Built Environment and Deprived Children: Environmental Perceptions of the Urban Slum Cohort in Pune, India

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Abstract— The built environment can have a significant effect on children's cognitive and socio-emotional development. Children living in urban slums in India confront issues associated with poor living conditions and lack of access to basic service. It is a well-known fact that slums are places of extreme poverty, substandard housing, overcrowding, and poor sanitation. These challenges faced by children living in slums can have a significant impact on their physical, psychological, and social development. Despite the magnitude of the problem, the area of research particularly on the impact of the built environment of slums on children and adolescent well-being has been understudied in India. The impact of the built environment on children's well-being has been understudied in the global south. Apart from issues of the limited access to health and education of these children, perception of children regarding the built environment which they inhabit is rarely addressed. A sample of 120 children living in the slums of Pune city between the ages 7 and 16 years participated in this study which employed a concurrent embedded approach of mixed method research. Questionnaires were administered to obtain quantitative data that included attributes of crowding, noise, privacy, territoriality, and housing quality in the built environment. The qualitative analysis of children's sketches highlighted aspects of the built environment with which they associated themselves the most. The study sought to examine the perception of the deprived children living in the urban slums in the city of Pune (India) towards their built environment.

Keywords—Physical environment, poverty, underprivileged children, urban Indian slums.

I. INTRODUCTION

THE rise in the urban population of India in the past two decades can be attributed to not only natural increase and migration but also due to boundary changes and area reclassification. Urbanization and growth of slums go hand in intertwined [1]. Slums are formed due to the inability of the local governments to manage urbanization and housing for the urban poor. According to the UN-HABITAT, the number of undernourished and poor urban slum dwellers is increasing, of which, 43% of the urban population of developing countries are slum dwellers [2]. The UN population division has estimated that around 40.6% of India's population will be living in urban areas [3]. Many people residing in subhuman conditions can be attributed to the fact that IT giants and multinational retail companies provide opportunities to the migrants seeking employment as skilled or unskilled labor and domestic helps [4]. This rapid growth is responsible for the ever-increasing gap in the infrastructural demand and supply; forcing them to live in unsanitary and crowded conditions. Slums are not only health hazards but also areas of broad social disadvantage due to the built environment issues such as overcrowding and substandard housing condition [5]; as well as territoriality and privacy concerns.

In India, the issue of slums is not only unique to the metropolises but also a challenge in the smaller cities due to rapid urbanization [6]. These dwellings usually mushroom around hillsides, railway lines, canals etc. The UN operationally defines a slum as one or a group of individuals living under the same roof in an urban area lacking durable housing, sufficient living area, access to improved water as well as access to improved sanitation facilities [34]. Further, a survey conducted by National Sample Survey Office (NSSO) in 2012 estimated that around 28% of children in urban areas of India lived in slums [7]. This suggests that there are millions of children living in slums in India confronting issues associated with poor living conditions and lack of access to basic services. The built environment and the implication of its attributes of crowding, noise, privacy, and housing quality on child wellbeing have been understudied in the South Asian context. This paper focuses on the opinion of children residing in slums and their perceptions towards the attributes of built environment in the city of Pune, India.

II. STUDY AREA

The city of Pune is the second largest in the state of Maharashtra, India, attracting immigrants due to varied economic activities and job opportunities. Most of these immigrants are compelled to live in slum-like conditions as they come from a lower stratum of society.

The city is home to around 477 slums that houses 40% of the urban population [8], which is overwhelming the already burdened infrastructure of the city. The slum population of the city has grown from 8% in 1951 to a mammoth 40% of the overall city population in 2011 [8]. Fig. 1 shows Sahakarnagar slum area at the foothills of Parvati considered for the study.

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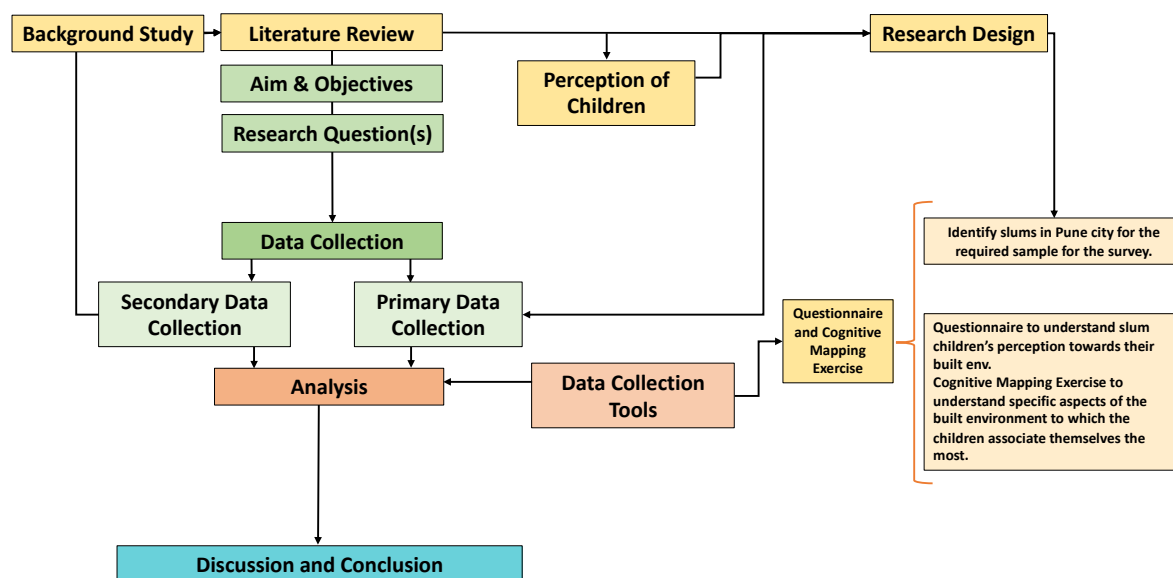Fig. 1 The dense slum in Sahakarnagar are along the foothills of Parvati [35]

Fig. 2 Research Methodology

A. Research Aim

The research aims to understand the perception of slum children towards built environment attributes of crowding, noise, priacy and territoriality, and housing quality.

III. RESEARCH METHODOLOGY

The study was conducted in the slums along the foothills of Parvati area running along the Mula-Mutha river in the Sahakarnagar ward of the Pune Municipal Corporation. The area was selected based on the geo spatial mapping of slums done by Mundhe in 2019 [8]. The Sahakarnagar ward has a slum population density of 2122 persons per hectare which is the second largest in the city. The slum tenement density in the area is also among the highest in Pune [8]. For this study, 120 children from these slums were categorized into two age groups namely middle childhood (6-12 years) and adolescents (13-16 years).

The sample size was broken down into subgroups of 30

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males and 30 females based on the Central Limit Theorem (CLT) [9]; to understand any differences in the perceptions of the male versus female respondents.

On identifying the respondents, parents/legal guardians of the children were approached, and permission was solicited to conduct the survey. The purpose of the survey was explained and only after permission was granted, the researcher approached the respondents. Further, verbal consent of each participant was taken before the questionnaire was administered to them. The children who denied permission to take part in the survey were not included as a part of the study.

A concurrent embedded approach of mixed method research was used for this study which included quantitative survey using a five-point Likert type scale as the primary method of data collection and cognitive maps as part of the qualitative data collection procedure [10]. The questionnaire was divided into domains of crowding, privacy, noise, territoriality, and housing quality. The options and the subsequent scoring ranged from Never (1), Rarely (2), Sometimes (3), Most of the time (4) and Always (5).

IV. LITERATURE REVIEW

The literature review section focuses on the built environment attributes of crowding, noise, privacy and housing quality.

A. Noise

Studies from high income countries have suggested that prolonged exposure to noise during childhood can influence reading acquisition among children [11]. Exposure to noise is not predictable or uncontrollable at times. Human motivation has been known to be challenged due to repeated exposure to uncontrollable events [12]. Multiple studies have also shown that learned helplessness is another problem associated with uncontrolled noise [13]-[15]. Studies have also shown that continued exposure to noise creates stress and annoyance thereby elevating cortisol (a stress hormone) [16]. However, no European study has established an association of the indices of psychological wellbeing with noise levels [17].

B. Crowding

Persons per room is the general metric used to determine crowding. There are diverse beliefs and experiences with regards to crowding and its tolerance that differs across countries and contexts [18]. Children in the global South are exposed to crowded situations than their North American or European counterparts. Densities of Indian families were found to be in the range of 0.67 to 5 persons per room whereas the US Census considers more than 1 person per room as crowding [19]. Residential crowding has also been known to affect parent-child communication [20], with parents interacting less with their toddlers [21]. Adverse effects on the socio-emotional functioning and behavior have been observed in children as well as parents in a crowded household [22]. Members of the family have been known to withdraw themselves to cope with crowding, which is known to affect social relationships [23]. Children in crowded households in Europe have been known to

be affected by learned helplessness [15].

C. Privacy and Territoriality

Territoriality is a means to achieve privacy. Children, like adults, control access to self to construct a 'sense of self' [24], to ensure privacy. In certain situations, it has been observed that children have very little choice to exercise solitude. Perpetual intrusion is a concern which children must counter as they are seen as dependents [24]. Absence of a primary territory and not being able to control other's access to self may lead to issues related to 'self-identity' [25]. Another study suggests otherwise, in that, those children who do not perceive any primary territory or a 'special place' may simply be more secure in a group setting [26].

D. Housing Quality

Evidence suggests that children living in slums have exhibited issues related to self-esteem [27]. It has been found that a high number of children living in the global South live in substandard housing [28], [29]; built of substandard materials, with leakages in walls and ceilings [30]. Unsafe dwellings and inferior housing quality have been known to place stress on the low-income parents [31]. A cross sectional study of primary school children living in slums in conjunction with elevated noise levels and crowding has exhibited a rise in the overnight stress hormones among the participants [32]. The current state of evidence suggests that the relationship between physical environment and its influence on children's development has been understudied in the global South. Only 10% of the developmental science research has focused on communities that form 90% of the world's population [33].

V. QUANTITATIVE DATA COLLECTION

As mentioned in the Research Methodology Section, a concurrent embedded mixed method research was employed for this study. The qualitative-quantitative data were collected from children of two age groups namely middle childhood (7-12 years) and adolescents (13 -16 years).

The data were elicited in the form of a questionnaire with a range of questions from the following four domains:
A. Crowding
B. Noise
C. Privacy and Territoriality
D. Housing Quality.

The percentage-wise data of each category are mentioned in Tables I and II.

The findings were based on the size of the dwellings which ranged from 15-20 m^2 and a family of 4 to 5 people inhabiting the space.

A. Crowding

7-12-Year-Old Children

Boys and girls from the middle childhood preferred having people around them most of the time; 47.8% of the boys opted for 'never' and a meagre 2.2% opted for 'always' when asked if they felt the room was crowded. Meanwhile, 13% of girls felt that the room was 'always' crowded and 39.1% felt that the

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room was 'sometimes' crowded.

TABLE I
BUILT ENVIRONMENT DOMAINS AND PERCENTAGE WISE DATA FOR 7-12-YEAR AGE GROUP

Sr. No.	Domain	Boys (n = 30)	Girls (n = 30)
A.	Feeling of Crowding	2.2	13
B.	Noise	18.4	8.7
C.	Need for Privacy	10.2	10.9
	Territoriality	10.2	15.2
	Housing Quality		
D.	Light	51	67.4
	Ventilation	53.1	56.5
	Comfort in Summers	28.6	30.4
	Comfort in Monsoons	24.5	30.4

The above numbers are the percentage of respondents who opted for 'always' on the five-point Likert scale.

TABLE II
BUILT ENVIRONMENT DOMAINS AND PERCENTAGE WISE DATA FOR 13-16 YEARS AGE GROUP

Sr. No.	Domain	Boys (n = 30)	Girls (n = 30)
A.	Feeling of Crowding	2.1	5.4
B.	Noise	24.4	32.4
C.	Need for Privacy	10.4	10.8
	Territoriality	16.7	13.5
	Housing Quality		
	Light	47.9	45.9
D.	Ventilation	62.5	64.9
	Comfort in Summers	31.3	35.1
	Comfort in Monsoons	43.8	29.7

The above numbers are the percentage of respondents who opted for 'always' on the five-point Likert scale.

However, in the case of boys when the entire family occupied the same room for a longer duration, only 32.7% of them preferred being in the same room, others preferred being outdoors due to paucity of space. For girls, 45.7% preferred to stay in the same room even when in the presence of others in the room, and 30% of girls said that they felt that the space was enough for them. On the other hand, 28.6% of boys felt that the space was enough for them.

Only 32.7% of the boys felt that they can move 'freely' in the room as compared to 58.7% of girls. This can be attributed to the fact that when asked, the girls preferred being indoors instead of playing outside and preferred cozy nooks and corners to sit and chat with friends and family, and for indoor play.

13-16-Year-Old Adolescents

Adolescents, when asked about the number of people in the room, 52.1% of boys and 35.1% of girls, said that they were comfortable sharing the space with other family members. The lesser number of girls in this case indicated their need of privacy. Further, 31.3% of boys and 29.7% of girls preferred to stay in the same room with others around; and, 2.1% of boys as against 5.4% of girls felt that the room was always crowded. Though the numbers may be small, here again the percentage of girls seeking privacy was more as compared to boys of a similar age group.

The other answers ranged from never to sometimes indicating a lack of space and both girls and boys preferred spending more time outdoors.

B. Noise

On the decibel scale, around 45 dBA is considered appropriate for homes. Sound levels using a decibel meter showed a range 75-80 dBA.

7-12-Year-Old Children

Results found that, 22.4% of boys and 28.3% of girls reported that they perceived no noise and chaos around them, while 34.7% of boys and 37% of girls felt that their home was sometimes noisy.

13-16-Year-Old Adolescents

Results show that, 15.6% of boys and 5.3% of girls perceived no noise around them, whereas 24.4% of boys and 32.4% of girls said that the surroundings were always noisy. The reduction in this number indicates reduced tolerance for noise in adolescents.

C. Privacy and Territoriality

7-12-Year-Old Children

When it came to the need of a personal space or being alone, 67.3% of boys and 59.2% said they never liked playing alone and being alone respectively. On similar lines, 72.1% of girls opted for 'never' when asked about their preference for solitary play and 65.2% of girls said that they 'never' liked being alone. Slum tenements are spaces with bare bone requirements for the survival of the residents. Even under those given spatial and economic constraints, the people inhabiting these spaces tend to create a comfortable environment for themselves.

When asked about any place which everyone liked to occupy, 10.2% of boys and 15.2% of girls said that there was a cozy nook (most of the times it was the only cot or small divan in the house which was a comfortable spot for occupants). Meanwhile, 38.8% of boys opted for 'never' as compared to 32.6% of girls.

When asked if there was any place within the house that they called their own, 32.7% of the boys and 43.5% of girls said that it was the bed or divan or a small corner seating on the floor flanked by cushions. Also, 63.3% of boys and 65.2% of girls said that they have a separate space for their belongings.

13-16-Year-Old Adolescents

Results for adolescents show that, 37.5% of boys as compared to 27% of girls felt that they did not specifically miss having a personal space. The lower percentage in the case of girls again hints to a greater need of a personal space in the case of females. The boys reported being spending more time outdoors with peers as compared to the girls; 50% of boys reported that they did not like being alone as compared to 43.2% of girls. Here again, the girls preferred having a space of their own where they could have some privacy. Only 12.5% of boys as compared to 29.7% of girls said that they liked occupying the soft cozy nook in their house. This again can be due to the fact that a higher number of girls spent longer duration inside the house. Both genders reported similar figures with respect to having a space for their personal belongings at 66.7% of boys and 65.2% of girls.

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In most cases it was observed that their understanding of a space for keeping their belongings was often a large aluminum chest which also acted as extra seating in the home. Some children shared a single cupboard with their family with compartments dedicated for each family member.

D. Housing Quality

7-12-Year-Old Children

Questions regarding light, ventilation and general thermal comfort of the occupants were posed to the respondents. Results found that, 51% of boys and 67.4% of girls felt that the there was enough light in the house during the day; 53.1% of boys and 56.5% of girls felt that the room was adequately ventilated, while only 8.2% of boys and 6.5% of girls felt that the house was stuffy and unventilated. In addition, 14.3% of boys and 34.8% of girls felt that the rooms would get hot during summer months. The difference in the number can be attributed to the fact that during summer vacations, a greater number of girls stayed indoors as compared to boys who played in the alleys or on the adjoining streets. Another concern was roof leakage during monsoon, 32.7% of boys and 34.8% of girls said that during monsoon the rooms would tend get moldy and the asbestos sheet roof which was used in most of the homes would leak during heavy rains. Winters on the other hand were tolerable with most of the answers ranging between sometimes to always for both boys and girls.

13-16-Year-Old Adolescents

The results for adolescents show that, 47.9% of boys and 45.9% felt that there is adequate light in the house during the day. The rest of them felt that the openings could have been larger to let in more sunlight. Meanwhile, 62.5% of boys and 64.9% of girls said that the room was adequately ventilated. Those who reported lower numbers (4.2% boys and 8.1% girls) were residing in homes which were poorly ventilated and were spaced close to one another. Only 31.3% of boys and 35.1% of girls said that they felt comfortable in the room during summer months. As mentioned above, apart from the substandard building materials used in constructing the houses; closely spaced poorly ventilated rooms with small openings can also be linked to the indoor temperature heating up. Meanwhile, 43.8% of boys and 29.7% of girls reported that the rooms were comfortable during monsoons. Here again, as the girls spent more time indoors, they felt that the rooms suffered from inadequate ventilation during monsoons. Along with roof leakage issues, certain respondents reported leakage in walls as well.

VI. Qualitative Data Collection

Qualitative data were elicited from the children in the form of a cognitive mapping exercise. The children were asked to sketch the place they frequented when they felt the need to escape feelings of crowding. In the example given in Fig. 3, an 11-year-old boy sketched the immediate view of the Mula-Mutha river outside his home. The same child drew another sketch that shows a mango tree close to his home under which he and his friends play a game of marbles in the evenings.

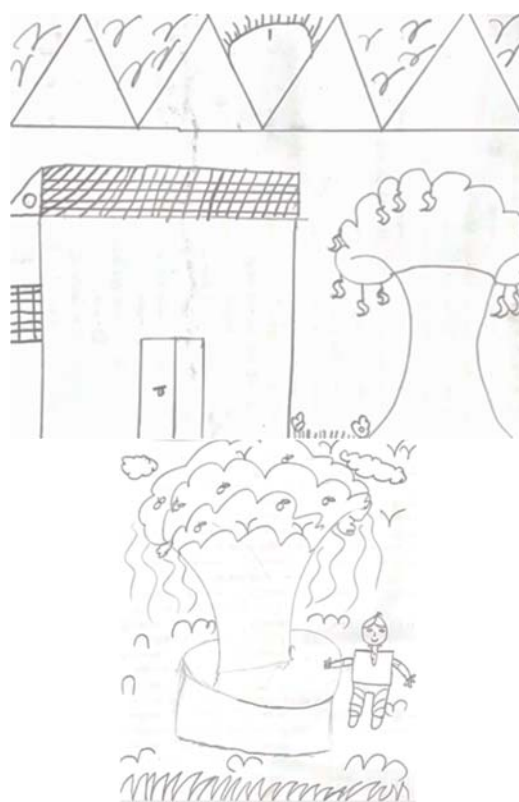Fig. 3 Drawing of the immediate surrounding by an 11-year-old boy

Fig. 4 Drawing of the immediate surrounding by a 13-year-old boy

On the other hand, a 13-year-old boy sketched his home with the Parvati hills as the backdrop. Incidentally, the same

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adolescent also drew the same picture of the mango tree. When probed further, the teenager said that this the very spot where all his friends gather in the evening for a chat.

Fig. 5 Drawing of the immediate surrounding by a 12-year-old girl

In Fig. 5, a 12-year-old girl has sketched a house similar to that of the 13-year-old boy as shown in Fig. 4. However, the difference here is that the girl has drawn a *rangoli* (traditional Indian decoration made with ground rice) at the entrance of the house. When asked about it, she said that she liked decorating the entrance of her house as traditionally, a rangoli signifies happiness and liveliness in a home. The same child has described in her native language that she likes her home even though it is small.

Fig. 6 Drawing of the cozy nook or corner by a 14-year-old girl

In Fig. 6, a 14-year-old girl has sketched her favorite nook or corner adjoining the trolley bed where she likes to sit and study or read comics in her free time. She said that she often decorates the corner with a rug and some cushions to make herself comfortable.

VII. FINDINGS AND CONCLUSION

The above findings support the literature that experience of crowding and tolerance towards crowding differs across contexts. Even in the case of the slums of Sahakarnagar, it was observed that overall lesser number of children perceived crowding as per the standards of developed countries. A typical family unit consisted of 4 to 5 persons, even so, tolerance towards crowding is seen from the above data. The US census defining crowding as more than 1 person occupying a room does not necessarily work in the Indian context. Tolerance to noise in general is also observed wherein the recorded data showed a mean of 75 dBA which is quite loud as per international standards. Even then most of the children reported being acclimatized to the higher levels of noise in the surroundings. Privacy in general is a necessity of every individual. Data from the above study showed that female adolescents seek privacy more than their male counterparts. Given the space constraints in which these children live, privacy is a luxury. Children reported being more adjusting in general, as there was no alternative even if they desired privacy. As mentioned in the examples above, when the children felt the need for some time alone, they preferred places in the immediate vicinity of their homes to escape feelings of crowding. Substandard housing in this case can in no way be compared to the literature cited above. What is termed as substandard as per the standards of the developed country is very different from the Indian scenario. Even under the given circumstances, children reported an overall satisfaction and attachment to their homes.

Though this study attempted to understand the perception of the slum children living in the city of Pune towards the attributes of the built environment, research in perception studies is still in a nascent stage. Literature from developed countries though exhaustive, falls short in giving a direction in diverse economic and cultural backdrops such as that of India. In conclusion, more studies in such settings both built as well as cultural are warranted to understand socio-spatial perceptions in dissimilar contexts.

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