

Research Paper

Criteria for Designing Urban Parks in a Pandemic of Infectious Diseases: A survey based on experts' opinions

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Abstract

Landscapes and urban green spaces, particularly urban parks, are among the most crucial urban areas. Therefore, planning and designing urban parks to offer appropriate services under various conditions, including during infectious disease pandemics, is essential and ensures citizens' health. This study aimed to bridge the gap between urban park design and pandemic needs by proposing design criteria based on expert opinions to meet park users' health needs during a pandemic. A questionnaire with seven questions was developed to establish these criteria, resulting in a total of 28 criteria. After collecting the questionnaires, the data were extracted, and the frequency of each option was determined. The criteria for designing urban parks under pandemic conditions were then ranked by importance. Our research identified three of the most important criteria: implementing an electronic queuing system in buffets or restaurants to eliminate customer lines, installing automatic hand sanitizers throughout the park, and equipping drinking fountains with smart valves to minimize hand contact. An additional 25 criteria were also prioritized. Designers and urban planners can utilize these criteria to create or redesign parks that are better suited for pandemic conditions compared to current parks.

Keywords: Urban Open Spaces, Urban Landscape and Green Spaces, COVID-19, Epidemic.

1. INTRODUCTION

Due to the rapid growth of urban populations worldwide, there is an increasing focus on creating urban environments that enhance the health of city residents as a solution to managing the rising healthcare burden in cities (1). Urban green spaces (UGS), in particular, are recognized for their health benefits and are considered an essential and cost-effective means to promote health in urban areas (2). UGS can take various forms, such as urban open spaces, parks, green roofs, forest lands, and public gardens, and they are key components of a healthy environment (3). UGS are crucial for activities and well-being in the city and are a valuable asset and vital element. Most city residents use urban green spaces daily, although urbanization and

everyday urban life have distanced them from nature (4; 5; 6). Reasons for visiting city parks typically include socializing with friends and acquaintances, enjoying fresh air, appreciating the natural landscape, and seeking silence and tranquility (4).

Societies and cities can face various crises at any time, such as floods, earthquakes, tsunamis, volcanic eruptions, fires, and environmental pollution. With the spread of human transportation and migration, pandemics have become another form of global crisis. Over the past half-century, humans have suffered from viruses such as the plague, cholera, Ebola, SARS, and other large-scale epidemics, each having a significant negative impact on human health. In many parts of the world, concerns about the global COVID-19 pandemic and quarantine policies have led to a general

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decline in residents' physical and mental health due to inadequate social interaction (8). Therefore, having suitable UGS during a pandemic can foster social interaction and mitigate the negative psychological impact of quarantine.

Green spaces offer a wide range of ecosystems that can help prevent many diseases in cities (9). UGS can be used as a public health tool to improve well-being in urban areas and reduce the negative effects of quarantine (10; 11). The COVID-19 epidemic, from early 2020 to the time of this writing, has brought about unprecedented changes in human life worldwide, including significant disruptions to urban mobility and social interaction (12), which may keep people away from UGS due to quarantine conditions (7). This distance from green spaces has many consequences in the social and health fields of society, especially for the elderly who have less access to social networks than others (13; 14). While younger generations can easily meet each other through cyberspace and to some extent reduce the negative psychological effects of staying away from UGS and visiting acquaintances in person, most elderly are generally deprived of visiting acquaintances due to a lack of familiarity with the available facilities.

During the COVID-19 epidemic, the benefits of urban parks were identified in the community (15). COVID-19 has had a profound impact on people's activities and use of public spaces. Before the COVID-19 epidemic, urban parks, as healthy places, were the most desirable locations for urban citizens. However, today, due to the lack of people, there is substantially reduced activity in urban parks. The perceived risk of disease seems to influence people's decisions to visit urban parks (16). People desire a calm and pleasant environment to rest and breathe easily during the epidemic (17). In addition to people's fear of the risk of epidemics, the lack of proper design of UGS has made the use of these places in critical situations, such as a pandemic, minimized or impossible.

The global epidemic has created an opportunity for urban planners, government decision-makers, health professionals, and environmental psychologists to collaborate and better understand the psychosocial situation in cities. Maintaining access to green spaces in cities during quarantine, as well as multifunctional design for greater freedom of action, should be considered necessary, with designers playing an important role in preventing the spread of disease and protecting community health (18; 19; 20).

Research related to urban parks and infectious disease epidemics primarily focuses on mental health and alleviating the negative conditions of quarantine. Most of these studies are incorporated into the introduction of this research and clearly indicate that

urban parks play a significant role in maintaining citizens' health during pandemics. However, the conducted studies reveal a gap: no research presents specific design criteria for urban parks during pandemic conditions. This study aims to fill this gap by addressing the lack of research on urban parks and infectious disease pandemics.

Given the above, the importance and value of UGS, including urban parks, in promoting community health is evident. Moreover, evidence-based design of these spaces is crucial. This study, the first of its kind in Iran and globally, aimed to survey experts to establish criteria for designing urban parks in epidemic conditions. By applying these criteria, UGS can be used more safely during epidemics. Enhancing existing parks to meet these criteria can make them usable during a pandemic, thereby restoring their vital role in urban settings.

2. METHOD AND MATERIAL

- Expert Population

The expert sample was selected from specialists in various fields, including medicine, paramedical, and engineering disciplines related to environmental design engineering, landscape architecture, architecture, and urban planning.

- Sampling

Specialists were identified through academic sites, engineering companies, and hospitals. The participants in the study were selected by randomly choosing their place of service and then randomly selecting among the specialists. The criteria for selecting experts included their educational degree and job relevance to the research topic. Once the required samples were identified, the questionnaire was distributed to them via email, social networks, and in person. Participants who completed the questionnaire returned it through the same channels. The selection of experts was done randomly as follows:

There were generally three centers for selecting specialists: university centers, hospitals, and technical and engineering companies. Considering the existence of 31 provinces in the country, we identified 93 locations for each of these centers. We then assigned a code from 1 to 93 and conducted a lottery without replacement, selecting 31 locations.

Next, we identified relevant specialists in each selected location, assigned a special code to each, and determined a sample of 20 specialists per province, totaling 620 specialists across the 31 provinces. From

this pool, 465 people were selected as the study sample by generating random numbers. Ultimately, 230 participants returned the completed questionnaires. The numbers 1 to 93 represented the numbering for the three research centers, including universities, hospitals, and technical and engineering companies in each province. After selecting 31 samples from the total 93, 20 individuals were identified for each, resulting in a total of 620 numbered specialists. Then, 465 individuals were chosen as a sample through random number generation.

- Data collection tool

+ library resources

Some of the information required for this research was obtained from past studies, which were accessed by searching article-indexing websites on the internet. Through reviewing and studying these articles, the necessary materials were selected and integrated into the research text, with appropriate acknowledgment of the sources. Additionally, library resources were utilized in crafting the introduction section, gathering information needed for the questionnaire, outlining the research methodology, and comparing and analyzing the results of previous studies with the current research findings.

+ questionnaire

Another data collection tool used in this study was a researcher-made questionnaire, which underwent validity and reliability testing before being administered to the experts involved in the research. The questionnaire comprised 7 questions, each requiring prioritized responses from 1 to 4, with 1 indicating the highest priority and 4 the lowest. Additionally, each question included a section for experts to provide their opinions, making the questionnaire partially open-ended.

To develop the criteria in the questionnaire, pandemic conditions were thoroughly examined, and health protocols published by the World Health Organization for preventing the spread of pandemic diseases, including COVID-19, were adapted to the criteria for designing urban parks, addressing existing gaps. The newly formulated criteria were then presented to the participating experts for evaluation.

In the review of library resources, the study conducted by Dushkova et al. in 2021 is notable. In this research, data were collected through a questionnaire consisting of 6 general sections and distributed online among the research participants,

with additional information gathered from library resources (14). Similarly, Marconi et al. conducted a study in 2022, utilizing both open and closed question surveys to examine urban green spaces in the context of the COVID-19 pandemic (21). Additionally, Pouso et al. employed an online survey in 2020 to investigate the effects of exposure to blue-green spaces during quarantine on mental health (11).

- Reliability and Validity of the questionnaire

It's worth noting that to ensure the reliability of the questionnaire, the test-retest method was employed. Forty questionnaires were distributed among experts over a two-week period. Comparing the responses obtained at two different time points revealed a significant correlation. Specifically, 9 out of 10 individuals provided the same answers to the questions as they did during the initial administration of the questionnaire, demonstrating a correlation of 90%.

Regarding the validity of the questionnaire, 40 questionnaires were distributed among experts, and its validity was confirmed by their feedback and input.

- Questionnaire details

The criteria prepared in the researcher-made questionnaire were categorized into 7 questions, with each question containing 4 criteria. These criteria were developed by utilizing the specific health protocols for the pandemic period provided by the World Health Organization, and necessary adjustments were made to adapt these protocols for use in the design of urban parks. The topics covered in each question include the following:

- 1- Facilities used in urban parks to prevent a pandemic of infectious diseases.
- 2- Creating a social distance in urban parks to prevent a pandemic of infectious diseases.
- 3- Adaptation of the current urban parks to the pandemic conditions of infectious diseases.
- 4- Decrease in population density and the reduction of the risk of increasing number of diseases in Children's playgrounds in urban parks.
- 5- Increase hygiene in buffets and children's playgrounds in the urban parks.
- 6- Reduction of density and volume of entrances to urban parks.
- 7- Reduction of density and the reduction of the risk of disease in the pavilions of urban parks.

Certainly, here's how the presentation of each question with its respective options could look like in Table 1:

Table 1. Questionnaire Questions

Questions	Options
- In your opinion, which of the following facilities is a priority for use in urban parks to prevent a pandemic of infectious diseases?	+ Using automatic hand sanitizers + Using drone to disinfect the area from a height + Using seats in which the virus survives less + Using drinking fountains and smart valves to reduce hand contact
- In your opinion, which of the following ways to create social distance in urban parks is a priority?	+ Tagging on park chairs to indicate proper sitting distance + Lining and lighting of sidewalks to remind and oblige to observe social distance + Increasing the number of sports equipment and also increasing the distance between them in order to observe the social distance + Increasing the area of dense land uses compared to their standard area in normal conditions to increase social distance
In your opinion, which of the following is the priority for use in the current urban parks in the pandemic of infectious diseases?	+ Redesign the spaces in these places to suit the epidemic conditions + Using warning signs to remind people of social distance + Restrict the entry of people to a certain number + Tenting in these spaces and use as a convalescent home
In your opinion, to reduce the population density in crowded places, in urban parks such as children's playgrounds, which of the following options is the priority, respectively?	+ Increasing the area of children's playgrounds + Increasing the number of playgrounds and playground equipment + Distribution of playgrounds by age + Limiting the number of people entering the playground + Using of antibacterial flooring for playground floor and sideboard walls
In your opinion, in order to increase the health of children's buffets and play places, which of the following options is the priority, respectively?	+ Designing a private playground for the use of the children of a family at a certain time + Using the electronic queuing system in buffets to eliminate customer queues + Using a spray system on top of play equipment to disinfect them
In your opinion, in order to reduce the density and volume of entrances to urban parks, which of the following options is the priority, respectively?	+ Complete separation of entry and exit paths + Increasing the number of entry and exit + Limiting the number of incoming people + Increasing the width of entry and exit compared to normal standards
In your opinion, in order to reduce the density and the risk of disease in the pavilions of urban parks, which of the following options is the priority, respectively?	+ Reducing the density of accommodation pavilions + Using plants with medium height in the distance between the pavilions + Increasing the area of accommodation + Scattering pavilions in parks

- Method of data analysis

After identifying the necessary samples for the research, the questionnaire was distributed to them via email, social networks, and in person. In each question, the experts were asked to prioritize items and assign them numbers from 1 to 4. This prioritization was carried out by the experts for each question, corresponding to the four options available. For the analysis of the research data, a score of 1 to 4 was assigned to each research priority, respectively.

Assigning points to research priorities was done as follows

- + Priority 1 equals to 4 points
- + Priority 2 equals to 3 points
- + Priority 3 equal to 2 points
- + Priority 4 equal to 1 point

After determining the frequency of each of the criteria in the questionnaire, the Mean score of each of the criteria was determined separately as follows: The frequency of each priority was multiplied by its score and then the result of this step was added together and divided into 230 and the respective score was determined for each of the criteria. After calculating the scores related to the criteria, each of them was classified from the highest score to the lowest score among the criteria related to their own section, each section containing 4 criteria. Also in the questionnaire for each of the 7 questions, we had a place to write the criteria in the minds of experts, some of whom had mentioned a few items in the questionnaire that are mentioned in the results section. Each criterion that obtained the highest average score was classified from the most important to the least important criterion.

In relation to the ethical considerations at the time of data collection through the questionnaire, it can be said that while making sure to use the data only for the article, no personal information such as the name and surname of the participants was requested from them in the questionnaires.

3. RESULTS

The questionnaire was distributed between March 21 and May 21, 2021. In total, 465 questionnaires were administered, and 230 were returned completed, resulting in a response rate of 49%. In terms of respondent composition by degree, 100 (43%) had a Ph.D., and 130 (57%) had a doctorate or a master's degree. Approximately half (n=111; 48%) were from the medical field, while the other half (n=119; 52%) were from urban design fields.

The results of examining the data related to the questions show that regarding the facilities used in urban parks to prevent a pandemic of infectious diseases, the use of automatic hand sanitizers was deemed the most important (mean score of 3.6), while the use of UAVs to disinfect the park from above was considered the least important (mean score of 1.4).

Regarding creating social distance in urban parks to prevent a pandemic of infectious diseases, the results indicate that increasing the number of sports equipment and increasing the distance between them to maintain social distance is the most important (mean score of 3.1), while marking and lighting the sidewalks of urban parks to remind and enforce social distance is considered the least important (mean score of 2.4).

In the third part, regarding the adaptation of current urban parks to pandemic conditions of infectious

diseases, restricting the entry of people to urban parks to a certain number was rated the most important (mean score of 3.4), while camping in urban parks and using them as convalescent homes was considered the least important (mean score of 1.6).

In the fourth part, concerning the decrease in population density and the reduction of the risk of increasing the number of diseases in children's playgrounds in urban parks, limiting the number of people entering the children's playground was deemed the most important (mean score of 3.2), while increasing the area of pavilions was considered the least important (mean score of 2).

Also, in the fifth section regarding the increase of hygiene in buffets and children's playgrounds in urban parks, the use of an electronic queuing system in buffets to eliminate customer queues was rated the most important (mean score of 3.7), while designing private playgrounds for the exclusive use of a family's children was considered the least important (mean score of 1.4).

Following the review of the seven sections of the questionnaire, in the sixth section, regarding the reduction of density and volume of entrances to urban parks, increasing the size of entrances and exits compared to normal standards was deemed more important (mean score of 3.0), while creating exit routes and increasing the number of entrances and exits was considered the least important (mean score of 1.8).

In the last part of the questionnaire, or the seventh section, regarding the reduction of density and the reduction of the risk of disease in the pavilions of urban parks, scattering pavilions in the park was rated more important (mean score of 3.2), while increasing the area of pavilions was considered the least important (mean score of 1.6).

Table 2. Reviewing the criteria proposed in the research based on the Mean score

		No. respondents who chose the criteria as the first priority (%)	Mean score
Facilities prioritized for use in urban parks to prevent a pandemic of infectious diseases	Using automatic hand sanitizers in urban parks	160(70%)	3.6
	Using drinking fountains and smart valves in urban parks to reduce hand contact	150(65%)	3.5
	Using seats in which the virus survives less	5(2%)	2.1
	Using a drone to disinfect the area from a height	5(2%)	1.4
Creating a social distance in urban parks to prevent a pandemic of infectious diseases	Increase the number of sports equipment in urban parks and also increase the distance between them in order to observe social distance	115(50%)	3.1

		No. respondents who chose the criteria as the first priority (%)	Mean score
	Labeling the seats in urban parks to remind the appropriate social distance	103(45%)	3.0
	Increase the area of dense land uses in urban parks relative to their standard area in normal conditions to increase social distance	47(20%)	2.7
	Marking and lighting the sidewalks of urban parks to remind and oblige to observe social distance	31(13%)	2.4
Adaptation of the current urban parks to the pandemic conditions of infectious diseases	Limit the entry of people to urban parks to a certain number	120(52%)	3.4
	Redesign of existing spaces in urban parks according to the epidemic conditions	57(25%)	2.7
	Using warning signs to remind the observance of social distance and health protocols in urban parks	45(19%)	2.5
	Tenting in large urban parks and use as a convalescent home	15(6%)	1.6
Decrease in population density and the reduction of the risk of increasing disease in children's playgrounds in urban parks	Limit the number of people entering the children's playground	135(59%)	3.2
	Increase the area of children's playgrounds	63(27%)	3.0
	Separation of children's playgrounds by age	31(13%)	2.4
	Increase the area of pavilions	5(2%)	2
Increase of hygiene in buffets and children's playgrounds in the urban parks	Using an electronic queuing system in buffets to eliminate customer queues	144(63%)	3.7
	Using antibacterial flooring for playground floors and buffet walls	58(25%)	2.6
	Using spray system on top of play equipment to disinfect them	23(10%)	2.1
	Design private playgrounds for the use of the children of a family at a given time	5(2%)	1.4
Reduction of density and volume of entrances to urban parks	Increase the size of entrance and exit compared to normal standards	113(49%)	3.0
	Complete separation of entrance and exit paths	67(29%)	2.9
	Limit the number of incoming people	33(14%)	2.3
	Increase the number of entrance and exit	25(11%)	1.8
Reduction of density and the reduction of the risk of disease in the pavilions of urban parks	Scatter of pavilions in the park	110(48%)	3.2
	Reduce the density of pavilions assigned to the pavilion section	15(6%)	1.8
	Use plants between the pavilions to create a barrier between them	12(5%)	1.7
	Increase the area of pavilions	5(2%)	1.6

In summary, experts prioritized the following for each category (in order of highest mean score overall):

Use of electronic queuing system in buffets to eliminate customer queues (3.7),

Use of automatic hand sanitizers in different areas of the park (3.6),

Use of drinking fountains and smart valves to reduce hand contact (3.5),

Limiting the entry of people to urban parks to a certain number (3.4),

Limiting the number of people entering the children's playground (3.2),

Scatter pavilions in the park (3.2),

Increasing the width of entrances and exits to normal design standards for non-critical situations (3). (Fig 1).

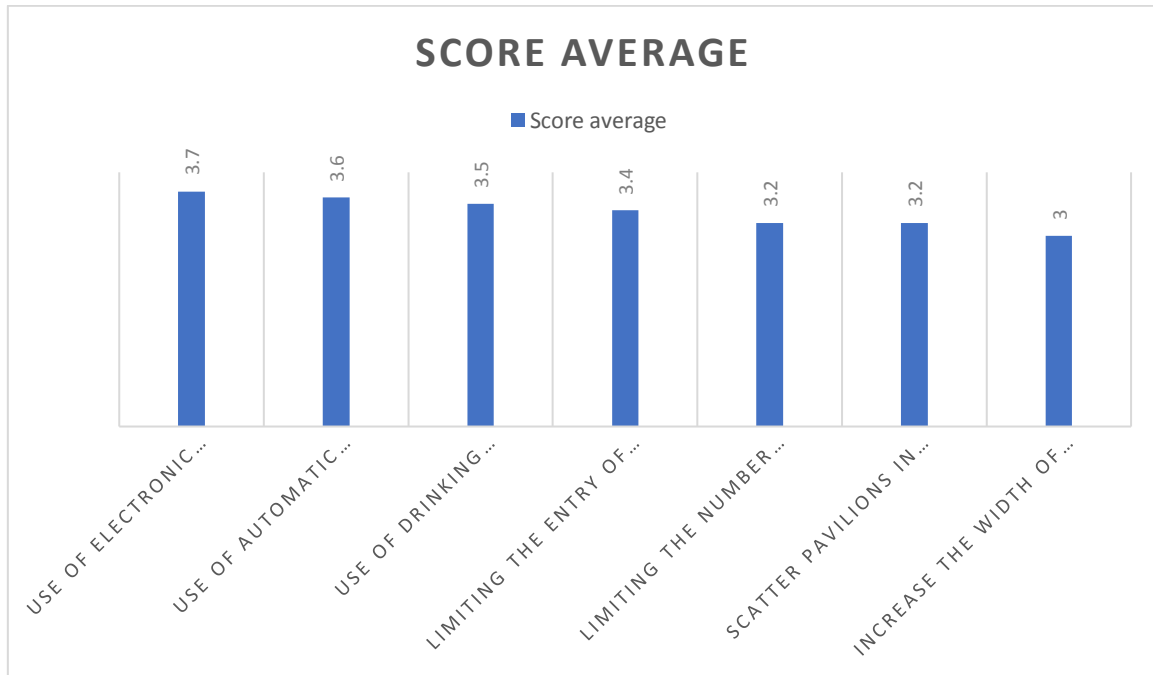


Fig 1. Important criteria obtained in the research

In the questionnaire, there was a section for each of the questions, so that in addition to the criteria in the questionnaire, the experts could add the criteria they wanted, in which some experts mentioned the following criteria. These criteria have been suggested by some experts individually in the questionnaire:

- Zoning of urban parks based on UGS management in epidemic conditions (such as separating high-risk spaces such as playgrounds and sports fields from other usable and low-risk spaces): This criterion, written by one of the experts present in the research, is related to the second part of the questions.

- Failure to plant aromatic and attractive plants in epidemic conditions due to the risk of transmitting the virus to children by touching fragrant and colored flowers: This rule is written by one of the experts in the research related to the fifth part of the questions, which includes increasing hygiene in children's buffets and playgrounds, which reduces the risk of disease transmission by observing it and not contacting children with these plants.

- Increase environmental facilities and furniture in parks: This rule is written by one of the experts in the

research related to the first part of the questions, which includes the facilities used in urban parks in pandemic conditions, which with increasing these facilities, the density decreases and the risk of disease transmission also decreases.

- Use of graphic and visual alarms: This rule is written by one of the experts in the research related to the first part of the questions, which includes the facilities used in urban parks in pandemic conditions, which use these signs to provide health reminders to clients.

- Pay special attention to the design of temporary planting and refrain from planting plants whose attractiveness causes human contact with the plant and virus transmission: This rule is written by one of the experts in the research related to the third part of the questions, which includes a process by which human hands can reduce contact with plants in the park and thus minimize the risk of disease transmission.

- Planting medicinal plants to acquaint citizens with their benefits in treating diseases: This rule is written by one of the experts in the research related to the first part of the questions, which includes facilities that can be used to be effective in the health of citizens.

- In landscape planning, the distribution of playgrounds at the neighborhood level, which reduces the distance of people access to the playground, and reduces the presence of people in parks, and reduces the issue of disease transmission: This rule is written by one of the experts in the research related to the fourth part of the questions, which includes reducing the density of children's playgrounds by scattering them in different neighborhoods and reducing the volume of people visiting the parks to minimize the risk.

- Use of open spaces without use in epidemic conditions (such as university campuses, open spaces of offices and schools) to increase people's access to open space and reduce population density in parks: This rule was written by one of the experts in the research related to the sixth part of the questions, which includes reducing the density in urban parks by using semi-public green spaces in the city.

- Use of phytoncide-producing plant species that kill microbes in the air: This rule was written by one of the experts in the research related to the first part of the questions, which included the use of appropriate facilities that were effective in cleaning the environment by planting such plants.

- Use speakers and televisions to remind people of health protocols in urban parks: This rule was written by one of the experts present in the research related to the first part of the questions, which included the use of appropriate facilities that remind the clients of health points through speakers and television.

- Increasing the quality of non-drinking water used to irrigate green spaces resulting from wastewater recycling, because of the possibility of contact with the hands of people, especially children: This rule was written by one of the experts in the research related to the first part of the questions, which included the use of appropriate facilities that reduce the risk of disease transmission by adapting the water used in urban parks.

- Observe the appropriate distance between the seats in urban parks: This rule is written by one of the experts in the research related to the second part of the questions, which includes creating a social distance in urban parks, which reduces the risk of disease transmission by increasing the distance between the seats in these places.

4. DISCUSSION

We reviewed and proposed the criteria for designing urban parks during the pandemic based on the opinions of experts. Examining the opinions of experts, it was found that the use of electronic queuing

in buffets and restaurants in urban parks to eliminate queues in these places and reduce the risk of disease transmission, with an average score of 3.7, was introduced as the most important criterion. Also, the use of automatic hand sanitizers in urban parks, with an average score of 3.6, was in second place, and other criteria were introduced in order of importance in the results section.

The results of the research can be used in designing urban parks for pandemic conditions. These results suggest the criteria for designing urban parks for the pandemic period based on the opinions of experts, which is very important in terms of adapting urban parks to pandemic conditions and can partially bridge the gap between urban park design and pandemic conditions.

The results of the research met expectations and were able to suggest criteria based on expert opinion for the design of urban parks in pandemic conditions. The role of urban parks in pandemic conditions has been studied in previous research, which shows that these places play an important role in reducing the negative effects of the COVID-19 pandemic and improving the physical and mental health of citizens (14). These spaces should be expanded and strengthened at the city level, especially for the pandemic conditions (6), so that citizens can take refuge in green spaces in critical situations such as the COVID-19 pandemic to escape its adverse effects (7) and in this way, the welfare of citizens in a pandemic situation is ensured (21).

The proposed criteria, based on the opinion of experts, can make access to urban parks in pandemic conditions easier than the current access. Access to green spaces is very important during the pandemic (23) and as a study by Huerta found that in poor areas due to lack of access to green spaces, COVID-19 disease has intensified and resilience has decreased (22).

Urban parks are one of the most important places in urban spaces and can perform well in critical situations. The presence of urban parks near residential areas in critical situations such as pandemics is one of the most desirable urban facilities to reduce the negative effects of pandemics (24), as well as proximity to nature has a great impact on psychological recovery in critical situations (25).

Research shows that the majority of them are to investigate the role of urban green spaces in improving the quality of life of citizens in pandemic conditions and there is no research to suggest criteria for designing urban parks during the pandemic. Other studies confirm the adaptation of these places by confirming the important role of urban green spaces in

pandemic conditions. Accordingly, this research was done to make this adaptation.

Examining the various researches, some of which have been mentioned, it can be said that UGS in critical situations such as the COVID-19 pandemic play an important role in reducing the negative effects of pandemics and quarantine, and access to these places should be maintained and strengthened in pandemic conditions. So, the problems in these places that reduce access to them should be addressed, therefore, it can be said that one of the most important obstacles to access to UGS is their lack of proper design for the pandemic conditions, which requires special design criteria. In this research, we have provided the required design criteria to designers and urban planners so that they can use these criteria to design suitable UGS, including urban parks.

Previous research, as noted in the text, has mostly focused on the role of urban parks during the COVID-19 pandemic, and the results of the present study were based on the proposal of design criteria based on expert evaluations that are not comparable to the results of this research.

In this study, a questionnaire was used to find the context. As a result, some people may refuse to provide a real answer and give an unreal answer. The results of the present study have been the result of the opinion of local experts, which can be generalized to the country. If needed, it can be generalized to other parts of the world with sufficient caution and knowledge. Also, in this study, due to the selection of the sample size of specialists, their cooperation in sending the answered questionnaires was very time-consuming and difficult due to their busy schedules. For this reason, the sample size did not reach the desired level, and if the sample size had reached the desired level, more realistic results would have been obtained.

Lack of similar research in this field caused serious problems in the formation, conduct, and analysis of the research. It also makes it difficult to compare results due to the lack of resources. Because no research was found to propose design criteria based on experts' opinions for pandemic conditions, this study had to develop new ground. In this study, criteria related to the design of urban parks were proposed by experts, which did not include all aspects of the urban landscape.

In connection with the terms provided, it can be said that these criteria should be used in the design or redesign of urban parks so that their efficiency is practically tested. For future research, researchers can discuss the study of UGS with some or all of the criteria and health of users. A pilot project could be designed to test a park and measure user interactions

and health status. These criteria could then be extended to other urban landscapes, including semi-private UGS.

5. CONCLUSION

The current research and the results obtained from it are presented to specialists and interested parties for the first time in Iran and the world with the aim of achieving the design criteria of urban parks in pandemic conditions in order to close the existing gap in the planning of urban spaces in relation to pandemic conditions. Urban landscapes and green spaces can play an important role in reducing negative effects on the health of people in the community even during pandemic situations. Yet, there is a gap between urban park design and the sensitive situation of the pandemic period, resulting in declining park use. By providing criteria for designing urban parks specific to the pandemic period of communicable diseases and their use in design and redesign, these places can become more efficient in crisis situations such as pandemics of communicable diseases.

In our research, we proposed criteria for designing urban parks in pandemic conditions based on a survey of experts. By using these criteria, the design of urban parks can be responsive to pandemic conditions and protect human health, allowing citizens to use these spaces more effectively during pandemics. This will enable urban parks to improve the quality of life for citizens in the best possible way. The most important criteria identified in the research are as follows, in order of the average points obtained:

- use of electronic queuing system in buffets to eliminate customer queues (3.7)
- use of automatic hand sanitizers in different areas of the park (3.6)
- use of drinking fountains and smart valves to reduce hand contact (3.5)
- limiting the entry of people to urban parks to a certain number (3.4)
- limiting the number of people entering the children's playground (3.2)
- scatter pavilions in the park (3.2)
- increase the width of entrances and exits to normal (Design standard for non-critical situations) standards (3).

The criteria obtained in the research can be used in the planning of urban experts and officials. By utilizing these criteria, existing urban parks can be redesigned and new urban parks can be designed. Adding the specified criteria to the facilities of urban parks will adapt these places for pandemic conditions, making them more suitable for use by citizens. The criteria introduced in the research can vary in

difficulty during the redesign or design stage based on their implementation type. For example, the use of disinfection devices is relatively easy to implement, while increasing the width of sidewalks in already built parks requires a significant amount of labor and time and can be expensive.

Suggestions for future research are as follows:

- Examining the measures required for pandemic conditions in city parks based on citizens' opinion
- Examining the measures required for pandemic conditions in urban parks based on passive defense
- Investigating the effects of designing urban parks suitable for critical conditions on health

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