in the MSRT more theoretical lessons are offered. In most of the courses studied in both ministries, safety and health are taught as part of the curriculum, which has a small portion of the topics. One disadvantage of this method is the lack of focus on safety and health. Due to the lack of courses with health and safety subjects in both ministries, the share of health and safety topics should increase.

On the other hand, some of these courses, particularly in the category of engineering disciplines in the MSRT are elective (non-core), reducing the effectiveness of safety and health training. In a small number of disciplines, a separate course is devoted to safety and health, which are more elective in the MSRT. This method of presenting courses can be very impractical. Assigning a separate course to the health and safety topics will concentrate on learning about health and safety issues. The best way to teach health and safety topics at universities is to devote separate required (core) units. On the contrary, health and safety topics can be embedded into other existing courses in that of major, simultaneously [9]. A disadvantage of this teaching method is the limited time of education, the continuous pressure on students to learn new topics into the curriculum and a significant reduction in the content of other topics of course [9]. Therefore, in all academic disciplines, specific and required safety and health courses should be considered in the curriculums.

On the other hand, theoretical learning methods do not meet the needs of students and require a more effective teaching method to raise students' awareness of safety and risk management [10]. Huston et al. also developed a course on laboratory safety using experts from academia and industry to influence further safety education on the behavior of chemistry students [29]. In a study conducted at Potsdam University in Germany, students were divided into two groups. The first group received lecture safety training as part of their curriculum and the second group received no training. The results proved that the first group of students had better safety knowledge. However, the differences between the two groups were negligible and the traditional method of lecturing only slightly increased students' safety awareness [14].

Therefore, health and safety education should proceed from the traditional lectures to practical, active learning methods, visit to industry, expert discussions, internet and distance learning and other participatory methods in education [30]. The results of the study of the frequency of health and safety topics at different degrees of education showed that in both ministries, the highest number of safety and health topics were presented at the master's degree and the lowest number of health and safety subjects were at the associate and bachelor's degree. Although the introduction of these topics at the master's degree was very practical due to research work in labs and workshops, since many undergraduate students were employed in industry, safety and health topics need to be included in this level. Short-term safety and health training in apprenticeships and internship courses in undergraduate degrees can also be very effective. Crockett examined the role of short-term safety training in students' behavior. The results of his study showed that short-term training could play an important role in enhancing safety attitudes. After the training period, all students with proper clothing were present in the laboratory, using personal protective equipment and appropriate duty tools, and were more sensitive to flammability and toxicity of chemicals [31].

Considering the renewal period of curriculums also showed that the revision process has been growing in recent years, which is very promising. However, different disciplines need to consider experts' comments on courses that are not the main goal of discipline at the time of revision. For example, considering the safety and health professionals' advice in providing the content of safety and health course for each discipline can make it more effective than writing the content simply by one of the interested members

of the discipline's scientific board to safety and health topics. Sigmann examined the status of chemical safety education in the 21st century. The results of the study revealed that undergraduate chemistry students achieve an acceptable level of knowledge, skills, and perspectives toward chemistry, but they need to learn occupational safety in a chemical research laboratory. That goal achieved by integrating safety knowledge with basic chemistry topics in the educational curriculum. Using safety professionals in the chemistry program of the 21st-century, incorporate basic and professional safety issues, risk assessment, and chemical safety information datasheet into the curriculum were necessary to get the objects [12].

Due to advances in science and technology, and also the growth of potential accidents, reviewing the course syllabuses considered every 5 years and embedment of the occupational safety and health topics in curriculum renewal of each discipline is recommended. The present study showed that the average duration of reviewing the curriculum was 7 years in the MOHME and 8 years in the MSRT. For example, the latest revision of the pharmacy curriculum was conducted in 2016, after 28 years, and was announced to universities for implementation. It means that graduates of this field have not received specific training in applied health and safety subjects at the university during this long period. Such a situation is also seen in some other fields of study. To get a better view of the general and basic knowledge of graduates in different occupational safety and health subjects and the level of education received during their studies, a comprehensive survey of the level of knowledge among the graduates and students of different disciplines is recommended.

CONCLUSION

The results of this study showed that in both ministries, the percentage of disciplines with health and safety courses in their curriculums was very low. However, the status of the MOHME was more favorable than the MSRT in providing health and safety topics. MOHME tends to teach health and safety topics more practically. However, in the MSRT, more theoretical lessons are offered. In most of the courses studied in both ministries, safety and health were taught as part of the curriculum, which had a small portion of the topics. Due to the low share of health and safety topics in Iran's academic disciplines, revising the curricula to incorporate health and safety topics into them and using a new teaching method can enhance the general knowledge of university graduates about occupational safety and health. Accordingly, it improves future workplace safety conditions, the insights of future managers and decision-makers on the importance of safety and health, and protects the lives of individuals and property of the organization. This achievement will ultimately lead to faster human development and health indicators as the most valuable capital of any country.

CONFLICTING INTEREST

The authors declare that they have no competing interest.

Published online: June 30, 2021

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Published online: June 30, 2021