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The Effectiveness of Kindergarten Buildings in Jordan: Shaping the Future toward Child-Friendly Architecture

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Abstract: From a sociology perspective, schools and kindergartens are society's primary institutions. Hence, safety in schools and especially kindergartens is essential for society. Moreover, due to the increasing number of working mothers in Jordan, the demand for safe and reliable kindergarten design has become extremely important. Child safety from injury, especially within the age group 4 to 6 years, is a crucial issue in architectural design. Moreover, there is a lack of interest in this age group compared to nurseries or primary schools. Therefore, this study aims to conduct a systematic field study to reveal to what extent Kindergartens in Amman city, as a case study, have achieved the fundamental criteria of a safe and child-friendly environment. The case study analytical approach was applied to a random sample of Amman kindergartens to generate an in-depth evaluation of the inner and outer built environment and its features based on the UNICEF evaluation checklist for the child-friendly environment. In addition, a triangulation method (interviews, questionnaires, and field visits) was used to ensure the credibility and reliability of the collected data. Results revealed that kindergartens achieved only 40% of the benchmark criteria for a safe, child-friendly environment. This percentage rings the bell for a real problem that must be considered and brought to the attention of the responsible authorities to find the necessary solutions to create a safe, healthy, child-friendly environment. The research proposed a framework consisting of proposals and practical solutions to the various kindergarten design problems. More large-scale studies are required to evaluate kindergartens in other cities in Jordan to develop national sustainable standards that consider the child's psychological, physical, and intellectual aspects, with the participation of government sectors, universities, experts, and students of architecture colleges.

Keywords: Architecture engineering, Civil engineering, Child-friendly architecture, Sustainable design, Design for safety

Introduction

Every child has the right to a safe environment, protected from injury and violence. Any facility or institution caring for the child is responsible for providing the necessary protection and care, regardless of the difficulty in achieving this task (WHO, 1986). Despite this, around 2,400 children worldwide die from unintentional or intentional injuries (Peden et al., 2008). Injury is a common reason for children to visit the emergency room or be admitted to the hospital. According to the National Safety Council, the National Center for Injury Prevention

and Control, and other sources, injury is the primary cause of death in children and young adults. Moreover, over 40% of deaths among children aged 1 to 14 are caused by injuries (UNICEF, 2001).

Schooling is the one shared experience that most children have around the world, and it is the most common way for societies to educate their children for the future. More than a billion youngsters attend schools or kindergartens on any given day. They share the experience of learning, developing their potential, and enhancing their lives in permanent or temporary facilities. But on the other hand, schooling is not always a joyful experience for children.

The Convention on the Rights of the Child (CRC) emphasizes fundamental human rights principles: the access that allows for learning; the quality that promotes cognitive and affective growth; and the respect that values the individual's language, culture, religion, and point of view (Convention on the rights of the child, 1989). These principles played an essential role in the schools, ensuring a child's overall development and child-friendly environments. As a result, many nations' educators have been looking for ways to implement the CRC in schools. The child-friendly school action (CFS) takes a rights-based education approach and is one of the best initiatives (Clarke et al., 2001).

The United Nations Children's Fund (UNICEF) sought to create an education model aimed at helping schools achieve safe, healthy, and preventative environments that meet the needs of children. UNICEF was the first to employ the concept of child-friendly settings to improve interaction and engagement, but it was later expanded to include educational settings. This idea has been adopted and focused on by many countries. In the last decade, these approaches have been advocated in primary schools, and UNICEF's "Child-Friendly Schools Manual" has been used to transfer child-friendly surroundings to schools (Wright et al., 2009).

Child-friendly Schools

Fulfilling the education goals is not only ensuring that all children attend school. Its comprehensive mission ensures that all schools work in the children's best interests. This entails creating safe and secure schools that are appropriately staffed with trained teachers, supplied with sufficient resources, and blessed with conducive learning environments.

Learning environments should support students' and teachers' physical, psycho-socio, and emotional health. Child-friendly schools (CFS) use a multidimensional approach to quality that considers the whole child's needs as learners. According to UNICEF, the CFS model aims to move schools and education systems closer to quality standards over time (Almazeedi, 2019). In other words, they allow children to attain, at the very least, the knowledge and skills required by the curriculum and assist children in developing their ability to think and reason. Moreover, CFS helps children develop self-respect and respect for others and realize their full potential as individuals, community members, and global citizens (Mohidin et al., 2015).

CFS is a model that encourages schools to work in child-centered environments where children provide context that allows children to learn and develop; respect their identities, interests, and needs. The child-friendly schools manual proposed by UNICEF addressed all factors that affect the child's well-being and rights as a learner REF. Moreover, the CFS manual emphasizes a critical principle of a safe, healthy, and protective environment. According to CRC, children in the school environment should be away from violence, abuse, and injury. This learning setting benefits all children's physical and mental health.

Child-friendly School Manual by UNICEF

As the leading developer of various CFS models, UNICEF took responsibility for presenting a cohesive overview of them, summarizing their key aspects to establish a template that can build national capabilities that design and develop CFS in various countries. This manual introduces the child-friendly idea, its underlying ideology, and the essential concepts that can be used to derive the major characteristics of a child-friendly school in many settings. Moreover, it provides practical guidance on designing, constructing, and managing child-friendly schools as safe, welcoming learning spaces, focusing on community connections, educational concerns, cost-effectiveness, and sustainability (Wright et al., 2009). Table 1 explores how new CFS spaces are planned and designed, considering the location, design, building construction, operation, and maintenance.

Table 1. Basic planning and design standards for school facilities (Wright et al., 2009)

Essential Elements and Criteria for CFS	Characteristics
Structure	The structure must be waterproof following local environmental conditions, climatically comfortable, quickly exited in an emergency, and well-integrated with the surrounding environment and culture.
Administrative Office	Separate space for teaching and administrative workers provides privacy for students and teachers. To monitor students' activities and create safety through transparency,' proximity between classrooms and administrative offices is recommended. Increases classroom space to allow staff to work independently from students.
Safe Water	Within the school, children should have access to fresh, potable water. The provision of safe water is made possible by proper plumbing infrastructure. A borehole/well should be included in the school compound if such a setup does not exist. As needed, this can be supplemented by a roof-mounted rainwater collection system.
Hygiene Facilities	For youngsters to wash their hands, a separate area with water, soap, or another cleaning agent should be provided.
Toilets	For girls and boys, separate toilets should be available. Regarding facility location and design, privacy, cleanliness, and safety are essential factors. Separate bathrooms for boys and girls within or near the classrooms are the most practical and safest arrangement for students. However, to protect younger children, these facilities can be constructed and placed so they are shared among clusters of classrooms.
Environmental Conditions: Light, air, sun, dust, glare, reflection, humidity, noise, and odor	Classrooms require sufficient fresh-air circulation To minimize heat and excessive humidity. A minimum of 20% of the classroom floor's area should be a window area to ensure adequate daylight. Electricity is required to give light and run the equipment. Direct sunshine, glare, and reflection must be adequately shaded in classrooms (indirect light). Schools should not be built near sources of excessive noise (traffic, railways, industry, or informal sector activities), pollution, or odors (waste belts, abattoirs). If this isn't possible, design treatments to reduce the impact of these issues should be used.
Color	Warm natural hues (reds, oranges, maroons, ochres, and linen/khaki/off-white) guided by local cultural tastes should be selected in harmony with the light, natural colors of the building materials. Materials like transparent varnish can be applied to maintain the material's natural beauty and warmth. Play corners, decks, corridors, and furniture can benefit from brighter colors. Learning environments should be light and airy, not gloomy, dull, or dark.
Power and Electric	A power supply should be available at the school to provide illumination and connectivity for communication equipment (computers, radios, and televisions) and other appliances (refrigerators, stoves). Alternative energy sources (solar, wind, and biogas) can be integrated into school design.
Safety Provisions	The design process and the school curriculum must include fire fighting and emergency evacuation plans. Flammable materials should not be used for construction unless treated to resist fire. Construction materials should be free of dangerous components or elements. All fluid, solid, and gaseous wastes should be removed from school sites once construction is completed. Industrial or other hazards should not be near schools.
Health Provisions	Schools should provide a first-aid kit or medicine cabinet for basic emergencies or accidents. Schools should be close to a clinic, so health personnel can visit the school regularly, and children can be taken to the clinic to treat health problems. Many developing countries achieve this proximity by clustering the primary social services in the exact location.
Library	Learning and teaching activities require a particular space where books and learning resources may be found in a comfortable reading environment. The library or resource room should be strategically positioned within the school to allow for convenient access while remaining quiet.
Landscaping	School grounds create an integrated, comprehensive unity between school buildings and their users. Trees are necessary for the filtration of sunlight, dust, and noise and for beautifying the school. Indigenous trees, shrubs, flowers, and edible plants

	should be planted on the school grounds to teach children about food production and sustainability. The learning environment and its users are also softened and calmed by trees. Planning the landscaping for the school is an excellent method to involve children in creating a child-friendly environment.
Flexible Spaces	Flexible spaces provoke student participation in class and enable teachers to create a more dynamic learning and teaching environment. Group activities, rooms for manual work, and easy access to open spaces are all available in such spaces. All students should be able to access their classrooms; ramps and broad doorways should be provided for less-mobile children.
Relaxation Rooms	Rooms -where children can relax- are ideal in the design of child-friendly schools at the nursery and kindergarten levels. In general, homelike aspects near learning places create a welcoming, friendly environment for this age group.
Individual Spaces	Individual-learning spaces should be offered in addition to flexible learning spaces for large and small groups (project-based learning/teamwork) because children have different learning styles, and some will need room to study or reflect on their own.
Open Spaces	Easy access to open spaces from classrooms grants direct contact for children with their environment and allows them to participate in physical activities. Sports fields, school gardens and orchards, decks or verandas for outdoor learning activities, open performance spaces, broad corridors and courtyards, trellises, canopies, shaded pavilions, nooks, alcoves, play lofts, and enclosed backyards are all examples of open spaces. After school, the community may use these spaces for neighborhood gatherings and other events.
Kitchen	Food should be kept fresh and away from flies and other pests that degrade food quality in school lunch preparation spaces, which should be constructed and furnished with appropriate equipment and furniture.
Clinic	Having the school near a clinic and health services helps children with general health services and allows for treating children who require constant monitoring of their health issues. This would establish a link between school, community, and family, all of which revolve around the child's well-being.
Protective	There are two critical aspects to the protective feature of child-friendly school design: -Teachers and parents must be trained in nonviolent, child-based disciplining tactics and interventions to combat bullying and abuse. Child abuse can be prevented by designing schools and other spaces to make actions visible from the outside. -The enclosure and limits of schools can vary in form and function depending on location and environment. The idea is to strike a balance where a fence can protect a child from outside factors (such as traffic and animals), set boundaries to keep students within the school, and separate an area for gardening and orchards.

Children should have the chance to get a beautiful, challenging, and interactive built environment from their early childhood (kindergarten) that helps them shape their sense of aesthetics and play as the bedrock for their knowledge and personalities. Moreover, an unrestricted environment consolidates a creative and innovative approach that establishes an evoking and renewable future vision. Therefore, CFS must balance the child's need for challenge exploration and safety. This research concentrates on the critical built-environment features highlighted in the CFS manual and related to child physical safety.

Early Childhood- Kindergarten Settings

Childhood is a distinct physical, mental, and cognitive stage that ranges from one and a half to sixteen years (Dudek, 2005). Dudek defined kindergarten (early childhood between the ages of four and six) as the children's garden, in which the child blooms and grows like a plant. From a sociological perspective, schools from early childhood (kindergartens) are the fundamental institution for society ((Parsons, 1966). Therefore, kindergarten is one of the most critical stages in forming a child's personality and education; it deals with the most critical years of a human's life that affect his mental, psychological, and emotional development (Anbari & Soltanzadeh, 2015).

At the age of four, a child is full of energy, talkative and curious, asks many questions, and desires to test his environment and explore his surroundings (Anbari & Soltanzadeh, 2015). In his theory of cognitive development, Piaget called this stage the pre-operational stage, where the child builds and develops his

knowledge through experience and exploring his surrounding environment (Piaget, 2013). Kindergartens are available worldwide, providing preschoolers with early education and care (Watson & White, 2001). However, with the significant increase in working mothers in the workforce, the demand for kindergarten childcare has increased significantly over the past few years (Chen, 2013). Children in kindergarten spend 2.5 hours on average in Finland. In comparison, it rises to 4 hours per day in Germany (Kong & Kumpulainen, 2018), while in Jordan, it ranges from 5 to 7 hours per day (in the case of the waiting system after official working hours). Therefore, the demand for safe and reliable kindergarten schools has become extremely important.

Based on the above facts, the child-safe environment in kindergarten is an important topic that needs exploration and research, noting that injuries and accidents in kindergartens are not given attention, and data for these injuries are not recorded so far. Only severe injuries among children were reported in the media or social media, including deaths. Thus, the importance of this research comes with the increasing concerns about the safety of children and injury prevention, especially in the age group 4 to 6 years, and with the lack of interest in this age group compared to nurseries or primary schools.

The main objective was to conduct a systematic field study to reveal to what extent Kindergartens in Amman, as a case study from Jordan, achieved the factors related to a safe and child-friendly environment according to the CFS manual by UNICEF. This would help improve the environment's physical safety and highlight the need for innovative technological and sustainable solutions within indoor and outdoor kindergartens' built environments.
To provide a child-friendly environment in kindergartens, Leinonen and Vetiand emphasized that four main factors must be considered in the design: comfort, movement, efficiency, and control (Leinonen & Venninen, 2012). Furthermore, to achieve comfort, great attention was paid to the appropriate scale for the child, such as the dimensions of the classroom and classroom furniture, the ceiling height, the floor height, and the texture of the finishing materials. The movement also represents one of the leading design requirements in kindergarten and is the cornerstone of every intellectual child's development as he learns life experiences through play (Anbari & Soltanzadeh, 2015). Therefore, the architectural elements in the interior spaces, such as educational classrooms, and the outdoor spaces, such as playgrounds, must provide a child-friendly environment that allows them to move freely and safely without being subjected to physical injuries.

Stating the Problem

Currently, very few studies evaluate safety practices related to the built environment in kindergartens. For example, Davison revealed that 85% of school injuries occurred during rest and physical education, accounting for about a third of school time (Davison & Lawson, 2006). While in Germany, 47% of school injuries were related to sports, 30% to playtime, and 17% to classroom lessons for all school-age children (Scherer et al., 2006). In addition, other research has shown that injuries among children in childcare settings are increasing exponentially over time (Canadian Pediatric Society, 2009). Consequently, this problem has become a growing concern due to the increasing injury rates among children. Furthermore, despite a QIS checklist designed for kindergartens to help assess safety standards and children's well-being, many kindergartens are often reluctant to assess themselves, making the implementation of this checklist ineffective as it should be (Chiam, 2008).

Therefore, as a case study, this research aimed to explore and evaluate the physical risk factors and causes of injuries related to Amman's kindergartens' built environment structure, considering various indoor and outdoor elements. The reference point was the CFS manual which reported all the risk factors children might be exposed to at school and recommended several interventions to prevent these risks.

Methods

By analyzing the physical environment of kindergartens and linking them to cases of minor to severe injuries among children, we can understand and identify the elements that affect safety and safety in kindergartens. Thus, effective strategies can be developed to provide a safer environment, prevent future injuries, and eliminate physical environmental hazards. According to the Ministry of Education, there are 848 kindergartens in Amman, the capital of Jordan, distributed over seven different directorates. The Directorate of Education for the University Brigade was chosen to be the study population. Fifty kindergarten quota sample was selected with proportions related to the distribution of kindergartens among the University Brigade, excluding ten kindergartens who refrained from participating. That made the study sample more representative since the University's Directorate's economic and social factors are uneven.

Table 1. Evaluation questionnaire for testing child-friendly criteria at kindergartens

Pivots	Essential Criteria for CFS	Questions	1	2	3	4	5
Structural and Environmental Features	Structure	Paved roads to facilitate access to the kindergarten.					
		The building's proximity to an inhabited neighborhood					
		The kindergarten site is far away from the main streets.					
	Environmental Conditions: Light, air, sun, dust, glare, reflection, humidity, noise, and odor	Humidity and damp wall treatment in classrooms					
		The convenient temperature inside the building					
		The kindergarten building is exposed to sunlight and air.					
		The kindergarten site is far away from pollution sources.					
	Power and Electric	Kindergarten is provided with alternative power supplies					
		Electricity sockets are located far from children's reachability					
Design and Functional Features	Toilets	There are separate toilets for boys and girls					
	Flexible Spaces	Kindergartens are designed to consider less-mobile children					
		Different spaces in the kindergarten supported various activities for children					
	Relaxation Rooms	There is a relaxing room for children					
	Individual Spaces	There is an individual space for special needs children to learn and reflect					
	Kitchen	There is a kitchen and its appliances					
	Anthropometrics and Ergonomics	classroom seating is suitable and comfortable for children					
		Toilet seats of the bathroom suitable for children					
	Entrances	The distance between the main entrance of the kindergarten and the street shouldn't be less than 3 meters					
Open Spaces and Landscape features	Landscaping	Trees and plant allergies are considered in kindergarten					
	Open Spaces	Playground sharp edges are treated against injuries The swimming pool's edges and floor are treated against slippery accidents					
Health and Safety features	Safe Water and Hygiene Facilities	Fresh potable water is available for children					
	Clinic	There is a clinic and first aid kit					
		Ease of entering the building in case of emergency					
	Safety Provisions	Fire alarms and extinguishers are located in a conspicuous place					
		Emergency exits are located in clear and appropriate places					
		Children are trained for emergency evacuations					
		Treatment of doors against injury in case of a sudden close					
		Evacuation plans are hanging in clear and visible places					
		Corners and sharp edges are treated against injuries					
		There are surveillance cameras					

		The main entrance opens to the outside					
		Outdoor playground furniture is safe for children					
	Protective	Kindergarten is designed in a way that can watch classrooms					
		Kindergarten has a fence (at least 1.5 meters) and architectural features to protect children from streets hazards					

The research relies on qualitative and quantitative methodology by collecting measurable and nonmeasurable data that help draw results and conclusions. For credibility and objectivity issues, the triangulation method was used for data collection during all stages of the research. Data collection tools were interviews (56 teachers and 25 principals), direct observation with documentary evidence and checklists, and online questionnaires targeting parents of children in the chosen kindergartens. The questionnaire was designed based on the data collected from principals' and teachers' interviews and the observation results (Table 2). One hundred fifty online questionnaires were collected, while Fifty questionnaires were excluded because they were filled by patients whose children are attending kindergarten outside the chosen directorate. The research developed an evaluation tool based on the CFS manual to evaluate the kindergartens' physical environments. Table 2 elucidates the research evaluation tool built on a 5-points Likert scale providing five alternative responses (1= Very Poor, 2= Poor, 3= Fair, 4= Good, 5= Excellent), allowing parents to indicate the level of quality for the evaluated criteria.

Results and Findings

The questionnaire was the primary measurement tool used for data collection. It was designed to evaluate the safety and the effectiveness of kindergartens' built environment based on the CFS manual through field visits and online google forms. It consisted of five main pivots: Structural and Environmental Features, Design and Functional Features, Open Spaces and Landscape features, and Health and Safety features. In addition, SPSS was used to process and analyze the frequency and correlation ratios. Following are the results found from all data collection methods:

Online Questionnaire Findings

Figure 1 represents the questionnaire results from various study areas affiliated with the University Directorate at Amman. Results showed that the correlation between economic-social levels and the score of CFS criteria is (r=.89), indicating a solid positive correlation.

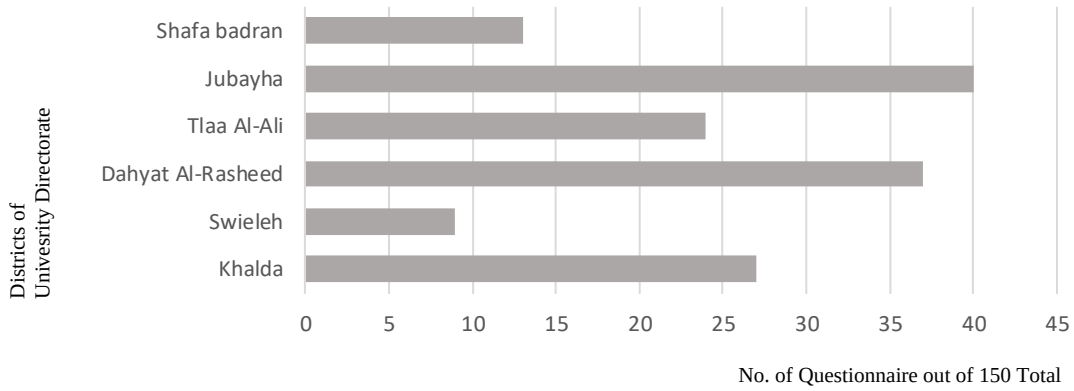

Figure 1 The number of questionnaires answered distributed over various study areas

Results related to anthropometrics and ergonomics showed that furniture inside classrooms, bathrooms, and courtyards took child dimensions into high consideration. 65.3% of participants evaluated this factor as an excellent treatment. However, this consideration disappeared regarding the protection from reaching electrical sockets; on average, 66% consider it poor treatment; this causes a high probability of danger (Table 3).

Table 3. The most critical causes of danger resulting from the built environment of kindergartens

		Very Poor	Poor	Fair	good	Excellent	Total
Q26: Treatment of doors against injury in case of a sudden close	Frequency	62	49	15	14	10	150.0
	Percentage	41.33	32.67	10.00	9.33	6.67	100%
	Mean	*2.07*					
Q19: Swimming Pool tools for emergencies	Frequency	5	8	12	55	17	97
	Percentage	5.15	8.25	12.37	56.70	17.53	100%
	Mean	*3.73*					
Q15: Furniture and toilets furniture suits children's scale	frequency	5	9	18	20	98	150
	percentage	3.3	6	12	13.3	65.3	100%
	Mean	*4.3*					
Q8: Electricity sockets are located far from children's reachability	Frequency	43	57	22	11	17	150
	Percentage	28.67	38.00	14.67	7.33	11.33	100%
	Mean	2.3					
Q20: The swimming pool's edges and floor are treated against slippery accidents	frequency	11	13	24	33	16	97
	percentage	11.34	13.40	24.74	34.02	16.49	100%
	Mean	*3.4*					
Kindergartens are designed to consider less-mobile children	frequency	64	34	30	13	9	150
	percentage	42.67	22.67	20	8.67	6	100%
	Mean	*2.1*					
Kindergarten is provided with alternative power supplies	frequency	73	42	15	11	9	150
	percentage	48.67	28.00	10.00	7.33	6.00	100%
	Mean	*1.94*					
Emergency exits are located in clear and appropriate places	Frequency	62	38	22	15	13	150
	Percentage	41.33	25.33	14.67	10.00	8.67	100%
	Mean	*2.2*					
Playground sharp edges are treated against injuries.	Frequency	69	51	15	8	7	150
	Percentage	46.00	34.00	10.00	5.33	4.67	100%
	Mean	*1.88*					

The results in the outdoor playing area showed an apparent deficiency in the safety treatments; the percentage of suitable treatments of exterior features against risk and hazard was 5.33% (Table 3). The answers differed about the cause of harm caused by playing in these yards to address the most critical causes of severe injuries in the outdoor yards and playing areas, which included: falling from games, falling from stairs, sharp edges in the gaming hall, wounds and fractures from falling on asphalt yards, in addition to stinging Insects in sandy yards. In addition, the results showed that allergies to trees and plants affect, to varying degrees, the health and safety of the child in kindergarten.

Table 4. The most critical causes of danger resulting from the built environment of kindergartens

Questions about availability	No	Yes	Remarks
Are the doors handled in a way that prevents children's hands from getting hurt in case of sudden closing?	%80	%20	High Danger
Have dangerous sharp corners in the indoor environment and classrooms been treated?	%65	%35	High Danger
Are there surveillance cameras?	%35	%65	Moderate Danger
Are fire exits clear?	%67	%33	High Danger
Are fire exits located in a suitable place?	71%	29%	High Danger
Are there fire extinguishers in sufficient number and a clear place?	%45	%55	High Danger
Are children trained to evacuate buildings?	%58	52%	Moderate Danger

The last part of the questionnaire aimed to study the state of kindergartens' outdoor and indoor environments and the extent to which they fulfill the essential principles and conditions of safe and child-friendly environments. In addition, it explored the essential emergency standards and treatments for a safe-physical environment at kindergartens. Table 4 shows the most important results related to this part of the questionnaire:

Field Visits and Direct Observations Findings

Observation is used in the social sciences to collect data about people, processes, and situations. It is the systematic description of events and behaviors in a social environment. (Fry et al., 2009). In this research, direct observation was made by visiting the selected kindergartens. In addition, information was collected through interviews, observation, blogging, and photos. The concentration was on the built environment features and their effect on child physical safety. Figure 2 depicts some of the poor features of the kindergartens' observations. The total score for all of the visited kindergartens was 2.06, which indicates a bad situation and rings the bell to the kindergartens' conditions related to safe environments and child-friendly schools criteria and the required criteria.

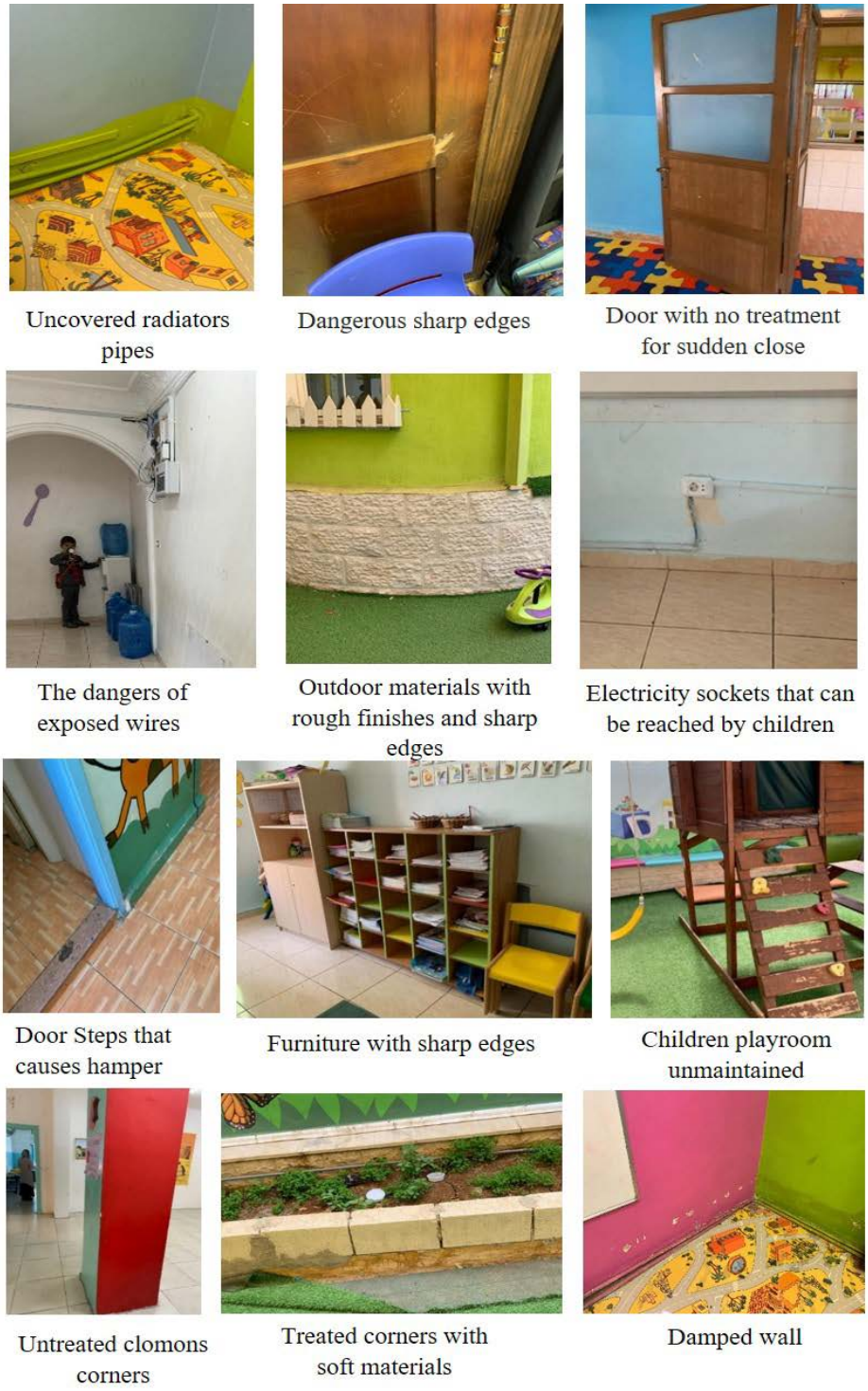

Figure 2. Features that do not Match CFS Criteria

Interviews Findings

During the field visits, interviews were conducted with twenty-five principals, 54 teachers, and some parents. The interviews show that the level of safety and security of kindergartens in Amman is "acceptable" in general. Still, some of the studied pivots lack the minimum requirements for security and child-safety features. The interview questions were developed based on previous studies and the UNICEF manual of the CFS. Data collected from the interview participants are summarized into four main aspects: sharp edges, outdoor and landscape furniture, emergency exits and evacuation plans, and obstacles of high-cost treatments that prevent injuries and accidents. A summary of these results is presented in Table 5.

Table 5 Interviews and direct observation findings and results

		Observations
Interviews and Direct Observation Finding and Results	Sharp Edges Risk	- Sharp edges are located at step doors, corridors, windows, furniture, and the playing area
		- Heating pipes are uncovered most of the time
		- Trees, playground floor finishing, landscape furniture, and plants container are poorly treated to avoid falls and accident injuries
		- Heating must be covered to ensure the safety of children.
		- Doors pose a danger to children if they are closed incorrectly
	Emergency Exits and Evacuation Plans	- Fire extinguishers and alarm devices are available most of the time
		- The location of fire exits is in the kitchen most of the time
		- There was no concern about the dimensions and Specifications of emergency doors
		- No fire evacuation plans were hanging in viewable places
		- Children training for evacuation is rarely conducted
	Outdoor and Landscape Furniture Risk	- Trees stems are covered with poor materials that need high maintenance (most of the time torn and ruined)
		- Playground floors are unsuitable for children (asphalt, broken tiles, slippery)
		- The playing field is not shaded.
		- Insects and reptiles in the sandy playground (In the summer, children are often exposed to the danger of pinching by poisonous insects)
		- Trees and plants that cause allergies are not taken into consideration
	Financial obstacles	- Financial constraints hinder the desire of some schools to provide safe buildings that consider children's safety.
		- Design solutions for risk considered expensive and hard to achieve

Analysis and Discussion

The previous results showed an apparent defect in understanding the child-friendly environment in most kindergartens in the chosen area. In addition, many features of the built environment appeared to be related to danger and put children at risk of injuries. Through inductive observation, there was an attempt to explain results and search for causes that turn kindergartens into risky built environments. Following is a summary of the current situations assessment and kindergartens evaluation according to the designed tool used by this research:

1. The external environment analysis showed an apparent deficiency in the treatments related to the safety of the yards and the games they contain. The percentage of the number of unsafe kindergartens was 80% of the total sample studied.
2. The analysis of the results related to the internal environment of the kindergarten showed shortcomings in the treatments related to the general safety of the classrooms according to the furniture and equipment they contain.
3. UNICEF emphasized in its manual the importance of choosing a site far from noise, pollution, main streets, and industrial areas. In comparison, the results showed that approximately 56.3% of the kindergartens did not adhere to this item and did not take into account healthy and safe sites.
4. It was noted that 68.7% of the study sample had an entrance that was not higher than the outside street level. And based on climatic changes, especially after the increase in rainfall rates in recent years in Jordan, attention should be paid to raising the level of kindergartens on the street to avoid the damage caused by the flow of rain.
5. UNICEF emphasized that Child-Friendly Schools should use trellises and trees to create shaded places to protect children from the sun's direct rays. The results showed that designed shaded areas at outdoor yards were 31.3%. At the same time, only 12.5% of kindergartens used trees for shading. It is a poor percentage and shows

an imbalance concerning the essential environmental treatments related to sunlight. Note that the trees' quality and the possibility of causing allergic reactions for children were not considered.
6. 19% of kindergartens did not consider ease of movement and freedom of movement, which is especially necessary when children scramble inside the kindergarten building. Moreover, there were many obstructing objects and furniture in the corridors.
7. Floor treatment to reduce the possibility of life-threatening head injuries is one of the most critical items to consider, whether in indoor or outdoor yards (Martinsen, 2015). However, it was noticed that the internal floors were only concerned with using rubber or foam for kindergarten floors, while the playgrounds lacked appropriate treatments. Furthermore, the percentage of asphalt coverage was 59% of the kindergartens, which is a high percentage that shows the risk of potential injuries. In comparison, only 18% of kindergartens used sand for outdoor yards.
8. Regarding outdoor toys, 10% of iron toys and 18% of mixed toys (iron and plastic) were used. This poses a clear danger to children because iron toys contain dangerous sharp corners, and iron may cause burns due to its high temperature and friction with the child's skin while playing.
9. The kindergartens contained 75% of the furniture with untreated sharp corners, which constituted an essential cause of wounds and injuries ranging from simple to severe.
10. 43.7% of the kindergartens studied suffer from moisture problems, and the presence of the child for nearly six hours a day in such environments leads to many diseases, the most important of which are various respiratory diseases.
11. 43.7% of the kindergartens studied suffer from moisture problems, and the presence of the child for nearly six hours a day in such environments leads to many diseases, the most important of which are various respiratory diseases.
12. 75% of the kindergartens did not treat the sharp corners of the columns, which posed a real danger to the child.
13. 68.8% of kindergartens had games with sharp angles and designs that posed a danger to the child while playing or jogging in the outdoor yards.
14. One of the most critical factors in child-friendly schools is the presence of ramps for people with special needs. The field visits showed that 97.3% of kindergartens do not have these ramps.
15. Emergency doors that do not open to the outside according to security and public safety requirements represented 68% of the kindergarten study sample.
16. It was noted that 56.7% of electrical sockets are within reach of children, and we can attribute this to the fact that most of the kindergartens that were visited were houses or villas that were reused as kindergartens; This situation makes kindergartens unsuitable in terms of function and environment for the child.
17. The physical aspects were sometimes an obstacle to the periodic maintenance of some treatments for the physical environment.
These solutions are considered impractical due to the need for permanent and expensive maintenance that prevents some kindergartens from achieving them.

Conclusions and Recommendations

Schools in Jordan have achieved some child-friendly school standards by 32%. This percentage was extracted from the various results and observations during the study. Therefore, it enables us to predict a real problem that must be considered and highlighted before the responsible authorities to find the necessary solutions to create a safe, healthy, and child-friendly environment.

Kindergartens should have a good quality environment to enhance children's self-confidence and create safe and free exploration spaces. However, the economic aspects hindered this in terms of the difficulty financing or sustaining maintenance of the physical environment. In addition, the prevailing idea of converting any house or apartment into a kindergarten, ignoring the special requirements and needs of such an environment, increased the risk and the rate of injuries. Figure 3 shows some of the research's suggestions to find solutions for a child-friendly environment as economical and inexpensively as possible. Through the analysis and discussion of the results, it was possible to reach proposals and practical solutions to the problems of kindergartens and the natural and built environment to create an appropriate child-friendly environment per international standards and requirements. Figure 3 shows some of these subjected solutions. As a healthy, civilized society, we must recognize the importance of preventing or mitigating danger in its many forms in childhood. In light of the results of this study, it was found that although kindergartens in Jordan are concerned with the child's safety, there are still some matters that are not concerned attention despite their importance and danger to the child's life or health. This research has tried to highlight the risks children are exposed to that result from indoor and outdoor environments at kindergarten, shedding light on conducting studies of broader scope that include other

areas of Amman and extend to all parts of the Hashemite Kingdom of Jordan. These studies must consider the child's psychological, physical, and intellectual aspects. We could benefit from these studies in developing special codes for kindergartens that take care of safety and public safety to create a child-friendly environment and find solutions to risks with intense cooperation between different authorities and official and private departments.

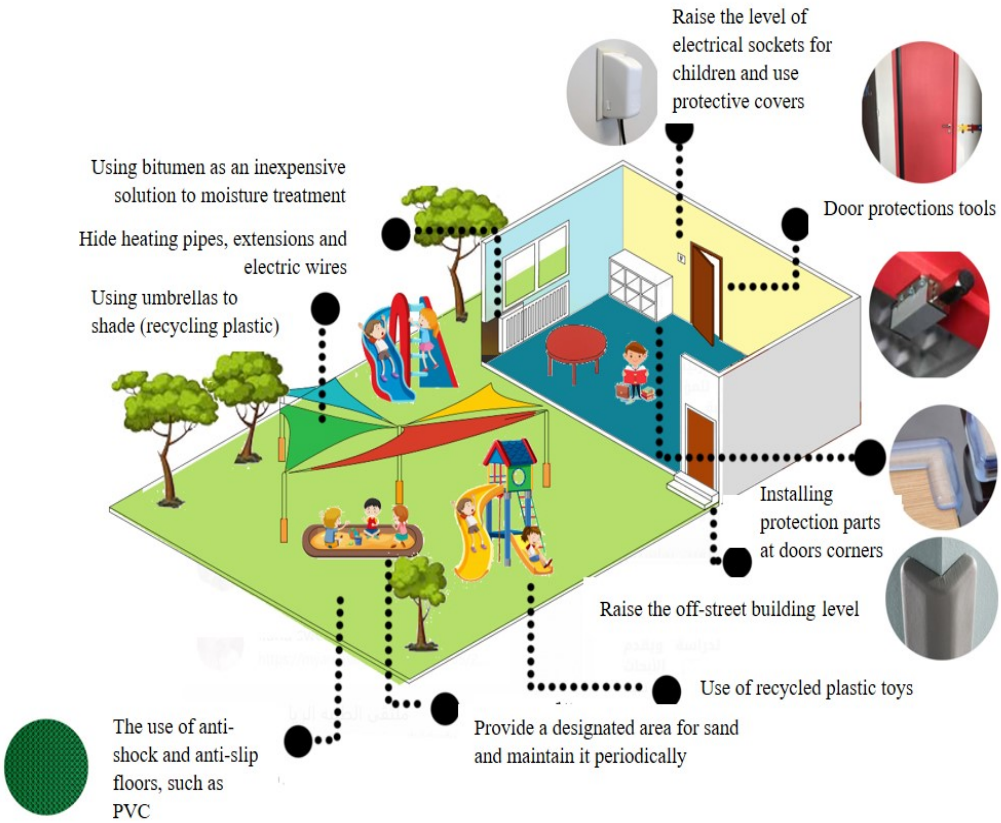

Figure 2 Economic and technological solutions to some kindergartens design shortening

There is a high need to encourage cooperation between kindergartens and the industrial sectors in the country (paper and plastic recycling companies). For example, water bottles, plastic bags, damaged plastic toys, and paper from children's waste could be collected and recycled to obtain indoor furniture such as chairs, tables, and shelves, and outdoor furniture such as outdoor toys (Figure 4). These products are low-cost, environmentally friendly in terms of their components, and child-friendly in their final finishes. The researchers also recommend expanding the circle of interest in the subject by stimulating interdisciplinary studies and research within different university disciplines to create child-friendly design and environmental solutions. Comprehensive and continuous training programs and seminars must be increased in the field of awareness of the risks that affect the safety and security of the child, that wealth The future that we are investing in since childhood for a prosperous pioneering future in all areas of life

Figure 3. The HDPE plastic is cleaned, processed, and molded into 100% recycled toys.

Believing in the Jordanian Ministry of Education in the significant role that early childhood plays, which is reflected in the family and society, it has established and equipped many kindergartens in government schools. To ensure the quality of services provided to this category, whether governmental or private, the Ministry, in cooperation with the National Council for Family Affairs, developed a proposed document, "Standards for Kindergarten Accreditation" (National Council for Family Affairs, 2016). However, after an extensive study of the criteria related to the built environment, the research found that they need more detail in some items and greater clarification, in addition to some modifications in dimensions and design ideas. This is to ensure that the best is achieved in the kindergarten environment and to formulate the future of child-friendly architecture with standards, standards, and codes that serve the nurturing environment for our children in whom we invest in building a better tomorrow.

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