

# A comparative study of the environmental health and safety of urban and rural schools of Abadan and their compliance with national standards

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## ABSTRACT

Students' academic achievement as the community capital depends on the appropriate educational, physical, and psychological environment. Since students spend 20% of their time at school, and due to their high vulnerability to health problems and their value for the family, attention and promotion of their educational environment health is essential. A descriptive cross-sectional study was conducted to evaluate the environmental health and safety of 192 urban and rural schools in Abadan using a checklist prepared according to the Ministry of Health Regulations. The collected data were analyzed using Excel. The results showed that 100% of urban and rural schools have access to safe drinking water. In 98.6% of urban schools and 93.75% of rural schools, the standards for water drinking were followed. The minimum required area per student was met in 100% of urban and rural schools. Per capita green space was observed in 100% and 12.5% of urban and rural schools, respectively. In 95.5% of urban schools and 79.2% of rural schools, the standards for the number of hand washing stations was followed. The standard number of toilets was followed for 76.4% of urban schools and 77% of rural schools. In 100% of urban schools and 77% of rural schools, waste disposal was based on the sanitary standard. A total of 73.4% of urban schools and 45% of rural schools adhered to Article 13 of the Food, Cosmetics and Health Act. With regard to the effect of school buildings on education and academic achievement of students, it is necessary to address the environmental health deficiencies of schools.

**Keywords:** School health, Environment, Building condition, National Standards, Abadan

## Introduction

Around 18% of the world's population is made up of children of school age.<sup>1</sup> As the most important organized social institution and its importance in influencing family and community, schools are at the center of policymakers' attention. By addressing the health status of students, it not only improves

the health status of the community, but also reduces the financial burden of chronic diseases and their spread.<sup>2</sup> Schools as the second home of children are important in terms of cognitive processes and the creativity and social development of children, so it is expected that the best possible conditions for the growth of students' talent will be provided.<sup>3</sup> Students' status regarding planning for the prevention of health problems at the community level is very important, due to the high importance of their health problems and their value in the family.<sup>2</sup>

In international standards, a healthy environment of schools is accomplished with such factors as having clean air, use of relaxing

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colors in the educational environment, absence of sound pollution, the presence of appropriate lighting in the classroom, existence of a ventilation system and a comfortable temperature setting.<sup>4</sup> Also, factors such as the cleanliness, area, and location of the school affect the learning and behavior of children.<sup>5</sup> The negative physiological effects of the environment on children have been confirmed in crowded, noisy environments, with inappropriate ambient light and a lack of green space. Seat position, class design, school privacy, and the presence or absence of windows affect the behavior, attitude, and success of children. In examining the role of the school as a factor in the relationship between the facilities and the student's scores, experimental evidence has confirmed the effect of the quality, conditions, and facilities of school buildings on the educational and students' success.<sup>6</sup> Research has shown that there is a direct relationship between the characteristics of the physical environment of schools and students' behavioral problems.<sup>7</sup> The environmental health of schools includes all activities that affect student health, prevent transmission of diseases, and promote school health, in such a way that we considered all physical, psychological and social needs of students.<sup>2,7,8</sup>

In the absence of environmental health, students are often infected with parasitic, infectious, and diarrheal diseases.<sup>9</sup> Increasing school absenteeism in developing countries due to inadequate health facilities and a reduction in diarrhea and gastroenteritis in schools with increasing health services have been reported. As a result, high rates of infectious diseases and mental illness are recorded in schools in developing and developed countries where children are in contact with inadequate sanitation facilities and unhealthy water.<sup>10</sup> The poor safety state of the schools is related to injury, discomfort, musculoskeletal discomfort, and fatigue.<sup>9</sup> Many accidents leading to bone fractures in schools can be prevented through a change in environmental conditions.<sup>7</sup>

Inadequate per capita learning space, school proximity to unhealthy and unsafe places, old buildings and unhealthy conditions of toilets and water drinking spaces, unsafe and unhealthy conditions in the classroom and

school grounds, the possibility of electric shock and fire, inadequate assistance facilities, and inappropriateness of boards, desks, and benches are among the most important factors in reducing the level of environmental health, safety, and ergonomics in schools.<sup>9</sup>

The lack of coverage of the school yard and soil contamination directly expose students to pathogenic organisms in the soil, such as all types of fungi, tetanus, and infectious earthworms.<sup>11</sup> These cases tend to have an effect on the efficiency of educational efforts.<sup>7</sup> Schools can influence the physical environment and nutritional patterns of children because students can access food from the school's cafeteria, and their sport activities vary according to the availability of varying degrees of facilities. Therefore, schools can apply policies and strategies for proper implementation of food or snacks served or the sports facilities available to children because they affect the sports and nutrition activities of students.<sup>12</sup>

Indoor environmental quality (IEQ) in the school is influenced by the location of buildings and their environmental quality, and various factors associated with the building, such as its condition, maintenance, and cleaning, as well as indoor environments, building age, and materials. The results showed that the most common IEQ factors of daily discomfort in the classroom were inadequate clean air, or weak IEQ.<sup>13</sup>

Since there are many problems regarding the health and safety of schools in the country, its causes should be scientifically evaluated and appropriate solutions should be provided. This study examined the health of the educational environment of Abadan, Iran.

## Materials and Methods

This was a cross-sectional descriptive study examining the environmental health and safety of urban and rural schools in Abadan. In this study, 192 schools (144 urban schools and 48 rural schools) were selected based on census sampling. A checklist containing 87 questions on the status of schools' environmental health and safety were used to collect data.<sup>7</sup> The checklist was completed through referrals to schools, observation, interviews and

measurements. The collected data were analyzed using Excel. It should be noted that the checklist was prepared in accordance with the Health Regulations of the Ministry of Health. In this study, descriptive statistics were used for presenting data and analytical statistics were applied for all parameters and comparisons among them. All statistical tests were carried out using SPSS statistical software, ver.16, with the significance level of  $\alpha = 0.05$ .

## Results and Discussion

The results of the health assessment of schools including the health status of schools; drinking water quality; sanitation, toilet, and wastewater treatment; compliance with Article 13 of the Food, Cosmetics, and Sanitation act; and waste disposal; as well as room for health services and factors are provided in Table 1.

Table 1. Results of health status of schools in Abadan, by health facility

Health factors	Related parameters	Urban schools		Rural schools	
		Total number	Healthy schools percentage	Total number	Healthy schools percentage
Water	Water supply source	144	100	48	100
	Water approved by health authorities	144	100	48	100
	Washable floor with a suitable slope	144	100	48	100
	Washable wall	144	100	48	100
Water drinking space	The right water drinking edge	144	95.8	48	89.6
	A drinking space for every 45 people	144	98.6	48	93.75
	Separating drinking water from the toilet	144	100	48	83.3
	Drinking wastewater treatment	144	86.1	48	87.5
	The height of the drinking water valve is between 75 and 100 cm above the ground	144	100	48	89.6
WC	For every 60 people, a toilet	144	95.5	48	79.2
	Hygienic toilet	144	83.3	48	79.2
	Using liquid soap	144	100	48	79.2
	The height of the bathroom is proportional to the age of the students	144	100	48	100
WC (Wastewater)	For every 40 people a toilet	144	76.4	48	77
	Toilet having sanitary conditions	144	76.4	48	77
	Disposal based on health standard	144	100	48	77
	Observing septic tank or absorbent well	144	100	48	77
Cafeteria	Observance of Article 13 of the Regulation	64	73.4	20	45
	Floors, walls, and ceilings of resistant material	64	73.4	20	45
	Impenetrable and washable	64	73.4	20	45
	Stone or tile to a height of 30/1 and bright color	64	73.4	20	45
	Having a valid medical examination card for cafeteria workers	64	73.4	20	45
Waste disposal	Existence of sanitary garbage	144	100	48	100
	Observing the drain interval	144	100	48	83.3
Sanitary service room	Well-equipped room	144	69.4	48	20.8
	Health educator	144	6.9	48	20.8
	First aid box	144	100	48	79.2
Observing the minimum distance from intrusive and non-sanitary places	Factory, garbage storage, cemetery, slaughterhouse, animal husbandry, poultry, nursing centers, and hospitals	144	100	48	%75

Table 2 describes the health and safety status of classrooms, corridors, stairs, laboratories, and school grounds.

In Table 3, the health and safety conditions of the classes are given according to the lighting conditions, the board, the color of the classroom, the windows, and so forth.

Table 4 shows the safety status of

laboratories in the schools with laboratories. Of the total urban schools surveyed, only 3 boarding schools and only 80 schools had laboratories. A total of 64 of the urban schools and 20 of the rural schools had cafeterias. There were no boarding schools in the villages. Among all rural schools, only three schools had laboratories and all had safety policies.

Table 2. Results of health conditions of schools in Abadan from the point of view of safety facilities

Safety Facility	Safety facility status	Urban schools		Rural schools	
		Total number	Healthy schools percentage	Total number	Healthy schools percentage
Classroom and hallway	Minimum ceiling height (3 meters)	144	100	48	100
	Windows equipped with a protective fence on higher floors	144	100	48	100
	Corridor light (at least 5 feet of candlelight)	144	100	48	100
	Class temperature (18-21 °C)	144	100	48	100
	Humidity (50-60%)	144	100	48	100
	Classroom ventilation system	144	100	48	100
	Use of artificial light in night classes (200-500 lux)	3	100	-	-
	Prohibiting any terraces and balconies associated with the class	144	100	48	97.9
	Safety tips for heating and cooling	144	100	48	100
	Non-slippery stairs and fitted with appropriate railing	144	100	48	100
Stairs	Observing the maximum height of stairs (18 cm) and minimum width of 30 cm	144	100	48	100
	Presence of safety instructions in the laboratory	80	100	3	100
Laboratory	Equipped with fire extinguishers	144	100	48	100
	At least two escape routes for emergencies	144	100	48	100
Fire extinguishing	Alarm for use in emergencies	144	100	48	100
	Banning any pool or pond at the school	144	100	48	100
School ground	For every student, 0.5 square meters of green space	144	100	48	100
	The school grounds have the appropriate level of surface (asphalt or concrete floor)	144	100	48	100
	The area of the school's land for each student is 6-8 m <sup>2</sup>	144	100	48	100

Table 3. Results of health condition of schools in Abadan from the point of view of health and safety facilities.

Health and safety facilities	Urban schools		Rural schools	
	Total number	Healthy schools percentage	Total number	Healthy schools percentage
The walls are dry, smooth, and seamless	144	77.8	48	100
The ability to wash the wall up to a height of 1.2 m	144	83.3	48	100
Washable floor with a suitable slope	144	100	48	100
The ceiling is smooth and lit	144	100	48	100
Minimum classroom distance to first row of students (minimum 2.5 m)	144	100	48	100
Maximum dimensions of the class (8 × 7 m)	144	100	48	100
Maximum class height (3 m)	144	100	48	100
The minimum space required for each student (3.5–6.5 m)	144	50	48	100
No disturbance to the auditorium, laboratory, workshop, and sports venue	144	100	48	100
Using the maximum natural light	144	100	48	100
Door and windows overlooking outer spaces equipped with wire mesh	144	50	48	6.25
Existence of sanitary garbage	144	79.2	48	100

Table 4. Results of the safety situation of the laboratories in Abadan schools

Safety facilities	Urban schools		Rural schools	
	Total number	Healthy schools percentage	Total number	Healthy schools percentage
Washable floor and surface	80	100	3	100
Non-slippery floor with proper slope	80	100	3	100
The laboratory is equipped with a ventilated unit with a hall volume	80	100	3	100
Laboratory and workshop equipped with toilet and liquid soap	80	100	3	100
Presence of safety instructions in the laboratory	80	100	3	100

School is a special social space where children's education as future community builders is founded and managed using the right teaching and physical environment and the appropriate psychological environment.<sup>8</sup>

Sufficient health, physical, and safety considerations are necessary for the growth and success of the children.<sup>14</sup> A survey on the status of health facilities summarized in Table 1 showed that 100% of urban and rural schools

had access to safe drinking water. The use of piped safe drinking water will reduce the amount of intestinal parasitic infections. A total of 98.6% of urban schools and 93.75% of rural schools had a drinking fountain for every 45 pupils. All (100%) of urban and rural school drinking spaces had washable floors and walls. In urban and rural schools, respectively, 100% and 83.3% of the drinking spaces were separate from the sanitary facilities, so 16.7% of rural schools need to be better equipped with a separate drinking space. The results of the Chi-square test showed that there was a significant difference between urban and rural schools for the health facility of factors such as water, water drinking space, WC, waste disposal and observing the minimum distance from non-sanitary places ( $p < 0.001$ ). However, there was no significant difference between the cafeteria and sanitary service room ( $p > 0.05$ ). In a study carried out by Dehghani et al. in Azad Shahr, Yazd, 23.8% of the schools had no separate drinking space.<sup>15</sup> Adegbenro et al., showed that only 50% of Nigerian schools had water supplies.<sup>16</sup> The results of this study were better than the results obtained by Dehghani et al. and Adegbenro et al.

The results of the statistical test showed that there was a significant difference between the health and safety facilities and safety situation of the laboratories in Abadan urban and rural schools ( $p < 0.001$ ). The minimum required area for each student in primary, secondary, and high schools was 6, 7, and 8 square meters, respectively, which was respected in 100% of urban and rural schools. Research has shown that the number of children per square foot in the classroom is a factor in reducing girls' scores and increasing behavioral problems among boys.<sup>5</sup> Reducing the area per student is also accompanied with the increased transmission of communicable illnesses.<sup>11</sup>

Per capita green space per student is suggested to be 0.5 m<sup>2</sup>, which was observed in 100% of rural schools, but it was observed in only 12.5% of urban schools. The presence of green space is psychologically a very important factor in improving students' morale.<sup>11</sup> On the other hand, the yard, building, and the larger area of sport facilities per student in school, with increasing physical activity of students, leads to a decrease in body mass index and obesity.<sup>17</sup>

Considering the pandemic increase in child obesity over the last few decades, nutrition and exercise have been highlighted as important.<sup>11</sup> When the space outside the classroom is sufficiently large and diverse, students are more likely to go out of the classroom in their leisure time and play, entertain themselves, and interact with each other and with their environment, resulting in more physical activity. If the yard's environment is not interesting to the student, they stay in the classroom. Particularly, the size of the environment and its diversity are important to them.<sup>18</sup> Heydari et al. reported that 88 schools in Shiraz had enough greenspace per person.<sup>19</sup>

A study on the knowledge, attitudes, and practices of water, health, and sanitation in schools showed that in South Africa some urban schools had facilities for washing hands, but soap was not available and in the rural schools hygiene resources and facilities were inadequate and there was no hand washing facility or the WC entrance door was broken.<sup>20</sup> These findings are not consistent with the present study. In this study, 95.5% of urban schools and 79.2% of rural schools had a hygienic toilet per 60 students. A total of 100% of urban schools and 79.2% of rural schools were equipped with liquid soap, which indicated a favorable situation in this regard, and 76.4% of urban schools and 77% of rural schools had a toilet for every 40 pupils. In 100% of urban schools and 77% of rural schools, the method of waste disposal was based on the sanitary standards. The difference was statistically significant ( $p < 0.001$ ). All (100%) of urban and rural schools had a sanitary garbage dumpster, and 100% of urban schools and 83.3% of rural schools followed drainage principles. Since the proper management of waste collection plays a major role in raising the level of environmental health in schools, it is important to compensate for this deficiency in the remaining 16.7% of schools. In a survey of 77 primary schools in Isfahan, Pirzad reported that 79% of schools had favorable conditions for collecting and disposing of waste.<sup>21</sup> Therefore, more than 80% of urban and rural schools in Abadan had favorable conditions. The difference was statistically significant ( $p < 0.001$ ).

However, 30.6% of urban schools and 79.2% of rural schools lacked a room for health

services. It is necessary to pay attention to this issue. The lack of a health care room in the school disturbs the provision of urgent and emergency services to students.

In this study, 73.4% of urban schools and 45% of rural schools had adhered to Article 13 of the Food, Cosmetics, and Health Act in the cafeteria. In examining the status of school cafeterias and the effect of training on cafeteria operators in Isfahan, the results showed that education had a significant effect on the improvement of the health status of the school cafeteria, and in 95% of schools, the cafeteria location was in accordance with the standards. The personal health of the cafeteria workers and the health of the cafeteria environment were inappropriate in 46.5% and 34.5% of schools.<sup>22</sup> In the study by Modi et al. in Birjand, it was found that cafeteria status was undesirable in 86.8% of cases.<sup>23</sup>

The results of this study showed that 100% of urban schools and 75% of rural schools were at least 500 meters away from places such as waste storage, hospitals, factories, high voltage power lines, livestock farms, poultry farms, and noisy centers. Therefore, care should be taken for the 25% of rural schools that were close to these noisy and polluted centers.

A study on the effect of different environmental noise sources on mental health problems in school-age children showed that sound exposure in children's homes was associated with mental health problems such as behavioral problems, anxiety symptoms, and hyperactivity.<sup>24</sup> It also increased stress levels and reduced the accuracy, concentration, and learning levels of students.<sup>11</sup> Shendell et al. reported the negative effects of vehicle noise in near-road schools of Nigeria, of which more than 70% of the complaints were due to fatigue from noise pollution. The results showed that the noise was higher than the WHO standard for educational environments, which affects children's ability to learn.<sup>3</sup> Table 3 shows that 77.8% of the classrooms in urban schools and 100% of the classrooms of rural schools were smooth and seamless, and 83.3% of the classrooms in urban schools and 100% of rural school classes were washable. The difference was statistically significant ( $p < 0.001$ ).

Having natural light in classrooms,

observing safety tips on heating and cooling equipment, standardizing stairs in terms of length, width, and height, and the presence of fire extinguisher equipment were observed in 100% of urban and rural schools. Light significantly changes the mood of children and increases or decreases the cognitive function of memory and problem solving abilities.<sup>5</sup>

In a study on the quality of the indoor environment in the building of primary schools in Finland, the academic and hygiene performance of students were assessed considering the ventilation speed and temperature conditions. The most common symptoms were in spring, and included fatigue, stiffness, nasal congestion, and headache. The researcher reported that there was a relationship between air conditioning and absence from school due to illness.<sup>13</sup> The studies carried out in Zahedan showed that most of the safety problems were related to emergency exits and firefighting equipment. Overall, the results showed that the health status of schools in Zahedan was undesirable.<sup>8</sup> In the cases of poor design of corridors, stairs, and the entrance to the school, there are some potential problems during the movement of children from one place to another, and it is difficult to control children in these settings.<sup>5</sup>

A study of the environmental health condition of primary school girls in Khomeyni Shahr of Isfahan in 2013 showed that only 25% of the classrooms had enough light. None of the toilet and hand washing rooms had suitable lighting and the 91.7% area of playgrounds per student was not observed. Also, the condition of the walls of the classrooms and corridors was not in accordance with the standard in terms of the height of the stones in any of the schools. In this study, 33.3% of the libraries were adequately lit.<sup>25</sup> Newly-built schools had a better health status than old ones, because the health status of schools has a significant relationship with the age of the school building<sup>14</sup> and there is a correlation between school design and education.<sup>26</sup> In another study in Markazi province, 210 primary schools were surveyed in terms of environmental health, safety, and ergonomics in the academic year of 2003–2004. In terms of environmental health, only 21.2% and in terms of safety 18.1% of schools were in

favorable conditions. According to the principles of ergonomics, 25.6% of schools were in appropriate conditions. In both cases, there was a significant difference between urban and rural schools. In other words, the health status of the environment, safety, and ergonomics in the primary schools was not favorable.<sup>9</sup> One study found that the presence of a health educator could improve the health of the school environment, and schools with no health service individuals had a very low level of health.<sup>27</sup> In a survey of 220 schools in Zahedan, minimum required area per student, per capita green space, access to safe drinking water, sewage disposal and standard toilet numbers were observed in 32, 0, 62.5, 75, and 27% of schools, respectively.<sup>8</sup>

### Conclusion

Generally, it can be concluded that most schools in Abadan, in terms of environmental health and safety, have a good status according to the school environment health regulations. All (100%) of rural and urban schools had the best health conditions in terms of sanitary and safety facilities in accordance with the health regulations. Also, 100% of the laboratories had high safety status. However, 55% of rural schools and 26.6% of urban schools had an unhealthy cafeteria, and 79.2% of rural schools and 52% of urban schools had a poor sanitary service room. These issues require more attention by relevant authorities to improve the health status of schools.

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