Assessment of occupational health and safety in school buildings: A case study of Arar town

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ABSTRACT

The area of occupational health and safety is of great concern to everybody in education facilities, because of the increasing number of accidents in the schools' area. This study aims to determine the occupational health and safety measures in school facilities in Arar, KSA. A questionnaire survey was developed, consisting of questions that inquire about the occupational health and safety dimensions that measure the main variables. The study targeted population are teachers, students, and administrative persons who are currently working in school facilities in Arar town. A convenient sample of 1500 school facility members identified in a random selection process and the respondents have completed 1372 questionnaires in the early year 2019 through school facility members who represent 91.5% of the total sample and then administered and analyzed by computer software (SPSS). The study concluded that all hardware such as the requirement of civil defense existed in a school facility, but the software such as training and awareness is less cure in the school facility.

1. Introduction

School health and safety concepts are essential in the Saudi vision 2030, and few types of research are addressing the issue of school safety. However, in many Western countries, numerous studies are tackling this issue (Nansel et al., 2001; Pellegrini and Long, 2002; Pepler et al., 2006). Most residents in Saudi Arabia ignored many safety aspects in their residential buildings, so the incidence rate of fire in their buildings is very high, which indicates there are many deficiencies to which several strategies needed for designers, building owners, local authorities and residents (Al-Homoud and Khan, 2004). Many developing countries public schools have numerous accidents and incidents occur because of inadequate safety regulations and management systems, the Saudi Ministry of education is active in providing safety requirements and protection equipment in the design phase. The Saudi Ministry of Education seeks new approaches to measure safety performance to decrease accidents. So in this context, studies were conducted to reveal significant relationships between safety management and leadership, which had a significant effect on safety learning and safety policy, procedures, and processes (Alolah et al., 2014). Saudi Arabia's government views the promotion of a safe and healthy work environment as moral, religious obligations to protect all stakeholders in work-related issues. So, to increase the Saudi workforce efficiency, attention should be paid to the protection and promotion of worker's health and working capability, the working environment and work should be more safe and healthy, the safety workgroups must create, and working traditions to ensure the safety at the workplace should be maintained (Khasawneh, 2014).

Schools in Saudi Arabia in different types and levels were not prepared to deal with earthquakes risks. The ministry of education challenge to take into account for the new school construction, and besides that, it is essential to prepare a public emergency plan for disasters and crises, and train school members to develop contingency plans for disaster management in school as a part of disasters awareness program (Momani and Salmi, 2012). Accidents occurred and caused many kinds of injuries and death among school residents in Saudi Arabia. So, there is a need for creating a culture of safety and realize that injuries prevention and safety promotion are everybody's business (Alsubaie, 2017). In most developing countries, there is a lack of injury records in schools. Moreover, little known

about the civil defense for Saudi schools. Some studies showed that there is a reasonable safety measure available in Saudi schools, and the surveyed schools have a severe lack of car park and bus zone facilities (Bendak, 2007). The objective of this paper is to determine the occupational health and safety measures in school facilities in Arar, KSA.

2. Materials and methods

A thorough review of existing literature was previously carried out to identify the occupational health and safety to measure the gap relative to standard measures between school facilities. To test suitability for use, a questionnaire form designed, administered through school facilities in Arar, KSA. The questionnaire designed to meet the objectives of the study, namely, to determine the occupational health and safety measures in school facilities in Arar, KSA. A questionnaire survey was then developed, consisting of questions that inquire about the occupational health and safety dimensions that measure the main variables. The study targeted population in this paper is teachers, students, and administrative persons who are currently working in school facilities in Arar town. A convenient sample of 1500 school facility members in Arar town identified

in a random selection process, and the respondents have completed1372questionnaires in the early year 2019 through school facility members who represent 91.5% of the total sample and then administered and analyzed by computer software (SPSS).

3. Results and discussions

3.1. General information

3.1.1. School type

Table 1 and Fig. 1 show that about 35.71% of questionnaire respondents are elementary school members, 35.13% are intermediate school members, and 29.16% are secondary school members.

3.1.2. Number of floors in schools

Table 2 and Fig. 2 illustrate that the number of the floor in schools about 0% of questionnaire respondents are one-floor school facility, 73.18% are two floors school facility, 26.82% are three floors school facility, and 0% are more than three school facility.

Table 1: School type

School type	Frequency	%	Cumulative %
Elementary	490	035.71	035.71
Intermediate	482	035.13	070.84
Secondary	400	029.16	100.00
Total	1372	100.00	

	Total	Secondary	Intermediate	Elementary
Respondents	1372	400	482	490
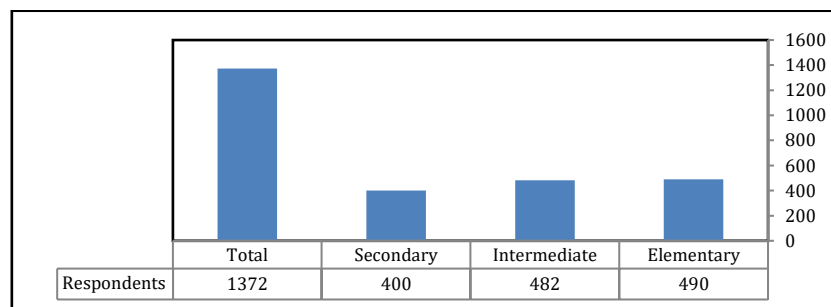
Fig. 1: school type

Table 2: Number of a floor in schools

No. of floors	Frequency	%	Cumulative %
One floor	0	0	0
Two floors	1004	073.18	073.18
Three floors	368	026.82	100.00
More than three floors	0	0	
Total	1372	100.00	

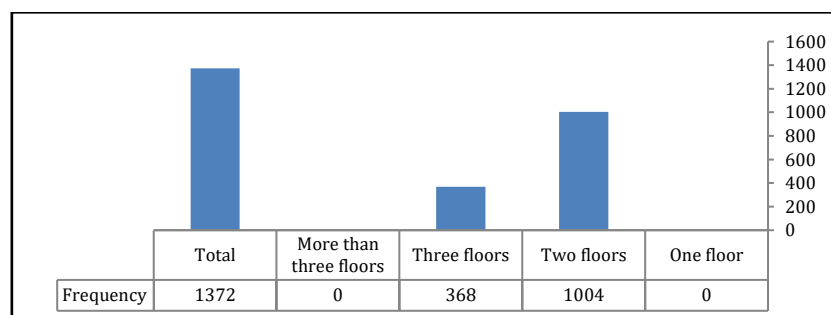|	Total	More than three floors	Three floors	Two floors	One floor
Frequency	1372	0	368	1004	0

Fig. 2: Number of a floor in schools

3.2. Essential information

3.2.1. Structure of the building

Table 3 and Fig. 3 show that the structure of building in schools has a positive answer about 99.1% of questionnaire respondents, which replied that "external walls of the school building is constructed from fixed materials." 80.2% replied that "school building is located at a safe distance from other buildings." 84.5% replied that "school building has an entrance enables the civil defense team and their equipment." 90.1% replied that "doors leading to hallways and stairs are made of non-flammable materials," and 81.3% replied that "school building was divided into fire zones."

Table 3: Structure of the building

Description	Yes		No	
S1	1360	99.1%	012	00.9%
S2	1100	80.2%	272	19.8%
S3	1160	84.5%	212	15.5%
S4	1236	90.1%	136	09.9%
S5	1116	81.3%	256	18.7%

Where S1 is External walls of the school building is constructed from fixed materials; S2 is School building located at a safe distance from other buildings; S3 is School building has an entrance that enables the civil defense team and their equipment; S4 is Doors leading to hallways and stairs are made of non-flammable materials; S5 is School building divided into fire zones.
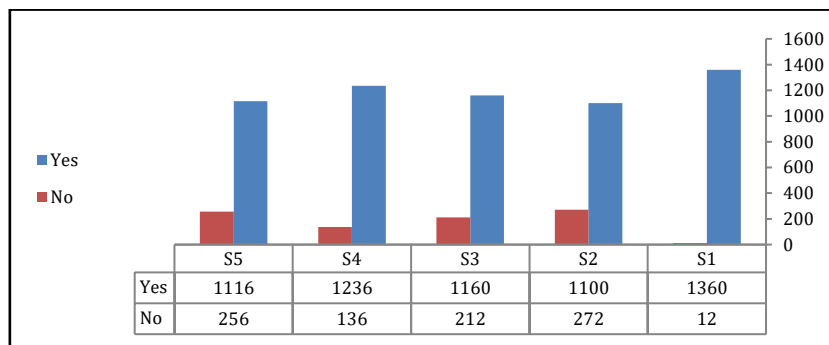

	S5	S4	S3	S2	S1
Yes	1116	1236	1160	1100	1360
No	256	136	212	272	12

Fig. 3: Structure of the building

3.2.2. Electrical fixture and fittings

Table 4 and Fig. 4 explain that the electrical installation and accessories in schools have a positive answer about 95.0% of questionnaire respondents are replied that "wiring used in the school building is well isolated and protected against damage or high current." 79.9% replied that "electrical equipment used in the school building is of good species." 85.1% answered that "main circuit breaker was used in the school building," and 90.4% responded that "electrical subpanels were used in the school building."

Table 4: Electrical fixture and fittings

Description	Yes		No	
E1	1304	95.0%	068	05.0%
E2	1096	79.9%	276	20.1%
E3	1168	85.1%	204	14.9%
E4	1240	90.4%	132	09.6%

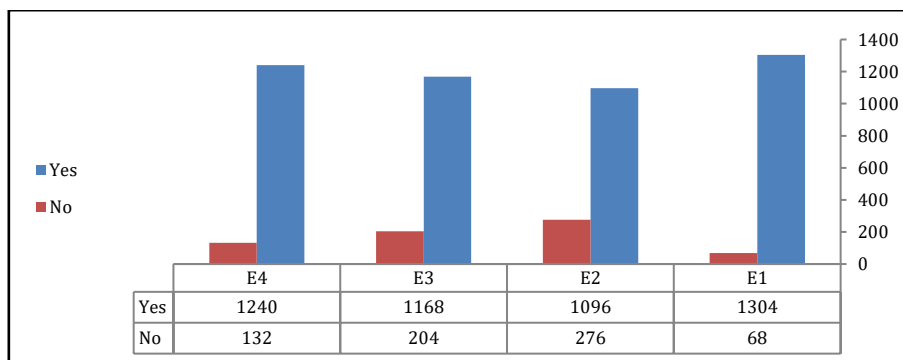|	E4	E3	E2	E1
Yes	1240	1168	1096	1304
No	132	204	276	68

Fig. 4: Electrical fixture and fittings

Where E1 is Wiring used in the school building are well isolated and protected against damage or high current; E2 is Electrical equipment used in the school building are of suitable species; E3 is The main circuit breaker was used in the school building; E4 is Electrical subpanels were used in the school building.

3.2.3. Fire fighting

Table 5 and Fig. 5 show that the structure of building in schools has a definite answer about 70.6% of questionnaire respondents are replied that "natural and mechanical ventilation was used in the school building." 77.3% replied that "fire extinguishers were used in the school building." 60.1% responded that "fire hoses are connected to the firewater source and ready to work in the school building." 50.2% answered that "a guide plate next to each fire hose cabinet existed in the school building." 62.1% replied that "fire pumps were operated automatically in the school building," and 65.0% replied that "external nozzles were installed in school building yards."

Table 5: Fire fighting

Description	Yes		No	
F1	968	70.6%	404	29.4$
F2	1060	77.3%	312	22.7%
F3	824	60.1%	548	39.9%
F4	688	50.2%	684	49.8%
F5	852	62.1%	520	37.9%
F6	892	65.0%	480	35.0%

Where F1 is Natural and mechanical ventilation was used in the school building; F2 is Fire extinguishers used in the school building; F3 is Fire hoses are connected to the firewater source and ready to work in the school building; F4 is A guide plate next to each fire hose cabinet were exist in the school building; F5 is Fire pumps were operated automatically in the school building; F6 is External nozzles were installed in school building yards.
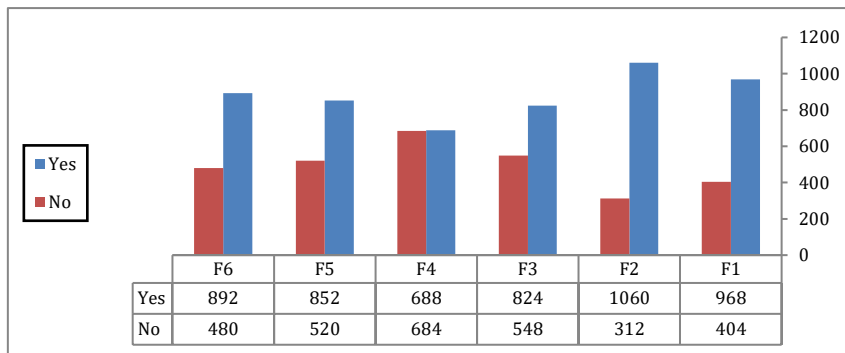

	F6	F5	F4	F3	F2	F1
Yes	892	852	688	824	1060	968
No	480	520	684	548	312	404

Fig. 5: Fire fighting

3.2.4. Road to survival

Table 6 and Fig. 6 show that the way to survival in schools has a positive answer about 74.9% of questionnaire respondents are replied that "there is an emergency exit leads out in each floor in the school building." 48.1% replied that "the way to escape in the school building is free of obstacles or barriers." 81.9% replied that "the escape stairs in the school building are made of non-flammable materials." 56.0% answered that "all exposed surfaces overlooking the escape road in the school building are made of fire-resistant materials." 37.0% responded that "the emergency exits in the school building are equipped with special lighting." 48.1% replied that "guidance plates showing escape routes, emergency exits and safety requirements existed in the school building," and 42.0% replied that "the way to escape is organized and has smooth flow leads directly to emergency exits in the school building."

Table 6: Road to survival

Description	Yes		No	
R1	1028	74.9%	344	25.1%
R2	660	48.1%	712	51.9%
R3	1124	81.9%	248	18.1%
R4	768	56.0%	604	44.0%
R5	508	37.0%	864	63.0%
R6	660	48.1%	712	51.9%
R7	576	42.0%	796	58.0%

Where R1 is There is an emergency exit leads out on each floor in the school building; R2 is The way to escape in the school building is free of obstacles or barriers; R3 is The escape stairs in the school building are made of non-flammable materials; R4 is All exposed surfaces overlooking the escape road in the school building are made of fire-resistant materials; R5 is The emergency exists in the school building and is equipped with special lighting; R6 is Guidance plates showing escape routes, emergency exits, and safety requirements existed in the school building; R7 is The way to escape is organized and has smooth flow lead directly to emergency exits in the school building.
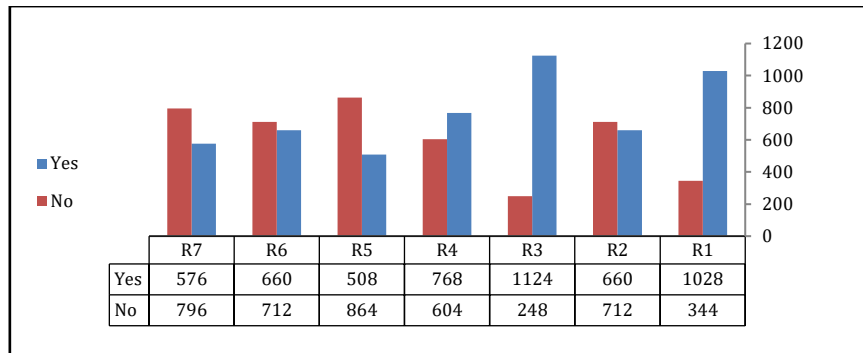

Fig. 6: Road to survival

	R7	R6	R5	R4	R3	R2	R1
Yes	576	660	508	768	1124	660	1028
No	796	712	864	604	248	712	344

3.2.5. Alarm and evacuation

Table 7 and Fig. 7 explain that the road to survival in schools has a positive answer about 74.9% of questionnaire respondents are replied that "school building has an automatic alarm and fire extinguishing systems." 62.1% replied that "there is a well-equipped main warning board in the school building." 22.7% answered that "there is a mock plan for evacuation in the school building." 32.1% responded that "there is a safety manual to ease evacuation in the school building," and 38.2% replied that "there is awareness with occupational safety and health in the school building."

Table 7: Alarm and evacuation

Description	Yes		No	
A1	1028	74.9%	344	25.1%
A2	852	62.1%	520	37.9%
A3	312	22.7%	1060	77.3%
A4	440	32.1%	932	67.9%
A5	524	38.2%	848	61.8%

Where A1 is School building has an automatic alarm and fire extinguishing systems; A2 is There is a well-equipped main warning board in the school building; A3 is There is a mock plan for evacuation in the school building; A4 is There is a safety manual to ease evacuation in the school building; A5 is There is awareness of occupational safety and health in the school building.
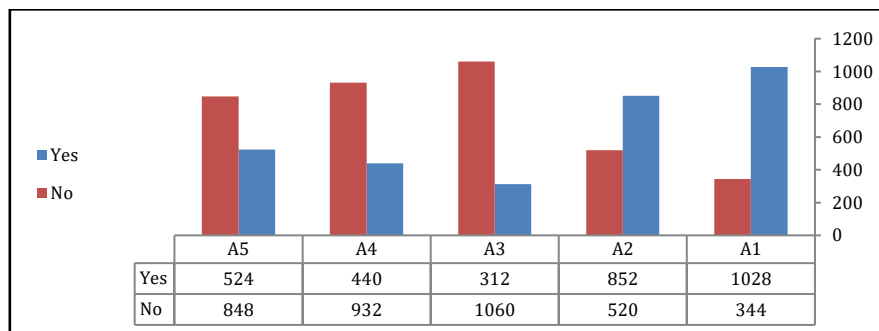

Fig. 7: Alarm and evacuation

	A5	A4	A3	A2	A1
Yes	524	440	312	852	1028
No	848	932	1060	520	344

3.2.6. Hand fire extinguishers and safety

Table 8 and Fig. 8 describe that the road to survival in schools has a positive answer about 98.0% of questionnaire respondents are replied that "there are fire extinguishers set in visible places in the school building." 88.0% replied that "the extinguishers are always fit for use in the school building." 72.0% answered that "school staff and students are trained to use fire extinguishers." 60.1% responded that "there is a first aid pharmacy in the school building," and 57.1% replied that "there are well special need requirements in the school building."

Table 8: Hand fire extinguishers and safety

Description	Yes		No	
H1	1344	98.0%	028	02.0%
H2	1208	88.0%	164	12.0%
H3	988	72.0%	384	28.0%
H4	824	60.1%	548	39.9%
H5	784	57.1%	588	42.9%

Where; H1 is There are fire extinguishers set in visible places in the school building; H2 is The extinguishers are always fit for use in the school building; H3 is School staff and students are trained to use fire extinguishers; H4 is There is a first aid pharmacy in the school building; H5 is There are well special needs required in the school building.

	H5	H4	H3	H2	H1
Yes	784	824	988	1208	1344
No	588	548	384	164	28
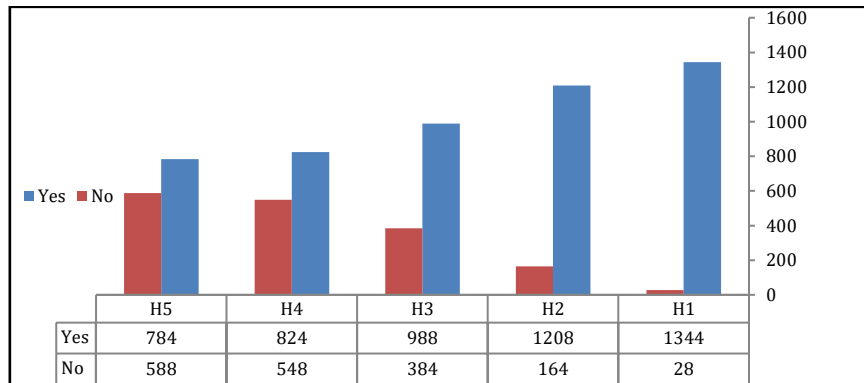
Fig. 8: Hand fire extinguishers and safety

4. Conclusion

This study aims to evaluate the risks that occur in the field of occupational health and safety and practices used for its mitigation and impacts. The study focuses on six areas, structure of school building, electrical fittings, fire fitting systems, the road for survival, alarm, and evacuation, and hand fire extinguishers, and safety. The study concluded that all hardware such as the requirement of civil defense existed in a school facility, but the software such as training and awareness is less cure in the school facility.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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