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Personal Green Spaces During the Pandemic - Perceptions Towards Urban Home Gardens During the COVID-19 Pandemic in Bengaluru, India

Varsha Bhaskaran

University of Missouri Columbia, vb8qz@mail.missouri.edu

Charles Nilon

University of Missouri-Columbia, nilonc@missouri.edu

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Personal Green Spaces During the Pandemic - Perceptions Towards Urban Home Gardens During the COVID-19 Pandemic in Bengaluru, India

The COVID-19 pandemic has brought about unprecedented changes in a short span of time to people's life and living. Being in a lockdown, especially in urban areas, has led to changes in the way people perceive nature around them and within their homes. Research on this topic in the cities of the global south has been limited with even fewer studies in Indian cities. To begin to address this gap, in this exploratory study we interviewed 30 residents of Bengaluru, India to understand how they perceived the changes they experienced in their home gardens and in the nature around their neighborhood due to the 2021 Covid-19 lockdown. A common observation was that most respondents felt the lockdown had led to an increase in their curiosity and observation towards nature. Some respondents highlighted that their enthusiasm towards gardening had increased. Participants also recognized the importance of home gardens as a safe outdoor space where they can enjoy nature. However, there were a few respondents who mentioned that they did not observe any imminent changes in the environment around them, due to the lockdown. While the lockdown has implications on a global scale, further research is needed to assess the changes at local scale to understand the impacts on people and nature.

Keywords

COVID-19, Global South, Bengaluru, Home Gardens, Perception

INTRODUCTION

Urban home gardens support biodiversity and are important urban green spaces (Jaganmohan et al. 2012; van Helden et al. 2020b). Home gardens improve livability in cities by regulating microclimate (Tomatis et al. 2023), providing habitat for birds (Goddard et al. 2017), insects (Jaganmohan et al. 2013) and small mammals (van Helden et al. 2020a), and by their potential to provide food security in certain regions (Algert et al. 2016). These benefits provided by home gardens are influenced by garden owners' decision on garden design, plant selection and gardening practices (Larson et al. 2022). Urban home gardens act as personal green spaces to owners and provide multiple benefits ranging from health and wellbeing to nature connectedness (Calvet-Mir et al. 2012; Cameron et al. 2012; Hanson et al. 2021). Studies pointing to physical and physiological benefits of gardening report that the main motivations for having urban home gardens are the feeling of joy and pleasure gardening brings (Chalmin-Pui et al. 2021).

Home gardening is a valuable means for nature connectedness. This attribute was amplified during the 2020-2022 COVID-19 pandemic and subsequent lockdown (Samus et al. 2022; Wu et al. 2022) when people across the world were forced to stay at home. In a study comparing garden owners and non-garden owners in Germany, Lehberger et al. (2021) noted higher self-reported life satisfaction and mental wellbeing among the former group. Other studies reciprocate these findings. In a study from India, respondents linked spending more time in home garden with reduced stress and anxiety during the lockdown (Basu et al. 2021).

Urban habitat was enhanced for some species due to reduced human activity during the lockdown (Coman et al. 2022). Decrease in vehicular movement and other activities led to decreased noise levels in cities across the globe (Asensio et al. 2020; Terry et al. 2021; Mishra et al. 2021; Caraka et al. 2021). Citizens spending more time in their home gardens and other green spaces observed increased clarity in bird calls, increased wildlife sightings and heightened sensory experience towards nature and wildlife (Marsh et al. 2021).

Lin et al. (2021) noted global trends suggesting that home gardening peaked during the initial year of the pandemic. Studies ranging from the early days of the pandemic in 2020 to post pandemic in 2023, showed that motivations for gardening included personal and community wellbeing, food security, and opportunity to spend time outdoors (Cattivelli 2023). These diverse motivations for maintaining urban gardens during the pandemic are similar to those previously documented for home areas in cities across the global north (Taylor & Lovell 2014). In contrast residents' motivations towards urban home gardens are relatively unexplored in the global south.

There exists a gap in literature in urban ecological studies in the global south. Botzat et al. (2016) found that most studies focus on cities in temperate climates with histories of past urbanization, while a majority of the newly urbanizing centers are in tropical areas. Urban ecological investigations in cities of the global south are gaining importance. But the themes explored in these regions are largely limited to urban agriculture and food security. This study seeks to address this gap in knowledge by exploring perceptions towards urban home gardens during the pandemic in the context of an Indian City. This paper uses qualitative methods and employs grounded theory, as this is an exploratory study in the Indian context. In grounded theory, the central theory emerges from the collected data and is rooted in the experiences and

accounts of the respondents in this setting. In this context our paper addresses two research questions:

1. How did the pandemic influence people's focus on and perceptions of home gardens in Bengaluru?
2. What do these perceptions mean for the future decisions respondents take towards their home garden?

METHODS

The study was conducted in Bengaluru, a mega city and the capital of the South Indian State of Karnataka. Bengaluru is the third most populous city in India with a recorded population of 8.7 million (Census of India 2011) and a current estimated population of over twelve million. It is one of the fastest growing economies in India with an annual growth rate of 38%. The city has seen major changes in terms of infrastructure and green spaces since the late 1900s. The rapid increase in built-up area has led to a decrease in green cover. Green cover in the city now lies below 15%, a rapid decrease from around 70% in 1973 (Ramachandra et al. 2017).

Participant Recruitment and Data Collection

The study was conducted for a period of two months between June-July 2021, just as the second wave of the COVID-19 pandemic was beginning to wane and the lockdown restrictions were being lifted in India. India had imposed a strict nation-wide lockdown in 2020 and 2021. The country was under complete lockdown from March to May in 2020 and partial lockdown from May to October 2020. In 2021, due to an increase in COVID-19 infections in March, many states including Karnataka imposed state-wide lockdown between March and June 2021 restricting people to their homes. People were allowed to leave their homes only in case of emergency and to buy essentials like groceries or medicines. At the time of this study, respondents had been confined to their homes for roughly a period of 11 months between the period of March 2020 to June 2021.

As this study was exploratory in the context of Indian cities, grounded theory was employed (Glaser et al. 1968), allowing the central theme to emerge from the collated data rather than testing a hypothesis. The idea behind data sampling in grounded theory is to select participants who will best contribute to the understanding of the problem and the research question. This was done by identifying single homes with gardens and asking the garden owners for their consent to be interviewed. Garden owners were initially recruited by posting an advertisement about this project on social media groups targeting urban home gardeners. Group members who consented to be a part of the study were interviewed. Home gardeners who were not part of social media groups were recruited through convenience sampling. Consequently, the majority of participants were recruited based on the recommendations of the initial participants (snowball sampling). This type of participant recruitment was conducted as it was difficult reach out to garden owners in the city without prior acquaintance. In-person and online (Zoom) interviews were conducted by the first author with a total of 30 participants. Only individuals aged 18 years and older were recruited for the study.

The interviewer read a detailed description of the project to each participant followed by reading a statement asking the participant's consent to participate in an audio-recorded interview. After giving their consent, participants were asked to fill out a questionnaire with demographic questions on age (18-25 years, 26-35 years, 36-45 years, 46-55 years, 56-65 years and 65 years and above) gender (open-ended question), occupation (working, retired, student, homemaker) and level of education (open-ended question); hours spent in gardening activities; and home garden characteristics. There exists no formal classification of home gardens. For this study the gardens were classified into five garden types based on their location in and around the residents' home (Table 1).

Table 1. Home garden classification type and description.	
Type of garden	Garden description for the study
Yard garden	Garden space in front of the residential building or behind the residential building, within the compound walls of the plot.
Rooftop garden	Garden on the rooftop of the residential building
Balcony garden	Garden/Plants located in the balcony, patio, or any other extended part of the main residential building.
Community garden	A common garden space usually located adjacent to the residential building but maintained collectively by the residents of the neighborhood
Plot garden/Street garden	Garden maintained on a vacant plot usually adjacent to the residential building or outside the compound wall of the residential building on the street. These types of gardens are usually developed in plots not owned by the homeowner

Participants were interviewed after completing the questionnaire. The interviews were semi-structured based on three open ended questions: 1. How has the COVID-19 pandemic and the associated lockdown changed the nature around your house? 2. Have you noticed any changes in biodiversity in your garden? 3. Do you see a future expansion of garden in your house? The interviews were conducted in both English and Kannada, the official language of Bengaluru (the first author is fluent in both languages). The interviews were translated to English (where required) and transcribed. The interviews lasted about 20-40 minutes, with an average of 30 minutes per interview. The survey and interview protocol were approved by the University of Missouri's Institutional Review Board (IRB# 2058702 MU).

Data Analysis

A multi-step analysis based on Grounded theory was used in this study (Figure 1). The transcribed interviews were coded using the coding software, Quirkos (Quirkos 2.5.2 [Computer Software] 2022). We then employed open coding, axial coding and conceptualizing data to identify the central theory regarding participant perceptions towards nature and home gardens during the pandemic (Table 2). The first step in the grounded theory process is called open coding. This includes sorting memos where each response by the respondent is sorted as a single phrase (Sorting Memos column, Table 2), these phrases are then restated for better description of what each phrase mentions, in a process called restating key phrases and lastly each restated phrase is labelled. In this study each restated phrase in open coding was labelled as a1, a2, a3, ... with a total of 109 items being obtained by the end of open coding (Labelling column, Table 2). In the second round of coding called axial coding, the 109 labels were further grouped to form concepts. This step was done by constant comparison, where each of the initial open coding labelled phrase was compared with other labelled phrases to identify a concept based on similarities. 27 items were obtained through this process from the initial 109 items. These 27 concepts were labelled as aa1, aa2, aa3... (Conceptualizing data column, Table 2). The next step was categorizing data, where the 27 concepts were classified into 16 categories based on constant comparison method and labelled as A1, A2, A3... (Categorizing data column, Table 2). In the final step, the 16 categories were linked to identify the relationship between these categories. This step resulted in identifying the four core categories of the study and these core categories were labelled as AA1, AA2, AA3 and AA4 (Categories column in Table 2). The relationship between the four core categories were considered to generate the theory of the study.

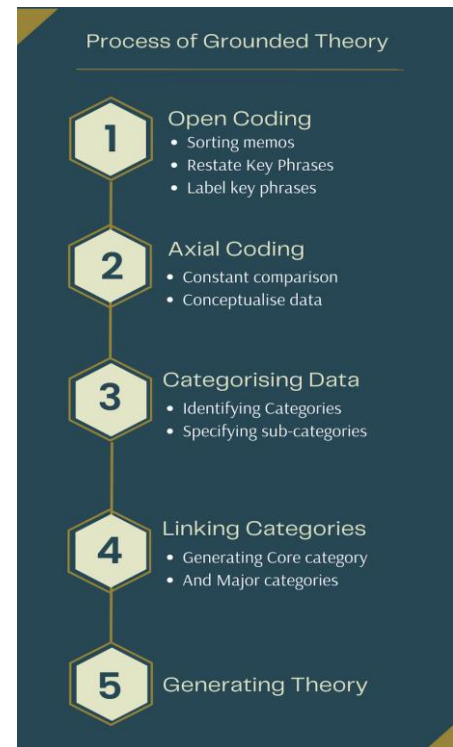


Figure 1: Steps to generate theme, using Grounded Theory

Table 2. Steps to generate theory from data, sorting memos, labelling, conceptualizing data, categorizing data and generating categories.				
Sorting memos	Labelling	Conceptualizing data	Categorizing data	Categories
Has the pandemic affected the biodiversity in and around your garden? Can you describe it?				
“We heard a lot more birds, we saw lots of more birds. But nothing really extra. Not a lot of change before the pandemic and after the pandemic”	a1. Heard lot more birds a2. Saw lots more birds. a3. Not a lot of change before the pandemic and after the pandemic	aa1. Heard more birds (a1, a5, a9, a46, a48)	A1. Heard and saw more birds (general statement and specific type of bird) (aa1, aa2, aa6, aa7, aa8 and aa9)	AA1. Perceived changes in Nature and Environment during the Lockdown
“We have seen more birds, I think since the vehicles have reduced on the roads, we hear more birds and see more birds. Earlier it was hard to see even the common bird such as crows. But now we are seeing a lot more crows, before we could only see pigeons, now we can also see lots of crows and even some sparrows”	a4. Seen more birds, since vehicles have reduced on roads a5. We hear more birds and see more birds. a6. Earlier, it was hard to see even the common bird such as crow, we can also see crows and even some sparrows	aa2. Saw more birds (a2, a4, a5, a10, a11, a23, a27, a37, a38, a39, a40, a44, a45)	A2. Seen and heard more birds due to reduction of noise, pollution and vehicles (aa4 and aa5)	AA2. Biodiversity observations and personal changes/perceptions and preferences
...
Total	109	27	16	4

RESULTS

Respondent Demographics

Of the total 30 interviewed respondents, 75% were female and 25% male respondents. Respondents aged 18-25 years were 7% of the interviewees, followed by 14% of respondents in the age cluster of 35-44 years. Respondents in the age group of 45-55 years and 65 years and older, constituted 18% each. Respondents aged 25-34 years and 55-64 years formed 21% of respondents each. Age distribution was uniform among study participants with the exception of participants aged 18-25 years. Half of the respondents had an undergraduate degree and 40% had a graduate degree. The respondents had a house ownership rate of 93%. A quarter of the respondents were homemakers and 15% were retired. The rest of the respondents were working in various sectors such as academia, industry, tech and government. One of the respondents was a student.

Garden Characteristics

With 93% house ownership, there were many types of gardens within the house, as mentioned in the methods section. 32% of the respondents had yard gardens, 14% had rooftop gardens and 7% maintained balcony gardens. 40% of respondents had a combination of the above garden types, with a majority having trees and large shrubs in the yard and potted plants on the rooftop. 7% of interviewees had a plot garden on property adjacent to their homes that they did not own. In such instances, the garden owners had an informal agreement with the plot owner, where they would remove the garden when the owner decided to build on the plot. Having a plot garden would increase space and allow the respondents to grow more varieties of plants on the ground. One respondent was part of a community garden near her house; however, the community garden was not operational during the study, due to the pandemic.

Respondent's perceptions of nature and home gardens during COVID-19 lockdown.

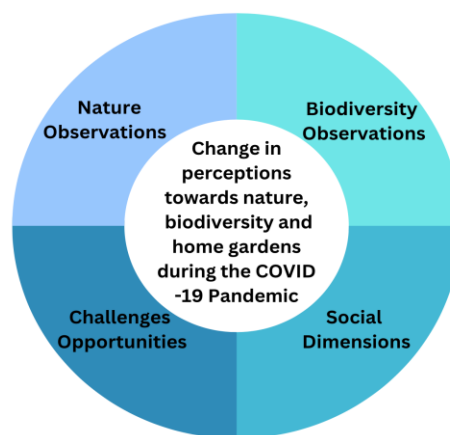


Figure 2: Central theory of the study along with the four core categories.

The central theory emerging from this study was that the lockdown led to a *change in citizens' perception towards urban nature, biodiversity, and home gardens*. The four core categories identified in this study (Figure 2) and discussed below, elaborate this change in perception.

Biodiversity Observations

All participants reported an increase in biodiversity observations around their homes and in their gardens. Birds were the most observed group, with participants reporting increased observations compared with prior to the lockdown. Garden owners mentioned several reasons for the increased observations such as reduction in noise pollution and air pollution due to restricted vehicular movement. A female garden owner in her late 40s noticed:

I feel like I can hear a lot of birds because there are less vehicles and less noise pollution. We get a lot of varieties of birds on our rooftop, before we never used to observe it, but now we are spending more time on our rooftop garden, so we observe a lot more. I have seen almost 8-10 varieties of small birds.

Other animal groups such as insects and pollinators were also perceived to be more frequently sighted in the garden. Few respondents mentioned, how spending more time in the garden has led them to appreciate the small insects as well. Another female gardener in her mid 50s who reported seeing many animals for the first time in her garden said:

I saw a red bug with black dots and that I observed for the first time during this lockdown. We have seen red cheeked myna, twice I have observed kingfisher, I have seen white birds which are very friendly with cows, they sit on their backs and travel, I like seeing those. Lots of parakeets (*Psittacula krameri*), (a) large bird, which makes an interesting sound, they look like crow and has brown tail. I have seen Koel (*Eudynamys scolopaceus*), crows (*Corvus sp.*) and lots of sparrows (*Passer domesticus*). Even some of the birds, I think fly back to their homes, we like seeing that. Usually, I see yellow butterfly with brown dots, blue and black butterfly, butterfly with black and white dots(sic)

A 30-year-old female working professional conveyed this:

Even in my apartment, I found Munia birds (*Lonchura sp.*), red whiskered bulbul (*Pycnonotus jocosus*). Then you know on the guava tree (*Psidium guajava*) just in front of the house we see tiny tailor birds (*Orthotomus sp.*). I have also seen lots of butterflies. And there are also common grass yellows (*Eurema hecabe*). There is a swallow tail butterflies (*Papilionidae sp*) there is common castor butterfly (*Ariadne merione*). And I've also seen common dragon flies and lots of bees.

Respondents were aware that their increased biodiversity observation could be the result of stay-at-home orders and mentioned that they were personally being more observant towards nature. Respondents reported they were curious about the distinct types of insects and pollinators that come to their garden. Garden owners seemed to be excited about the diversity of animals that visited their garden and mentioned that they would be happy to see more varieties of birds, butterflies and squirrels in their garden. Respondents hinted that staying-at-home was a blessing

in disguise, as they were able to really appreciate the minute details of nature around their homes.

Though most of the respondents mentioned they perceived an increase in biodiversity observations during the lockdown, there were a few respondents with different perceptions, as they did not find a difference in biodiversity observations before the lockdown and during the lockdown. As mentioned by a respondent with a front yard garden:

I don't think there's been any change in sightings. I think it's been the same. Like it was before that. And I've been spending almost a year maybe, I was spending a little more time in the garden during the lockdown, but I think I haven't seen any much change.

Nature Observations

Respondents noted changes around their homes and gardens. Changes in nature surrounding the house were mainly perceived through changes in greenery and pollution levels. A respondent in her late 20s commented:

Especially in our area, I can see more greenery. I can see how the air feels fresh and pollution free.” Respondents noticed lowered pollution levels as one garden owner noted, “Pollution has come down during pandemic. We can see more plants clearly.

Twenty-six of the respondents stated that air pollution had decreased, noise levels were lower, and the neighborhood was generally green. Being observant towards the nature around them made them more aware of the declining greenery in their neighborhood. One respondent in his late 60s mentioned, “We still have a lot of independent houses in our area. Before a lot of people had gardens before, but now that is reducing.”

Though the lockdown had somewhat preserved the trees, residents were worried that the city would lose more greenery in the future if no action were taken by decision-makers. As mentioned by a 61-year-old, male respondent, “I don't think lockdown has affected greenery that much. There has been no substantial increase. In general nature is diminishing, because of more concrete buildings.”

Social Dimensions

Domestic home gardens function as personal green space and a place for social interactions. The social dimension of home gardens was amplified during stay-at-home orders. A subset of respondents, many of whom lived in multi-generational households, enumerated the importance of gardening as a family bonding activity during the lockdown. A rooftop garden owner in his early 30s mentioned, “Everyone was at home; we found a lot of leisure time. So, we decided to start a garden, as we were sure we will be at home for the next 4-5 months at least.”

Families with children recognized the role of garden as a place for the children to connect with nature. A female garden owner, talking about her daughter's increased interest towards their rooftop garden, elaborated:

...before we never pulled her so much to take part in gardening, now she comes with us every time we work in the garden, when drying clothes on the terrace we kept telling her about this new bud, new flower that kind of a thing.

Two of the respondents above the age of 65, commented about the garden space as an important part of the house specially to teach their grandchildren about nature and to spend time outdoors. As one gardener mentioned, “Actually, my grandkids like to play with earthworms, my grandson is very friendly with the plants and animals. Having a garden also helps the kids know more about the garden.” This view of the home garden, as space to connect with nature is echoed by another gardener in her late 60s:

Other people have to go to parks to get fresh air, children don’t have space to play. But my grandkids play so well in our garden. We feel lucky that we have so much space. I have a lot of advantage.

Increased availability of time for gardening during the lockdown was a consistent response among all the garden owners. This led garden owners to diversify their garden and invest more time in taking care of the plants. As mentioned by a female gardener in her 20s:

When I was stuck at home, I could do more of the vegetable garden and I could get a lot of variety than before. The flowers also I think my mom and dad are growing much more this year, we have more plants than before, because we have enough time to take care of it.

Many garden owners hire professional gardeners to help maintain the garden. However, during the pandemic, the lack of professional gardeners due to restricted travel led many garden owners to be more hands on in tending to their gardens. As mentioned by a female garden owner:

We have started doing more work in the garden, because we could not get any help from our gardener as he could not travel to our house. So, we learnt a lot about how to tend to the plants and take care of it ourselves.

Gardening helped respondents stay occupied, helping them feel relaxed and away from the frustration of not being able to go outside. A female garden owner mentioned, “Yeah, I do feel it's more like therapeutic for us to care of it (garden). And we do have the time on hand to take more care of it.”

In summary, the respondents identified the garden as a space, not just limited to recreational value but as means of nature connectedness, a space for family bonding and as a personal green refuge during the pandemic.

Challenges and Opportunities

This theme illustrates the opportunities and challenges of having an urban home garden, specifically during the pandemic. A subset of interviewees mentioned they started their home gardens or expanded their gardens during the lockdown. Having a garden especially during the lockdown helped keep garden owner occupied and helped keep frustration at bay. A 55-year-old garden owner responded:

Because of COVID only we can't go out we can't do anything. No office, so people are getting, frustrated being at home and depressed. So, we thought the plot next door is empty so let's do gardening, vegetable garden. So, we started the vegetable garden patch.

A male gardener in his late 30s said, "I was always interested in gardening, but the pandemic gave me a push to actually start the garden." The lockdown increased exchange of ideas about gardening as mentioned by a male respondent:

I also am passionate about gardening because I saw a lot of my friends, relatives doing organic gardening very successfully, they have become experts now. So, I was interested seeing other people. Also, social media helped a lot.

Urban home gardening comes with some challenges such as non-availability of raw materials such as potting soil, potters, fertilizers, and constraints in space and infrastructure. Some of these challenges are amplified during the lockdown and there are also unique challenges due to the lockdown. In the words of a male gardener in his 40s:

I wanted to expand the rooftop garden, add more plants, and have a vertical step garden. I would have done this by now, if not for the pandemic. I would have more flowers and medicinal plants and vegetables.

Another concern expressed by new gardeners, who started gardening during the lockdown was their ability to make time for gardening after the lockdown was lifted. As elaborated by a male respondent in his 50s:

A lot of people were getting home gardens and terrace gardens done as well. That's a major change, it's certainly good, but it comes with lots of challenges and maintenance. I will make time to take care of my garden even when lockdown ends, since I spend time early in the morning in my garden, I can make time for it.

DISCUSSION

This study aimed at exploring how the pandemic influenced the focus on and the perceptions towards urban home gardens in Bengaluru through the grounded theory approach. The theory emerging from this study, is that there is a *change in citizens' perceptions towards urban nature, biodiversity and home gardens*, which highlights that the lockdown had influenced respondents' perceptions about personal green spaces around them. This change was evident in the way respondents perceived the importance of their home garden through the social and environmental lens. Prior to the lockdown, time was a major constraint to engaging in gardening activities. But the lockdown provided more time for gardening for those who already had a garden and those who started a new garden. Home gardens were viewed within a social context where home gardens were viewed as places of green refuge, a place for family bonding and a place for children to experience nature from the safety of their homes. In a densely populated city such as Bengaluru, opportunities to observe and experience nature is limited. But, during the lockdown respondents were more perceptive towards how nature changed around them, this led them to experience nature in a new way. Being more hands on in the garden provided an opportunity to

appreciate biodiversity and be observant towards the diverse animals that visited the garden. This led the respondents to be more sensitive towards how their actions can affect nature around them.

Perceptions of increased wildlife sightings and nature appreciation can be explained by relatively quieter cities during the pandemic. Lockdown restrictions of vehicular movement and the general widespread shutdown of cities during the pandemic facilitated opportunities for residents to experience these changes. A framework proposed by Soga et al. (2021), mentions opportunity as one of the three pathways that influence human-nature interaction during the pandemic. Our findings align with findings from a similar study conducted in England, Ireland and Spain, where urban residents perceived the most changes in nature around them during the pandemic (Garrido-Cumbrera et al. 2021). Increased opportunity to experience nature and biodiversity is important in Bengaluru, a city that is experiencing rapid loss of urban greenery (Nagendra et al. 2012) which could lead to an increased alienation of urban dwellers towards the local environment.

Findings from this study illustrate the social importance garden owners attributed to their gardens. Home gardens were viewed as a place for family bonding and personal green refuge. Respondents mentioned how in multigenerational households, grandparents and grandchildren bonded over gardening. Our findings align with a large-scale study conducted across various countries, where gardening had a significant social importance during the pandemic, and gardens became spaces for social connectedness among family members (Kingsley et al. 2022). The garden provided a safe outdoor space for children to play and explore nature, without having to leave the house. This enhanced the value attributed to the garden during the lockdown. People felt a stronger connection with nature through their backyard, a greater appreciation for the greenery around their homes and an increased concern over the fast-depleting nature in the city. People reported increased curiosity towards animals and birds around their homes and gardens. There was an overarching sense of personal contribution to the greenery in the city among all garden owners, irrespective of the size and scale of their garden.

Our study found that the pandemic gave a push for many people to start a garden and expand existing ones. Similar results were reported in a study from the Philippines that found an increase in numbers of plants in home gardens along with improved mental wellbeing during the pandemic (Sunga & Advincula 2021). Though the lockdown created opportunities for residents to spend more time in the garden or to start a new garden, there was concern over the time they could spend in gardening after the pandemic ended. However, all the respondents mentioned that they would make time to garden or spend time in the garden even after things returned to pre-pandemic normal.

Though all the garden owners in our study reported that they have a garden due to interest in gardening, they also mentioned that the lockdown had made them realize the significance of their gardens. In Bengaluru, a city where green spaces and lakes are lost due to development activities (Narayanan & Hajagi 2009), the conservation of existing green spaces, including home gardens is imperative. Respondents reflected that their home gardens would contribute to the urban greenery. Future research should focus on human dimensions of private urban green spaces, especially in the global south, where cities will undergo rapid population influx and an increase in the amount of built-up areas. Understanding motivations towards urban gardens in

India, outside of food security and urban agriculture, will help make a stronger case for policy changes at the local level to improve resources available for home gardeners. The perspectives related to social and environmental benefits derived from home gardens can help researchers and policy makers strengthen existing land use policies at the neighborhood level, further incorporating citizens' need for green spaces at a personal and public scale.

This study documented an increased awareness among citizens towards environmental degradation and concern towards environment conservation in Bengaluru. Respondents demonstrated awareness towards the importance of conservation of home gardens for urban resilience. Qualitative studies like this help in understanding and documenting perceptions of citizens in regions which continue to rapidly urbanize.

CONCLUSION

This study illustrates the perceptions towards home gardens in Bengaluru during the COVID-19 pandemic. Home gardens were viewed as personal green spaces and as places for interaction with nature. There was increased curiosity towards garden biodiversity and urban nature which increased resident's concern over depleting greenery in the city. The lockdown nudged people to spend more time in gardening and for some to build a garden, which enhanced nature experience across all age groups. This study was part of a larger study, focusing on perceptions, attitudes and motivations towards urban home gardens in the global south. As one of the few studies exploring changes in perceptions towards urban nature and home gardens in India, our study leads to further questions. Further research is needed to better understand: human dimensions of urban green spaces in the global south, perceptions of changing urban form and its effects on urban communities, and influence of extreme events such as the pandemic on non-formal urban green spaces such as vacant lots and remnant vegetation.

LITERATURE CITED

- Algert, S., Diekmann, L., Renvall, M., Gray, L. 2016. Community and home gardens increase vegetable intake and food security of residents in San Jose, California. *California Agriculture* 70: 77–82
- Asensio, C., Pavón, I., de Arcas, G. 2020. Changes in noise levels in the city of Madrid during COVID-19 lockdown in 2020. *The Journal of the Acoustical Society of America* 148: 1748–1755
- Basu, M., DasGupta, R., Kumar, P., Dhyani, S. 2021. Home gardens moderate the relationship between Covid-19-induced stay-at-home orders and mental distress: a case study with urban residents of India. *Environmental Research Communications* 3: 105002
- Botzat, A., Fischer, L. K., Kowarik, I. 2016. Unexploited opportunities in understanding livable and biodiverse cities A review on urban biodiversity perception and valuation. *Global Environmental Change* 39: 220–233

- Cameron, R. W., Blanuša, T., Taylor, J. E., Salisbury, A., Halstead, A. J., Henricot, B., Thompson, K. 2012. The domestic garden—Its contribution to urban green infrastructure. *Urban Forestry & Urban Greening* 11(2): 129-137
- Calvet-Mir, L., Gómez-Baggethun, E., Reyes-García, V. 2012. Beyond food production: Ecosystem services provided by home gardens. A case study in Vall Fosca, Catalan Pyrenees, Northeastern Spain. *Ecological Economics* 74: 153–160
- Caraka, R. E., Yusra, Y., Toharudin, T., Chen, R. C., Basyuni, M., Juned, V., Gio, P. U., Pardamean, B. 2021. Did noise pollution really improve during COVID-19? Evidence from Taiwan. *Sustainability* 13: 5946
- Cattivelli, V. 2023. Review and analysis of the motivations associated with urban gardening in the pandemic period. *Sustainability* 15: 2116
- Chalmin-Pui, L. S., Griffiths, A., Roe, J. *et al.* 2021. Why Garden? Attitudes and the perceived health benefits of home gardening. *Cities* 112: 103118
- Coman, I. A., Cooper-Norris, C. E., Longing, S., Perry, G. 2022. It is a wild world in the city: Urban wildlife conservation and communication in the age of COVID-19. *Diversity* 14: 539
- Census of India. 2011. Bangalore Urban. Registrar General and Census Commissioner of India. Accessed 04 Aug 2023
- Garrido-Cumbrera, M., Foley, R., Braçe, O., Correa-Fernández, J., López-Lara, E., Guzman, V., Marín, A. G., Hewlett, D. 2021. Perceptions of change in the natural environment produced by the first wave of the COVID-19 pandemic across three European countries. Results from the Green COVID study. *Urban Forestry & Urban Greening* 64: 127260
- Goddard, M. A., Ikin K., Lerman S. B. 2017. Ecological and social factors determining the diversity of birds in residential yards and gardens. *Ecology and Conservation of Birds in Urban Environments* pp: 371–397
- Glaser, B. G., Strauss, A. L., Strutzel, E. 1968. The discovery of grounded theory: Strategies for qualitative research. *Nursing Research* 17:364
- Hanson, H. I., Eckberg, E., Widenberg, M., Alkan Olsson, J. 2021. Gardens' contribution to people and urban green space. *Urban Forestry & Urban Greening* 63:127198
- Jaganmohan, M., Vailshery, L. S., Gopal, D., Nagendra, H. 2012. Plant diversity and distribution in urban domestic gardens and apartments in Bangalore, India. *Urban Ecosystems* 15: 911-925

- Jaganmohan, M., Vailshery, L. S., Nagendra, H. 2013. Patterns of insect abundance and distribution in urban domestic gardens in Bangalore, India. *Diversity* 5: 767–778
- Kingsley, J., Diekmann, L., Egerer, M. H., Lin, B. B., Ossola, A., Marsh, P. 2022. Experiences of gardening during the early stages of the COVID-19 pandemic. *Health & Place* 76: 102854
- Larson, K. L., Lerman, S. B., Nelson, K. C., Narango, D. L., Wheeler, M. M., Groffman, P. M., Hall, S. J., Grove, J. M. 2022. Examining the potential to expand wildlife-supporting residential yards and gardens. *Landscape and Urban Planning* 222: 104396
- Lehberger, M., Kleih, A. K., Sparke, K. 2021. Self-reported well-being and the importance of green spaces – A comparison of garden owners and non-garden owners in times of COVID-19. *Landscape and Urban Planning* 212: 104108
- Lin, B. B., Egerer, M. H., Kingsley, J., Marsh, P., Diekmann, L., Ossola, A. 2021. COVID-19 gardening could herald a greener, healthier future. *Frontiers in Ecology and the Environment* 19: 491–493
- Marsh, P., Diekmann, L. O., Egerer, M., Lin, B., Ossola, A., Kingsley, J. 2021. Where birds felt louder: The garden as a refuge during COVID-19. *Wellbeing, Space and Society* 2: 100055
- Mishra, A., Das, S., Singh, D., Maurya, A. K. 2021. Effect of COVID-19 lockdown on noise pollution levels in an Indian city: a case study of Kanpur. *Environmental Science and Pollution Research* 28: 46007–46019
- Nagendra, H., Nagendran, S., Paul, S., Pareeth, S. 2012. Graying, greening and fragmentation in the rapidly expanding Indian city of Bangalore. *Landscape and Urban Planning*, 105(4): 400-406.
- Narayanan, P., & Hanjagi, A. 2009. Land- use change in urban Bangalore using GIS and Remote Sensing. *Annals of the University of Craiova. -Series Geography*, 12: 126–138.
- Ramachandra, T. V., Aithal, D. B., Kulkarni, G., Shivamurthy, V. 2017. Green spaces in Bengaluru: Quantification through geospatial techniques. *Indian Forester* 143: 307–320
- Samus, A., Freeman, C., Dickinson, K. J. M., van Heezik, Y. 2022. Relationships between nature connectedness, biodiversity of private gardens, and mental well-being during the Covid-19 lockdown. *Urban Forestry & Urban Greening* 69: 127519
- Soga, M., Evans, M. J., Cox, D. T. C., Gaston, K. J. 2021. Impacts of the COVID-19 pandemic on human–nature interactions: Pathways, evidence and implications. *People and Nature* 3: 518–527

- Sunga, A. B., Advincula, J. L. 2021. The “plantito/plantita” home gardening during the pandemic. *Community Psychology in Global Perspective* 7: 88–105
- Taylor, J. R., Lovell, S. T. 2014. Urban home food gardens in the Global North: research traditions and future directions. *Agriculture and Human Values* 31: 285-305.
- Terry, C., Rothendler, M., Zipf, L., Dietze, M. C., Primack, R. B. 2021. Effects of the COVID-19 pandemic on noise pollution in three protected areas in metropolitan Boston (USA). *Biological Conservation* 256: 109039
- Tomatis, F., Egerer, M., Correa-Guimaraes, A., Navas-Gracia, L. M. 2023. Urban gardening in a changing climate: A review of effects, responses and adaptation capacities for cities. *Agriculture* 13: 502
- Van Helden, B. E., Close, P. G., Stewart, B. A., Speldewinde, P. C., Comer, S. J. 2020a. An underrated habitat: Residential gardens support similar mammal assemblages to urban remnant vegetation. *Biological Conservation* 250: 108760
- Van Helden, B. E., Close, P. G., Steven, R. 2020b. Mammal conservation in a changing world: can urban gardens play a role? *Urban Ecosystems* 23: 555–567
- Wu, C. F., Chou, L. W., Huang, H. C., Tu, H. M. 2022. Perceived COVID-19-related stress drives home gardening intentions and improves human health in Taiwan. *Urban Forestry & Urban Greening* 78: 127770