



# Re-Thinking Post-Pandemic Home Design: How Covid-19 Affected the Perception and Use of Residential Balconies in Egypt

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TECHNICAL ARTICLE

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## ABSTRACT

The spread of COVID-19 has led to the enforcement of physical distancing measures. The purpose of the paper is to understand the effect of these measures and lifestyle changes on the role and importance of balconies in Egypt. A literature review was conducted to understand the effect of pandemics on the built environment and the role of balconies throughout history and during the current pandemic. An online survey was then used to provide a deep understanding on the Egyptians' perception of home balconies after the pandemic. The pandemic has led to spending more time at home and in balconies. In Egypt, privacy, noise, pollution, and lack of furniture were the main limitations in using balconies. The most frequent activities carried out in balconies were socializing and solitary activities. These activities require quiet and private balconies that away from pollution and large enough to accommodate a seating area. The survey is not limited to a specific area, as it aims to provide an understanding of the different perception of balconies in different areas in Egypt. Research that studies the impact of COVID-19 on home design, architecture and even daily lifestyle in Egypt is very limited. Findings of research concerning post-pandemic architecture and home design over the world can not to be applied in the context of Egypt. This research provides a foundation to further studies that focus on post-COVID-19 home design that meets specific local needs and conditions.

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## INTRODUCTION

Urbanization rates are rapidly increasing worldwide. By 2050, about 70% of the population is expected to occupy urban areas (UN 2018). In cities with highly dense population, this leads to reliance on apartment buildings to face the growing population, which is often accompanied by less green and public spaces (Egypt is a perfect example). The country's population is projected to reach 52 million in urban areas, and 49 million in rural areas by 2025. 95% of the Country's population occupy four percent of the total land area (Mohammed Emam Hammad 2019).

In December 2019, the first cases of the new virus were recorded. The virus, named (COVID-19), was declared a global pandemic in March 2020. Globally, more than 70 million people were affected by the virus in 2020. Most countries took safety measures to limit the spread of the pandemic, including full or partial lockdowns, suspension of universities and schools, work from home policies and physical distancing rules. The lifestyles of people were severely impacted, especially in countries where social interaction is valued, and physical proximity is the norm. People were forced to stay at home for long periods, which led to increased boredom and stress levels. A sedentary lifestyle prevailed, and time spent watching the news and checking social media increased (EARG Collaborators *et al.* 2021).

In Egypt, immediate actions were implemented since the spread of the virus. Hence, this paper aims to study how the lockdown and safety measures affected the perception of Egyptians on the role and importance of balconies. The paper raises several questions including how home design will be affected after COVID-19, to accommodate post-pandemic needs? What is the role of balconies in times of physical distancing? How people currently perceive balconies in terms of importance and function? And should architects consider balconies as an essential home element? The paper's methodology relies on four main phases. The first, is providing an overview on how pandemics have impacted the built environment throughout history. The second, is understanding the role of balconies as an architectural, social, and political element over the years. The third is presenting the impact of COVID-19 on the lifestyle of Egyptians. Finally, an online survey is conducted to study how the pandemic has affected Egyptians' perception and use of balconies.

## A HISTORY OF PANDEMICS AND THE BUILT ENVIRONMENT

Our movements have been limited since the wide spread of the new virus and our bodies have been isolated. However, the fact is that pandemics have always impacted our built environments, through architecture

and urban design and planning. Preventing or limiting infections has always driven the function and form of the built environment (Megahed and Ghoneim 2020).

During the 14<sup>th</sup> century, the bubonic plague offered the basic move to the Renaissance. Public spaces were promoted, and dense residential areas were cleared. At the rise of tuberculosis (1810–1815), sanatoriums were designed to isolate and treat those who were infected (CHANG 2020). These buildings included strict hygiene policies and allowed natural ventilation and sunlight to the rooms, providing an environmental treatment strategy, when no medical alternative was still found. The Paimio Sanatorium, designed by Alvar Aalto, was integrated into the landscape in a forest in Finland, allowing maximum view, daylight and promoting walking for patients. These principles became the foundation for modern architecture later (Peters and Halleran 2020). Buildings were designed during this period with a minimalism approach that promoted the purity of form and eliminating homes from clutter and heavy elements, where every object is clear to emphasize the physical and symbolic cleansing from diseases. Le Corbusier once stated that *"A house is only habitable when it is full of light and air"*. Buildings included more balconies and terraces to allow exposure to nature. By the time it was known that tuberculosis can survive in dust, furniture design was also shifting into using light and washable materials such as tubular steel used by Mies van der Rohe. Modern architecture and design focused on the importance of sunlight, air, and nature (CHANG 2020). At the city level, planners and designers supported waste management and slum clearance at that time. During the industrial period and the spread of cholera and typhoid, the urge to install proper infrastructure to allow safe water supply and sewage systems, has led to the design of straight and wide streets (Tokazhanov *et al.* 2020).

## COVID-19 AND HOME DESIGN

Ever since COVID-19 was declared to be a global pandemic by the World Health Organization (WHO), our lives were highly impacted. Architects and urban designers and planners are currently facing the need to develop and upgrade spaces to adapt to the new measures (*Figure 1*). The spread of the virus is expected to raise the focus on villages and suburbs, to slow down urbanization and lower the population density, as infected cases in cities account for over 90% of the total infections. In urban areas, low-rise buildings will be more recommended, whenever possible. More attention should be given to decentralized services such as schools and healthcare facilities. Promoting self-sustaining, walkable communities and cycling is also a necessity. In addition, office spaces are expected to undergo future changes such to adapt to social distancing policies. Modular prefabricated units will

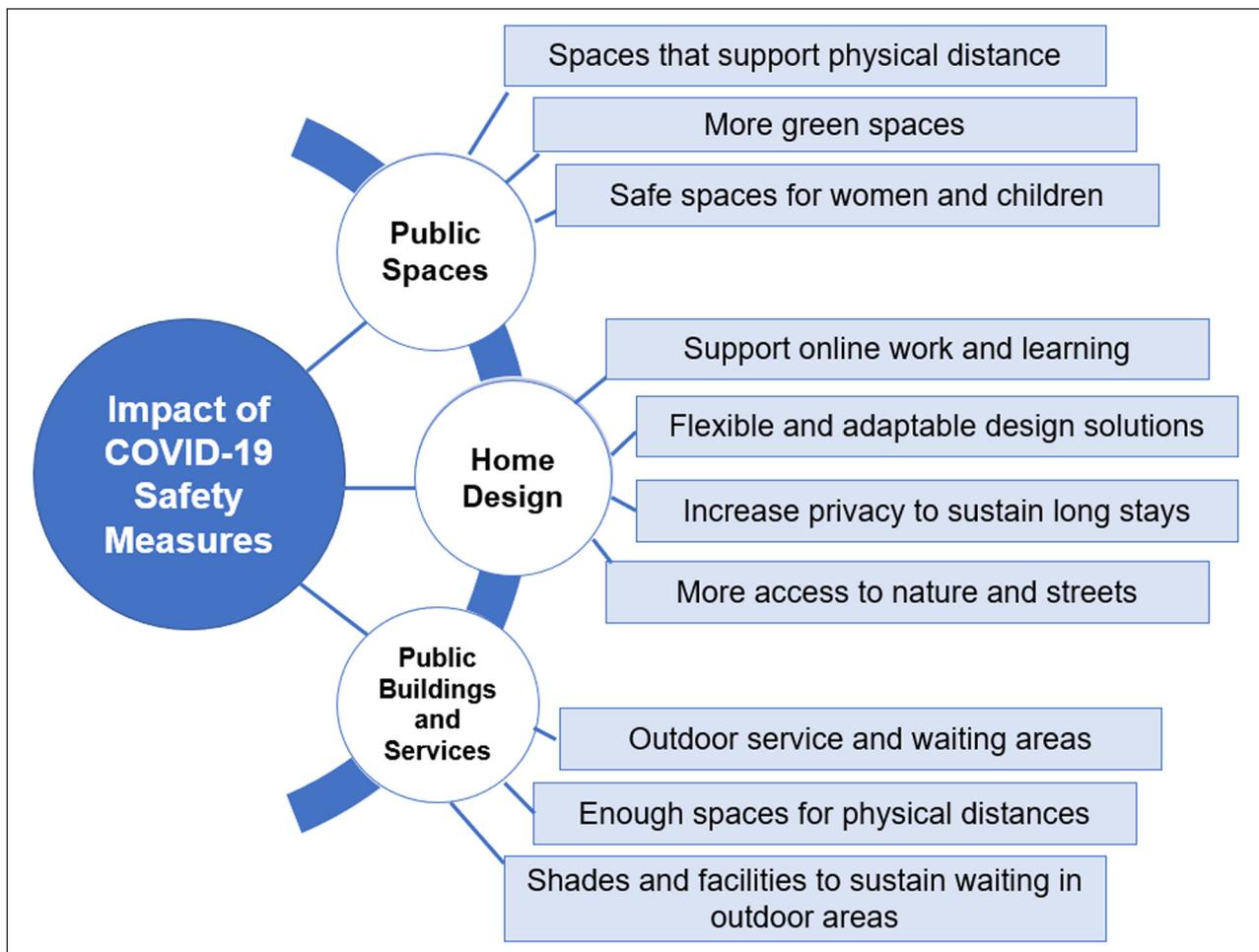
be more encouraged to adapt to quarantine requirements, especially in hospitals. Building design will focus on improved ventilation, green spaces, waste management, flexible architectural design and sustainable water and energy systems (Tokazhanov *et al.* 2020).

Such as the digital world is vulnerable to viruses, our physical environment has been attacked by the new coronavirus. Designers should develop antivirus design solutions. These new techniques will act as a security layer for coming generations to resist spread of infectious diseases, such as in the cyberspace (Megahed and Ghoneim 2020).

The enforced quarantine has transformed how people perceive the built environment. Use of public spaces has been minimized or sometimes prohibited, due to social distancing measures. Offices and learning organizations have been suspended or closed and replaced by work and study from home. As we are currently witnessing the latest pandemic, we can clearly see how it affected mental health and well-being, due to the increasing time spent home and physical isolation. These will be key aspects that affect the design of future homes. The built environment can facilitate mental recovery and influence our psychology, according to the Restorative environmental design theory. Exposure to nature can

also renew our depleted resources due to the various distractors that we face all day. The current high-rise apartment buildings, widely spread in Egypt, do not offer a restorative environment. Improvements in housing design can offer more comfort, better health, and higher quality of life for inhabitants. These include focus on nature and views from windows and balconies. High-rise residential buildings are exposed to more risks of infection than detached or low-rise buildings due to the shared spaces such as elevators, staircases, and lobbies. These spaces present a challenge to apply social distancing and hygienic precautions. Contactless technologies will be of great use in the future. Apartments often lack proper access to daylight and natural ventilation in all rooms, impacting the well-being of residents. The placement and size of windows, surroundings and views will be major criteria in future real-estate market. Homes must act as restorative space for dwellers in times of crisis and should offer separate bedrooms and bathrooms for those infected. Balconies should also consider distancing between other balconies (Peters and Halleran 2020).

An annual survey was carried out by the American Institute of Architects (AIA) addresses architects and firms to indicate whether request for certain spaces in homes is increasing or decreasing. In July 2020



**Figure 1** Built environment design response to the safety measures of COVID-19 (By Author, based on Peters and Halleran 2020).

(in the midst of the pandemic), results expectedly showed high demand for home offices, compared to 2019 (Figure 2). Requests increased also for sunrooms (rooms that allow abundant amounts of daylight and nature views) and mudrooms (rooms located near entrance and are used to store stuff). Exercise/yoga rooms and multifunctional/flexible spaces were also new additional requests in 2020. Outdoor areas were requested similarly to 2019 (AIA 2020).

### COVID-19 REGULATIONS AND LIFESTYLE IN EGYPT

Different measures were implemented in different countries to fight the pandemic. These measures mainly depended on socio-economic factors. Figure 3 shows the period of the highest measures in Egypt in 2020. A partial lockdown took place, allowing people to commute to their work and go back home by sunset. Schools and

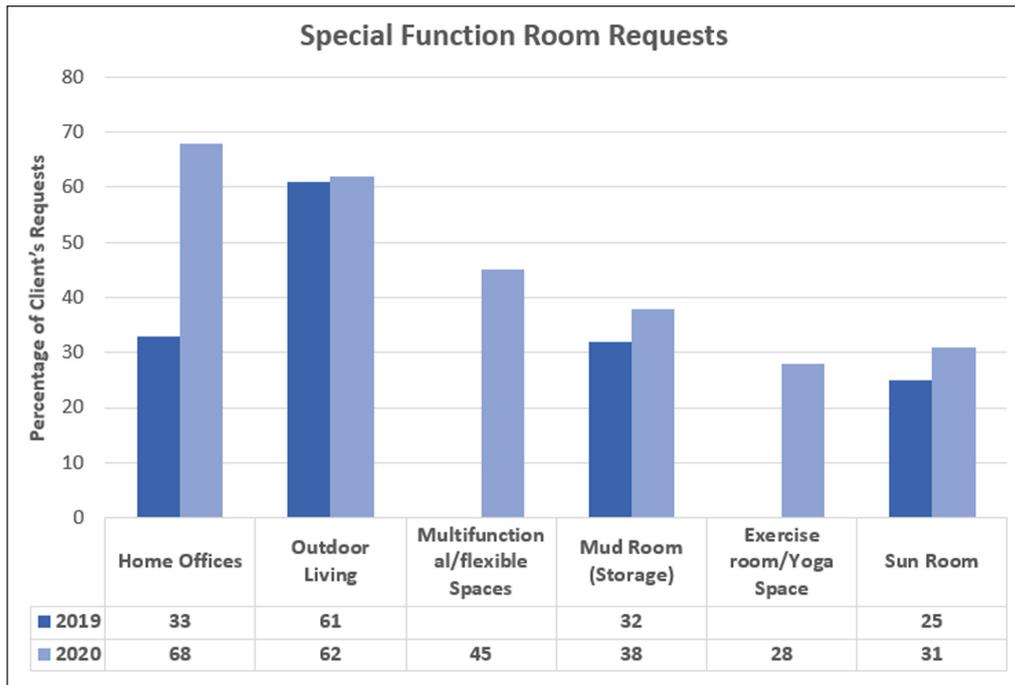


Figure 2 The chart shows the percentage of increasing or decreasing clients' requests for certain rooms in both 2019 and 2020 (the year of the pandemic). Some requests were new in 2020 such as multifunctional/flexible space and exercise/yoga room (By Author, adapted from AIA 2020).

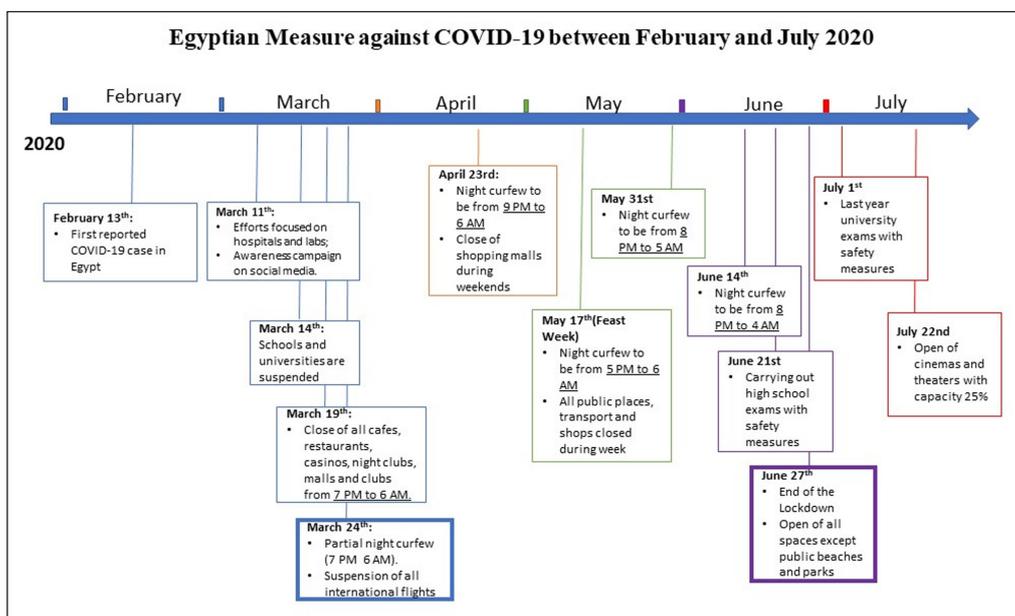


Figure 3 Diagram showing the key events and measures undertaken by the Egyptian government against COVID-19 during 2020, from the beginning to the end of the lockdown (By Author, Data collected from the Egyptian Cabinet of Ministries official website).

universities were suspended. Cultural and touristic events were banned, along with public gatherings and prayers. Employees of the public sector were reduced by half. Only basic services, such as supermarkets and pharmacies remained open (OECD 2020). Many companies allowed working from home. This partial lockdown lasted from late March to late June 2020. During that period, children suffered from fear and anxiety, reflecting their parents' fears. Many people coped with the boredom, stress, and lost jobs by adopting new hobbies. Cycling, kiting, and cooking were very popular activities during the pandemic. Many Egyptians, mostly women, started their new online businesses in the time of lockdown (AL-SHAMAA 2020). Social media played a major role in connecting people and providing social interactions. It became very important for homes to provide more private spaces to allow online working and learning.

## A HISTORY OF THE ROLE OF BALCONIES

A balcony is defined in the Cambridge Dictionary as *an area with a wall or bars around it that is joined to the outside wall of a building on an upper level*. This compact urban pattern takes over the availability of private or public green spaces and courtyards. These are replaced by balconies as a connection to the outside world. Balconies have the potential to improve social life and well-being and improve spatial spaces in both quantity and quality. Balconies have historically acted as a buffer zone for private indoor spaces. They have also been used as a passive design solution in vernacular architecture to preserve energy indoors. An open balcony can lower the energy needed for cooling in summer by about 12%. They also improve the environment (Ribeiro *et al.* 2020).

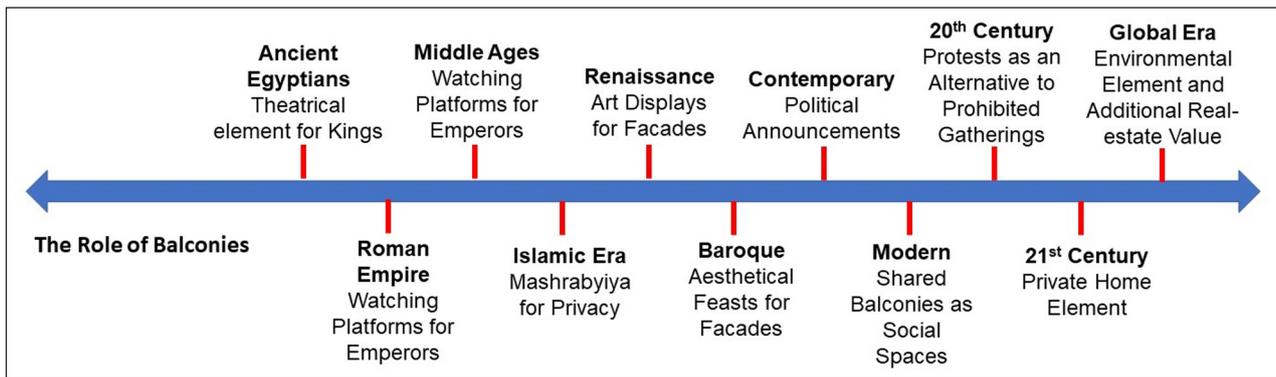
During the lockdown period, the importance of balconies increased. It became a gateway to observe the world, as observing is the only allowed means to participate, in times of pandemics. The old function of balconies, as a social element, is finally restored, as Makkox (an Italian cartoonist) said, "*balconies were the first social media*". Language also provides a clear overview on the function of balconies through history. "balconear" is a verb in Spanish that refers to the act of watching closely from the balcony, without participation (Origoni and Origoni 2020).

The role of balconies has been evolving according to social and culture aspects. Archaeologist Barry Kemp demonstrates that balconies were theatrical elements for kings in Ancient Egypt, to speak down to the crowds. While in the Roman Empire, an open-air platform was built for emperors to watch fights from a perceived place by the public (Traverso 2020). During the Middle Ages, the role of balconies dramatically transformed

to the equivalent of a nowadays toilet. A common Roman practice involved collecting human waste at night and throwing it from the balcony over the streets. In Islamic architecture, the mashrabiya is a significant element that resembles a small balcony, allowing natural air and sunlight. It also preserves privacy as passers-by cannot view the inside of the mashrabiya, allowing women to observe the streets without being noticed.

At the time of the Renaissance, balconies became art displays, representing the status of owners. A balcony's main function was aesthetic. Balustrades were a fixed ornament. Balconies then became the main element of noble facades in the Baroque period, where complex decorations were used. Facades became an aesthetical feast. Through modern and contemporary times, it has been a ritual for dictators to occupy elevated elements to look down the masses. The announcements of Hitler were held from the palace balcony. On the other hand, balconies became an inspiration for writers and artists. The so famous Shakespearean woman has occupied the balcony in her most famous scene. Juliet's story shows another use for the balcony, which is the only escape from her family to meet her love. She is also facing a different form of lockdown, where her balcony serves as the way to the outside world. The link between balconies and women is very common in history, where women has been kept away at home for centuries, leaving them very limited options to observe the outer world. There, the balcony once again played a significant role in connection and freedom.

During the installation of the new sewage infrastructure and boulevards in Paris (1853–1870), facades were created to represent elegance and balconies were built as the buildings' masterpieces. By the time of modern architecture, balconies have often appeared in photos of the professors and students of the Bauhaus, demonstrating they were more commonly used in architecture. In addition, shared balconies were widely used to connect and access housing units and as social spaces for residents. The balcony represented political change at the 20th century. In Algeria, public gatherings were prohibited during the independence war. Balconies were then used for protests as an alternative, offering, again, an escape from another form of lockdown. By the 21st century, social changes towards capitalism and individualism, transformed the balcony into a private element. Its function became an additional home element that provides protection and privilege simultaneously. In the global era, the importance of the balcony increased and acted as an environmental space, in addition to being the focus of real-estate advertisements. In recent times, technology has taken away our time spent outdoor, and the role of balconies has receded (*Figure 4*) (Origoni and Origoni 2020).



**Figure 4** Timeline showing the significant roles of balconies throughout history from Ancient Egyptians to the Global Era (By Author).

## BALCONIES IN EGYPT

Egypt is an arid country, with a dry hot climate. Most of the country is desert. Winter is mild with rain mostly over coastal zones, while summer is dry. Mean annual temperature is 22.5°C and mean annual precipitation is 33.3 mm (The World Bank Group 2020).

In Egypt, balconies are considered the modern development of the mashrabiya from the Islamic architecture. The balcony resembles the mashrabiya in terms of being a connection to the outside world. Currently, the use of balconies in Egypt is dependent on socio-economic factors. High income areas impose limitations on balcony design, preserving aesthetics of the community. Low- and middle-income areas, which represent the majority of Egypt, lack regulations on the use and design of balconies. A high percentage of balconies in residential buildings have lost their main function, which allows interactions with surrounding environment. Many balconies are currently used for other functions such as storing unused stuff, installing air conditioner units and satellite dishes or accommodating drier racks. Some balconies are even transformed into an indoor area to increase the limited total room space. These alternative uses are usually a result of lack of privacy, lack of climatic solutions, increased street noise or lack of safety. In addition, the small area of the balconies in high density areas doesn't allow for sitting and adding furniture. While the small area of residential units shifts the priority to increasing indoor spaces over keeping the balcony (Abdelmageed 2020).

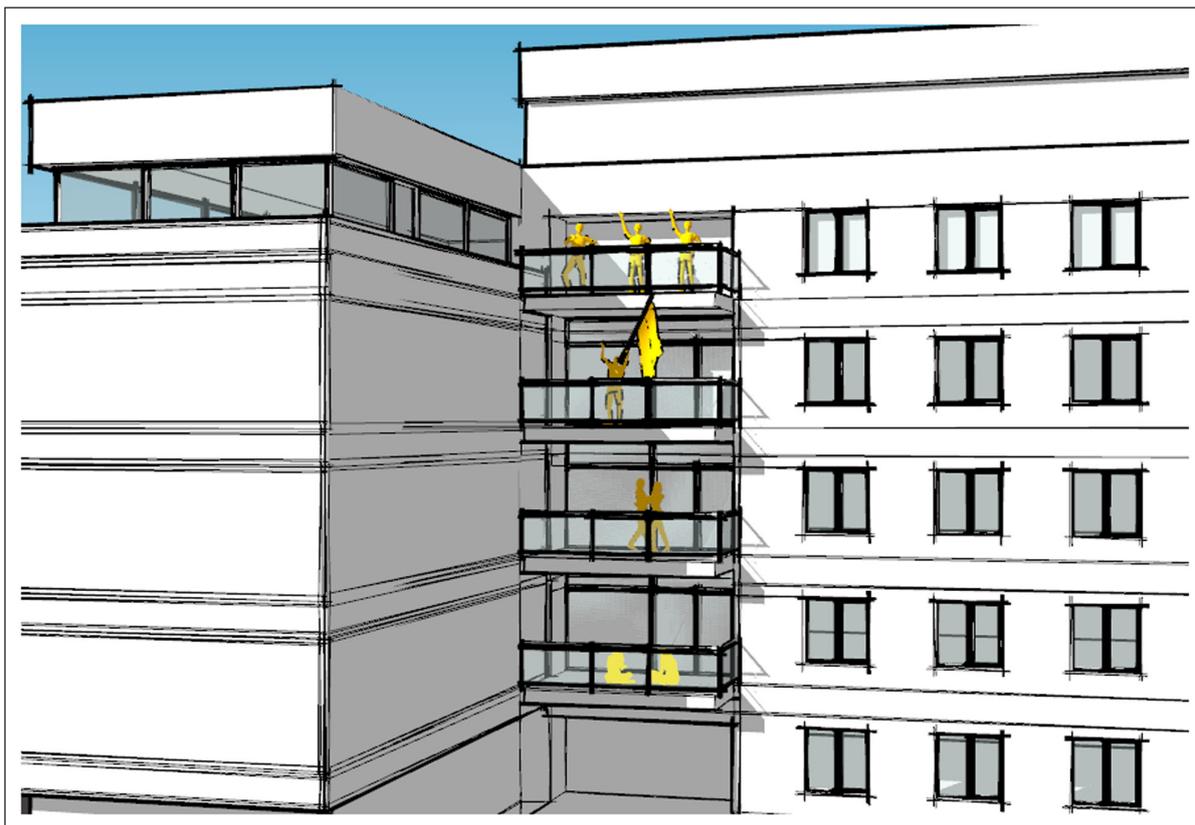
## BALCONIES IN TIMES OF PHYSICAL DISTANCES

During the lockdown, people were trying to look out desperately from balconies to take a glimpse of the world outside. As public spaces turned into completely lifeless spaces. Responsibility was handed out to balconies as the connection to the outer world, offering various functions such as a communication space between

neighbors, allowing performances and activities and acting as a public expression stage in a physically safe space allowing the distancing measures to take place (Grigoriadou 2020).

Balconies offered a means of social connecting with others, without physical contact. Digital social platforms allowed communication and organizing events and performances from balconies, where neighbors can participate physically or virtually. Balconies provided hope and freedom during quarantine time. These provided unity and a sense of solidarity in the community. Performances included singing, opera, and fireworks. These practices spread all over the world in different versions. In Copenhagen, for example, group workout sessions took place from balconies (Traverso 2020). Italians also invented the balcony toasting sticks, where they use long sticks of bamboo with a hoop at end to hold a glass. The neighbors salute each other by the stick and glasses (Ince 2020). In Egypt, some scenes of people singing and playing musical instruments from their balconies were widely spread over the internet. Therefore, the pandemic has proved that balconies have far more benefits than an outer connection to the world (Poon 2020). Balconies provided space for activities that normally took place elsewhere, such as dancing, singing, and social activities, as shown in [Figure 5](#).

During the pandemic, balconies acted as an essential element for providing view, daylight, and nature exposure. Nature helps in reducing stress and anxiety and improving well-being. The value of having access to natural views promotes a deeper consideration of dense urban environments that block views by other buildings. Access to nature, daylight and adequate ventilation have been linked to socioeconomic status during the pandemic. Lower status meant lower access, thus, higher probability of infection and mortality. Thus, the pandemic has presented inequality issues clear enough. The spread of diseases in specific areas, affects in turn others, so those of higher status are also affected due to contact with others at higher risk of infection. This introduced the shared responsibility of reducing the socioeconomic gaps in communities and enforcing proper design solutions



**Figure 5** The illustration shows different uses of balconies during pandemic. Balconies were used as an alternative social interaction space that allows physical distancing. People used balconies for dancing, singing, playing, communicating, and working out with neighbors. Residents of the same unit also used balconies to escape the long stay indoors (By Author).

PERSONAL INFORMATION	LIFESTYLE BEFORE AND AFTER THE PANDEMIC	RESIDENTIAL UNIT	PERCEPTION AND FUNCTIONAL VARIABLES
Age range	Work after the pandemic	Type of housing	Problems of balcony use
Gender	Study after the pandemic	Floor	Importance perception
Highest ducation qualification	Hours at home before and after the pandemic	Balcony size	Priority of having a balcony
Total household income	Hours in balcony before and after the pandemic	View from balcony	Balcony access
Household structure and number			Activities
City of residence			Upgrade

**Table 1** Categories of questions in the questionnaire.

in buildings for different income categories. Balconies should have enough space for exposure to sunlight, which is crucial in times of lockdown (Peters and Halleran 2020). Studies have shown that access to green areas improves the mental and physical health of residents, in addition to providing climatic and ecological benefits. It has also been proven that they lower stress levels, balance emotions, promote physical activities and encourage social engagement, which facilitates healing. In addition, vegetation enhances the sense of belonging, thus reducing crimes (D’Alessandro *et al.* 2020). Apartment buildings are often considered resilient when they are able to withstand power and water cutdowns for long periods. We need to consider pandemic-resilient homes. Social media has also highlighted the importance of having private balconies since the start of the pandemic. A hashtag (#balconygarden) has widely spread to reach about 533k posts on Instagram (AccomNews 2020).

## SURVEY AND RESULTS

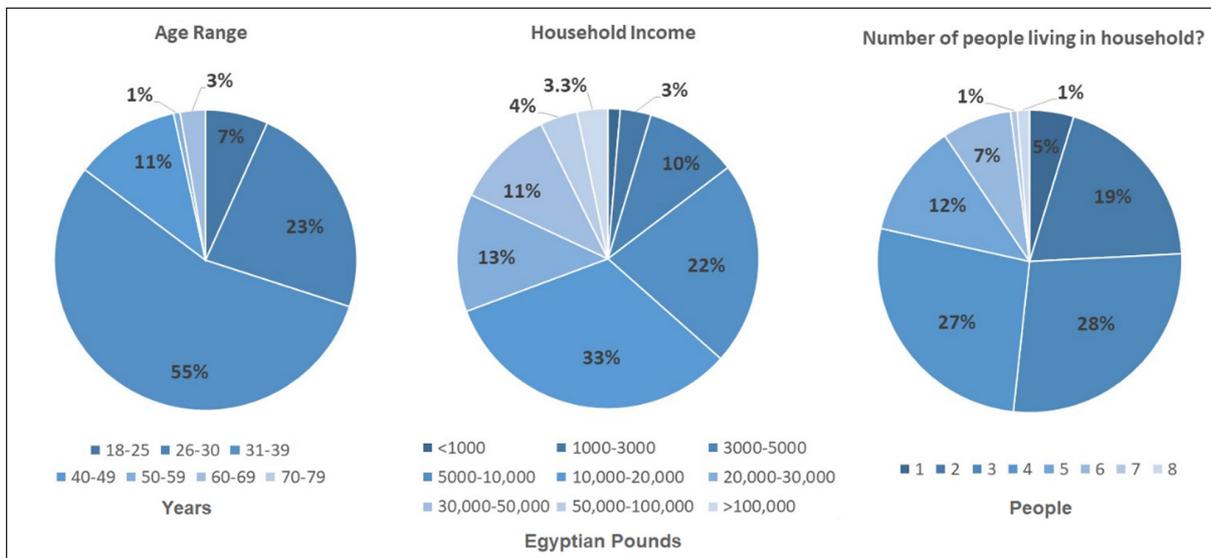
An online survey was conducted to gather information on the perception of the importance of balconies in post-pandemic Egypt to recognize the new design needs that have emerged. The survey was conducted during July 2021 and its participants were 150 Egyptians. It was distributed among acquaintances, social media groups and interested individuals. All participants answered the survey voluntarily and almost 90% of them live in Cairo, the Egyptian capital, which is convenient as it is the most populated city in Egypt. The survey is composed of four categories of questions (*Table 1*). It started by personal information such as age, gender, household structure... etc. Then, it moved to questions about lifestyle changes after the pandemic and characteristics of the residential unit and balcony of the respondent. Finally, questions focused on the perception of the value of balconies for

the respondents, and how the function of balconies were affected after COVID-19 and what changes have the respondents made or would prefer to make in the future. The main objective was to find out what are the new post-pandemic needs that should be considered when designing a home, regarding the balcony.

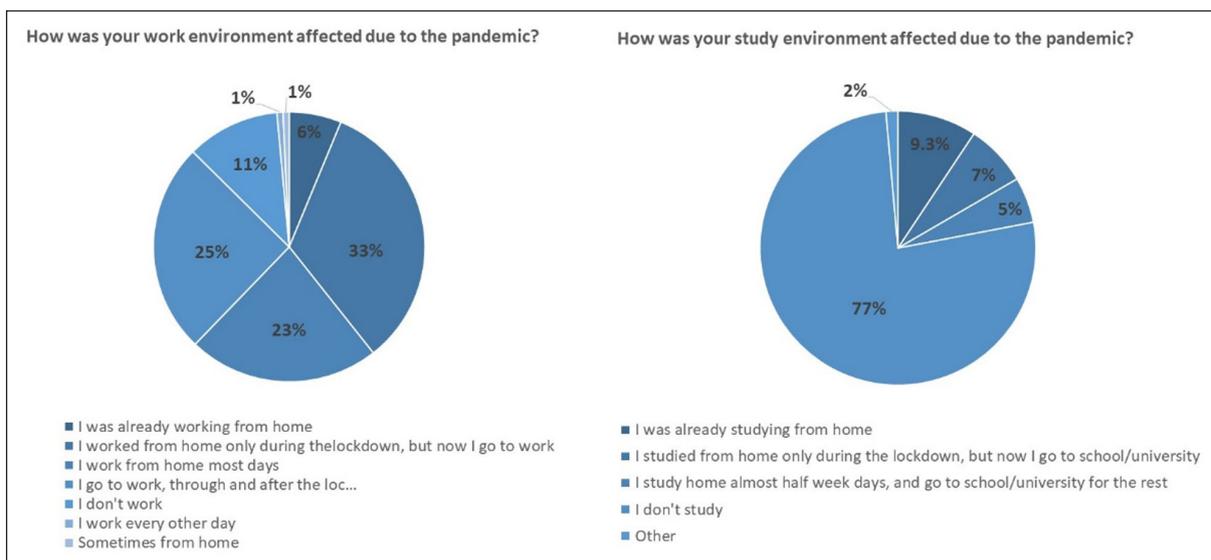
Over half the respondents were in their thirties and almost a quarter were in the 26–30 age range. No respondents were under the age of 18. Almost 80 percent of participants were females, even though the questionnaire was distributed equally. When asked about the last degree acquired, nearly half answered that it is their bachelor's degree, while 44% stated that their latest degree is a postgraduate one. The total household income varied greatly, with more than half the answers between 5000 and 20,000 L.E/month. Also,

most respondents live with either their parents or their partner and children. About 60% of the respondents' households contain three or four persons (*Figure 6*).

In the second section of the survey, concerning lifestyle changes before and after the pandemic started, respondents were asked about how their work or study was affected. When asked about work, 33% stated that they only worked from home during the lockdown, while 25% still work from home most of the days. 23% stated that they work lifestyle didn't change. On the other hand, when asked about study, only 23% of the sample stated that they study. About 9% said that they study from home before and after the pandemic, while the rest have stayed home during the pandemic. Only five percent are integrating remote learning with going to school/university after the pandemic (*Figure 7*).



**Figure 6** The chart on the left shows age groups of the questionnaire respondents, the middle chart shows household income for the respondents, while the chart on the right shows the number of people living in household (By Authors).

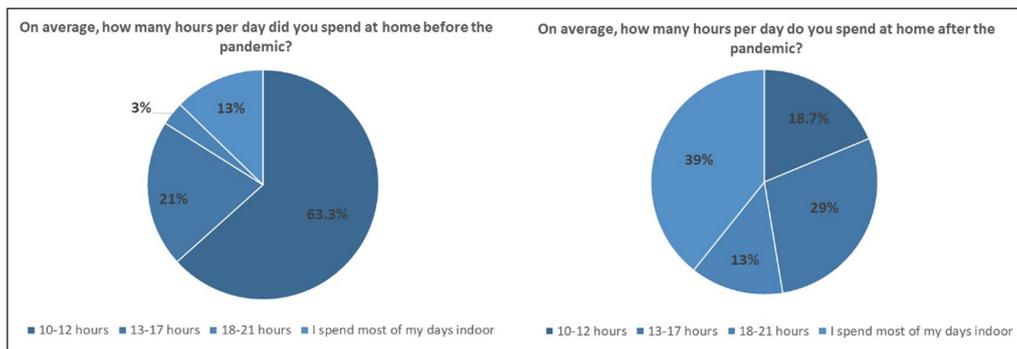


**Figure 7** On the left, the chart shows how the pandemic affected work lifestyle for the respondents, while on the right, the chart shows study lifestyle changes (By Authors).

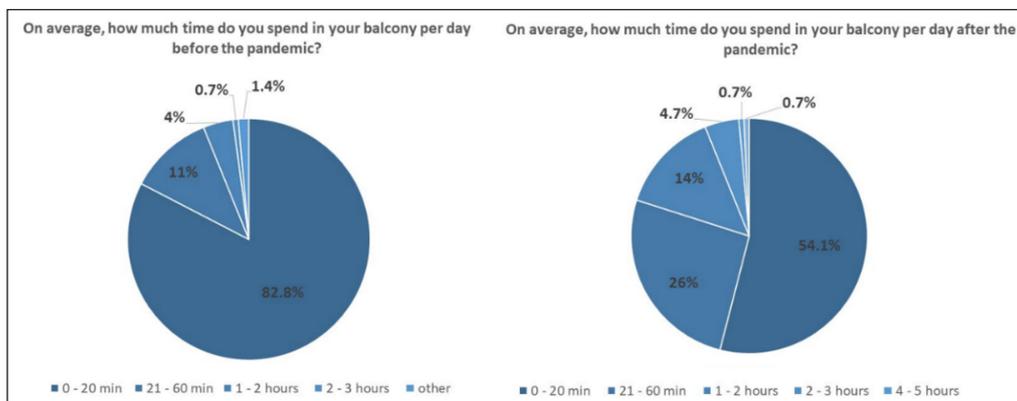
Charts on **Figure 8** shows how much time respondents spend at home before and after the pandemic. About 63% spent only 10–12 hours at home before the pandemic, compared with 19% after it started. 39% said that they spend most of their days indoors now, compared to only 13% before the pandemic has started. The same goes for time spent in balcony before and after the pandemic started (**Figure 9**). The majority of the respondents (about 83%) spent 0–20 minutes in their balcony before the pandemic started. 11% spent from 21 to 60 minutes and a very small percentage spent

up to 3 hours. The figure changed after the pandemic started, where 54% of the respondents spent 0–20 minutes and 26% spent 21–60 minutes. Also 14% said that they spend up to three hours in their balcony and one respondent spends four to five hours daily in their balcony (this time range did not exist in the responses before the pandemic).

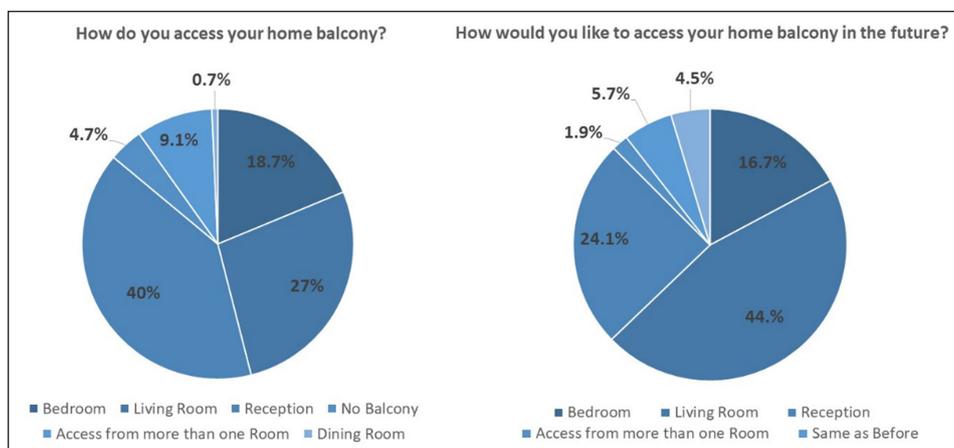
The majority (61%) of the respondents’ balconies are 2–8 m<sup>2</sup>. 25% have a balcony that is 9–15 m<sup>2</sup> and 7.4% have larger balconies. By looking at the charts in **Figure 10**, 40% of the respondents access their balcony



**Figure 8** The charts show the difference in time spent at home before and after the pandemic started (By Authors).



**Figure 9** The charts show the difference in time spent in balcony before and after the pandemic started (By Authors).



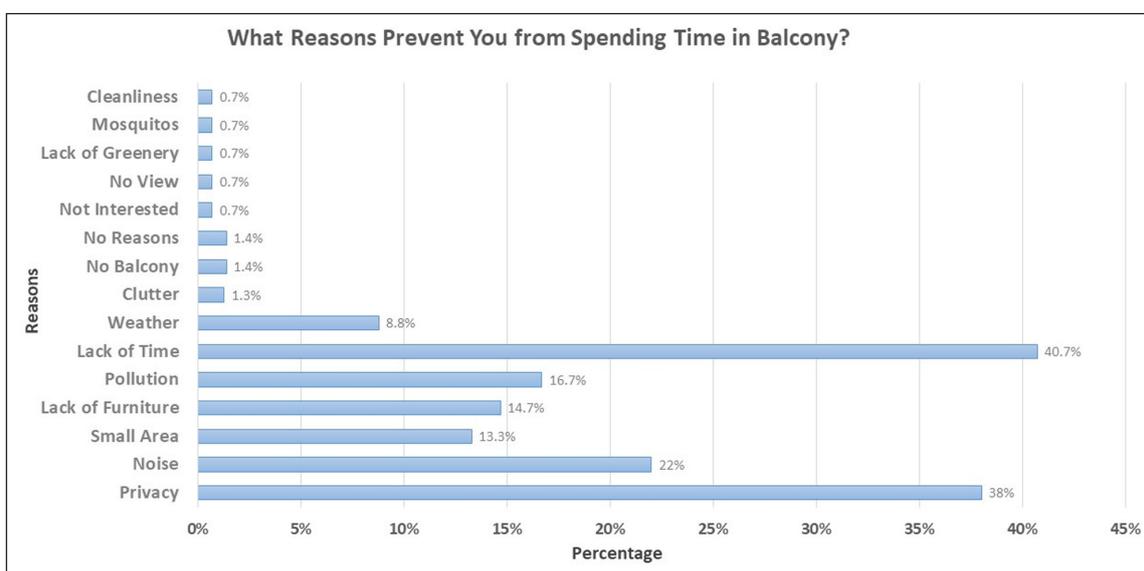
**Figure 10** Respondents were asked how they access their balcony, then they were asked how they would prefer to access it, if they were to choose (By Authors).

from the reception. 27% from the living room and 19% from a bedroom. When asked if they were satisfied about their balcony access, only 20% stated that they are not. In response to their preferred balcony access, 44% stated that they prefer to access their balcony from the living room, 24% from the reception and 17% from the bedroom. Only 1.9% prefer access from more than one room.

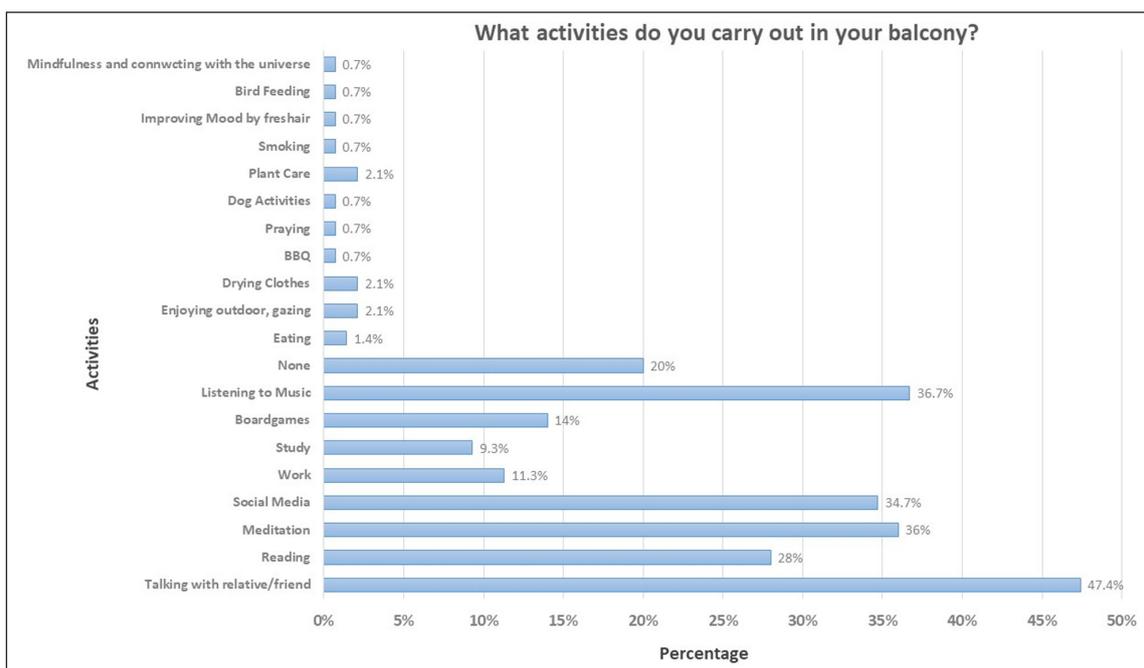
Asked about the view from balcony, 46% stated that they do not have a view of a green area or park, while almost the same percentage can see a green area from their balcony. The respondents were asked about the reasons that prevent them from spending time in their balcony. About 41% of the respondents selected

lack of time as their main obstacle, followed by privacy issues (38%), then noise (22%). Pollution, lack of furniture and small area of the balcony were selected by percentages 16.7, 14.7 and 13.3 respectively. 8.8% stated that weather is also an issue. Other reasons included clutter, no interest in spending time in balcony at the first place and lack of view and greenery (*Figure 11*).

In *Figure 12*, the respondents selected the activities carried out in their balconies. Almost half the respondents use their balconies to talk or socialize with a relative or friend. Solitary activities such as listening to music and meditation, using social media, and reading follow. It is shown that 11% use their balconies to work and 9% use



**Figure 11** The bar chart shows the reasons preventing the respondents from spending time in their balconies (By Author).



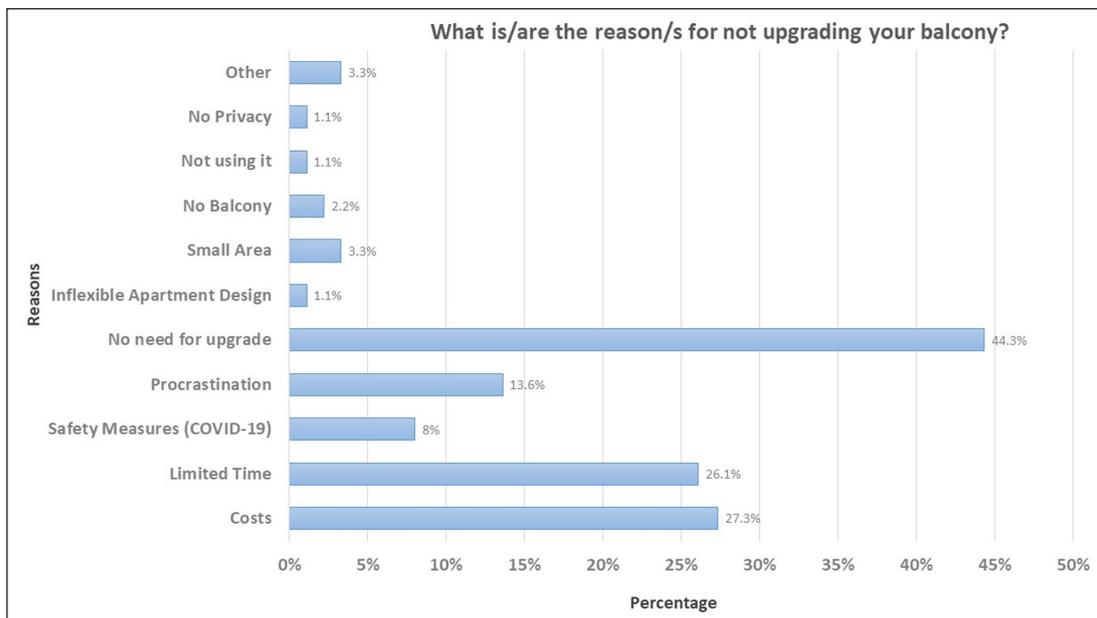
**Figure 12** The bar chart shows the activities done by the respondents in their balcony (By Authors).

it to study. A small percentage stated that they use their balcony for drying clothes, eating, plant care and other activities.

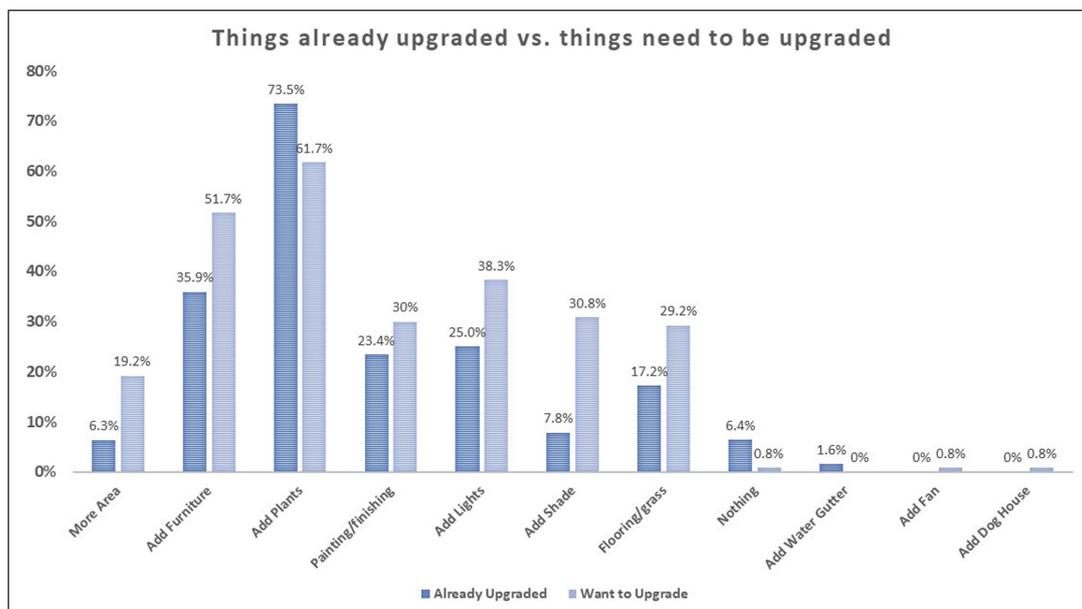
In the last section, respondents were asked if they have upgraded their balcony since the pandemic started. 28% has already upgraded their balcony, and 17% are planning to. Those who didn't upgrade their balconies were asked to select the reasons. 44% stated that their balcony does not need upgrade. 27% did not upgrade due to costs, followed by limited time. Procrastination was also one of the reasons for 14% of the respondents. Other obstacles included balcony area, privacy, and apartment design (*Figure 13*).

*Figure 14* shows the upgrades already made by the respondents compared to those they need to make. 73% have already added plants, 34% have added furniture and 25% have added light. Paintings constitutes 23% of the upgrades, while flooring upgrades represent only 17%. Only 8% have added shade. When asked about the upgrades they would like to make, still, the majority wanted to add plants, followed by furniture then lights. Up to 31% want to add shades. About 30% want to upgrade paintings and flooring. 19% wish to add more area to their balcony.

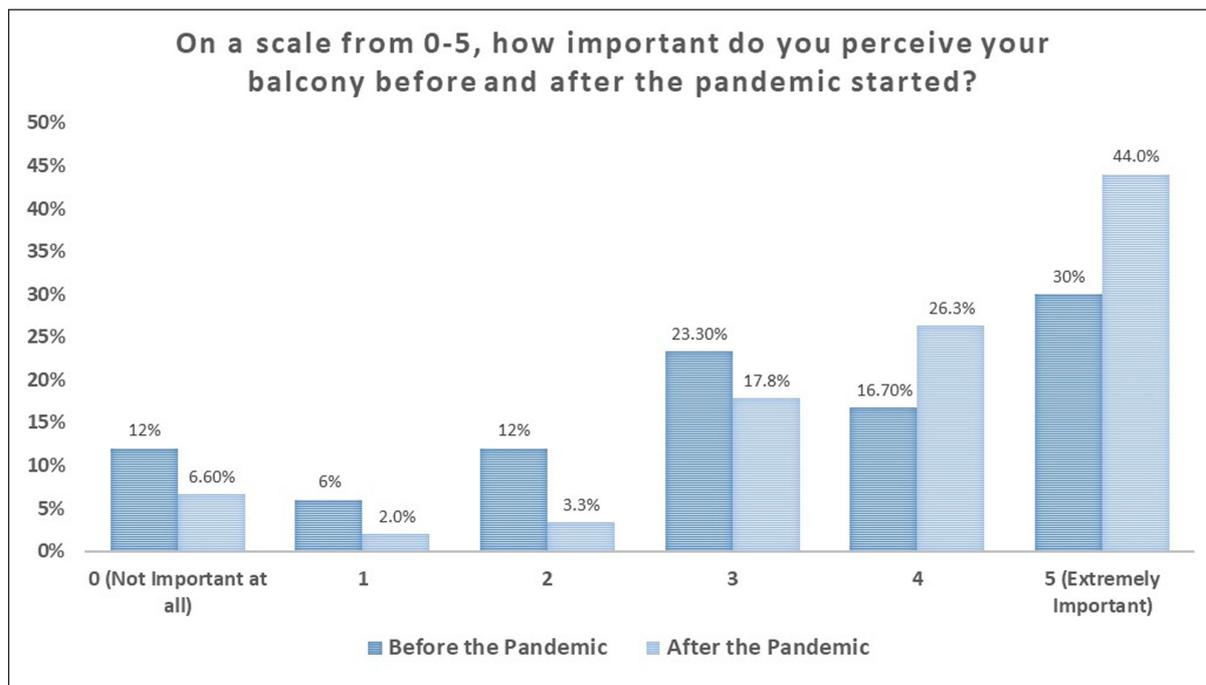
Finally, respondents were asked to rate their perception of the importance of balconies before and



**Figure 13** The chart shows the reasons respondents haven't upgraded their balconies since the pandemic started (By Author).



**Figure 14** The chart shows the upgrades undertaken by the respondents compared to those that they want to upgrade in the future (By Authors).



**Figure 15** The chart shows the respondents' perception of the importance of balconies before and after the pandemic, on a scale from 0 (not important at all) to 5 (extremely important) (By Authors).

after the pandemic started. As in **Figure 15**, before the pandemic, 12% perceived balconies as not important at all, compared to almost half the percentage after the pandemic. 16.7% rated the balcony importance at 4 before the pandemic, compared to 26% after. 44% stated that they perceive balconies as *extremely important* after the pandemic, compared to 30% before.

## FINDINGS AND RESULTS

From the survey results, people spend more time indoors after the pandemic has started, where 39% of the respondents spend most of their days indoors. Also, the time spent in balconies has increased dramatically. About almost half the respondents spend now more than 20 minutes in their balcony, compared to only 16% before the pandemic. The survey showed that privacy, climate adaptation, proper furniture and a convenient area are critical in determining the use of balconies.

Using Excel, we were able to check the correlation of the results applied on those who took the survey. The Pearson's correlation ( $r$ ) scale is used, where it is considered negligible when  $r < 0.1$ , weak when  $r = 0.10$ – $0.39$ , moderate when  $r = 0.4$ – $0.69$ , strong when  $r = 0.70$ – $0.89$  and very strong when  $r = 0.90$ – $1.00$  (Schober *et al.*, 2018). The highest correlations were found to be weak using the mentioned scale. The strongest correlations in the survey are mentioned as follows:

For those who responded to the survey, working from home was slightly correlated with more time spent in balconies after the pandemic, where  $r = -0.02$ . Correlation between age, income and number of

people living in household and time spent in balcony after the pandemic was negligible. While there was a weak correlation between the respondents' satisfaction about balcony access and the time spent in balcony ( $r = 0.2$ ).

Meanwhile, spending more time in balcony was also correlated with upgrading it ( $r = -0.22$ ). Weak (but highest) negative correlation was also found between both number of people living per household and the highest degree attained with upgrading the balcony ( $r = -0.2$ ). Correlation between the perception of the importance of balcony after the pandemic and upgrading was found to be  $r = 0.25$ . Upgrading the balcony through adding furniture has the highest correlation with time spent in the balcony ( $r = 0.24$ ), compared to other elements of upgrade. And its correlation with work environment after the pandemic is almost the same ( $r = 0.23$ ).

The number of people living in an apartment, is correlated with the priority of balcony in selection of a future apartment, where  $r = 0.2$ . The perception of the importance of balcony after the pandemic correlated with the household structure ( $r = 0.22$ ), hours spent in balcony after the pandemic ( $r = 0.26$ ), and the priority of balcony in a new apartment ( $r = 0.26$ ).

## CONCLUSION AND RECOMMENDATIONS

The pandemic has forced many people to develop a new relationship with their homes. As people spend more time indoor after the pandemic has started, their needs for a connection to the outer world increased. Balconies became the means to connect to the city, while keeping

physical distances. Over the world, people used balconies for social interactions, while keeping safety measures. In Egypt, too little data was found about the use of balconies before and after the pandemic. Using the online survey, we gained an insight that provides a foundation for post-pandemic home design and further research. Age, income, and household structure have almost no impact on the use of balcony, according to the survey results. Number of people in household has relatively more impact. It was found that people mainly use balconies for social activities, listening to music, reading, social media and meditation. These activities require quietness, privacy, and a good sitting area. Additionally, the survey showed that pollution, weather conditions and small area are key reasons for not using the balcony. Another finding is that the most common balcony upgrades are adding plants, furniture, lights, paintings, and flooring. Other aspired upgrades are adding shades and increasing the area of the balcony. The perception of the importance of balcony after the pandemic increased among respondents, compared to before the pandemic has started.

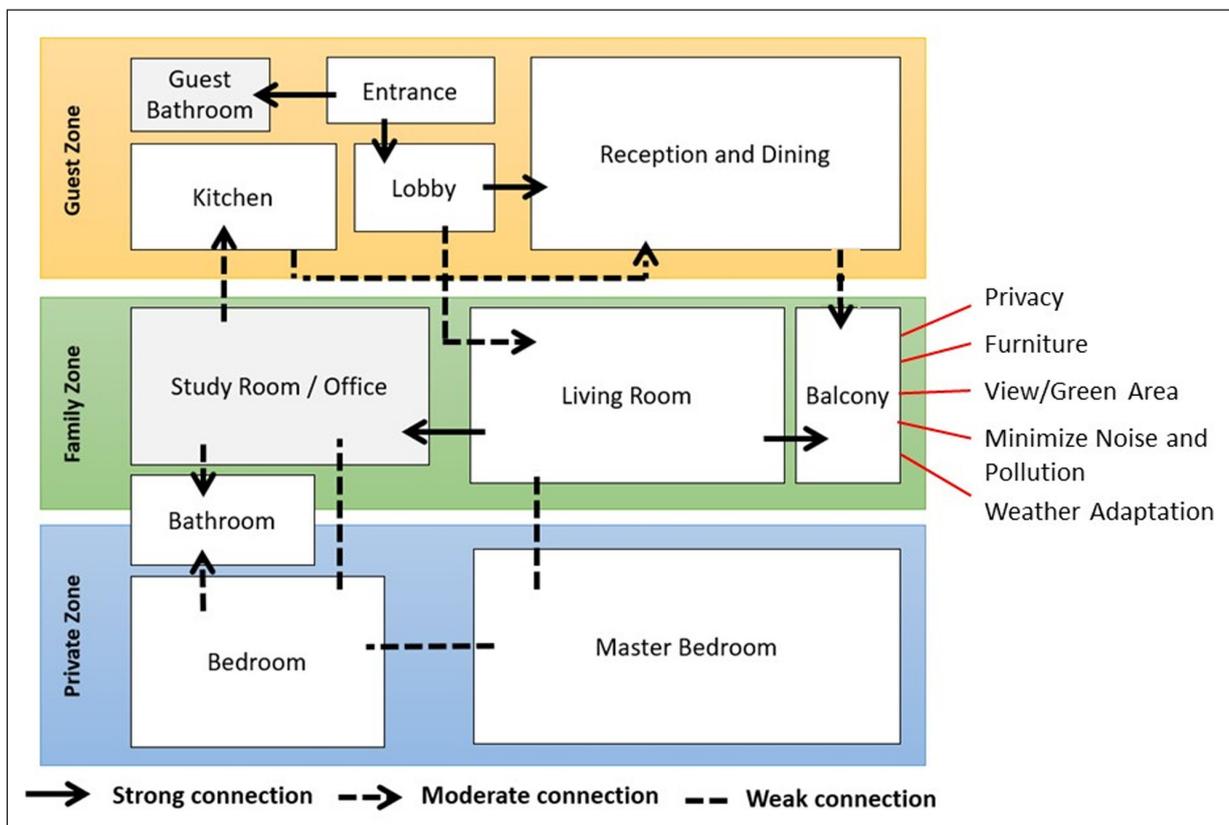
### RECOMMENDATIONS

Based on the literature review and the results of the online survey, the following recommendations, arranged

by priority, are provided for urban designers, architects, interior designers, and homeowners to make their homes more pandemic-resilient (*Figure 16*):

- Promoting privacy through ensuring sufficient spaces between buildings, changing the orientation of balconies, or using screens.
- Balconies should be far from main or crowded streets to avoid noise and pollution.
- Plants should be added in balconies to decrease pollution
- Furniture should be provided, at least in the form of a sitting area for two people, to allow socializing, work, and study.
- Balconies should have a suitable area to accommodate furniture and plants.
- Balconies should be oriented based on climatic conditions and shades should be provided to protect residents from heat or rain.
- Balcony access is best provided from the living room, and preferably from an additional room.
- Whenever possible, a view of trees, green areas or park should be a priority.

Further studies should be undertaken to gain deeper insight on Egyptians' lifestyles after COVID-19 and their effect on the role of homes.



**Figure 16** Proposed zoning for an apartment based on the literature review and survey results. Direct access to a guest bathroom from the entrance is mandatory for health precautions. A study room or office is also important for post-covid home design. Balcony access is preferred to be from the living room, along with another access point (By Authors).

## COMPETING INTERESTS

The authors have no competing interests to declare.

## AUTHOR CONTRIBUTIONS

This article is the result of a joint effort. All authors read and approved the final manuscript.

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