RESEARCH PAPER

Assessing the influence of neighbourhood on the health of women in urban India

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Received: 16th Dec, 2025; Revised: 8th Feb 2026; Accepted: 12th Feb, 2026; Available Online: 28th Feb, 2026

ABSTRACT
Neighbourhoods are essential organs of urban areas and have a significant influence on women's health. Yet, evidence on neighbourhood influencing women's health in developing countries, such as India, remains limited. This study attempts to examine how a neighbourhood in Kolkata, India, influences women's health. Data was collected from 170 women via surveys. Results showed that 49.41% of the respondents were overweight or obese. Digestive disorders affected 80% of the participants, reproductive health problems 48.24%, respiratory conditions 44.12%, cardiovascular diseases 32.94%, and diabetes 20.59%. Health concerns varied by age, with reproductive, respiratory, and cardiovascular conditions dominating younger, middle-aged, and older women, respectively. Lack of walkability significantly correlated with cardiovascular conditions at r 0.96, orthopaedic problems at r 0.94, and reproductive conditions at r 0.89. While air pollution significantly correlated with respiratory illness at r 0.56. Logistic regression identified air pollution as the strongest predictor of women's health, with odds ratios ranging from 1.43 to 1.63. In conclusion, the need for gender-sensitive neighbourhood-level urban health interventions is highlighted.
Keywords: Neighbourhood, women's health, physical environment, social environmet India
How to cite this article: Sarkar A, Raj P, Assessing the influence of neighbourhood on the health of women in urban India. Int J Drug Deliv Technol. 2026; 16(2): 475-482; DOI: 10.25258/ijddt.16.2.53
Source of support: Nil.
Conflict of interest: None

1. BACKGROUND

The World Health Organisation (WHO) (2023) acknowledges the place of residence or neighbourhoods as significant determinants of health[1]. Among other factors determining health, gender also emerges as imperative. Neighbourhood is a residential space in urban areas that are geographically proximate and where residents interact socially[2]. These are not simply geographic units, but socio-spatial systems shaped through residents' experiences. Neighbourhood characteristics are often interpreted through two broad lenses: physical environment and the social environment[3]. Physical environment encompasses air quality, built-up areas, walkable streets or footpaths, access to healthy food stores, adequate lighting and shading, effective waste management, and other features[4]. The social environment of a neighbourhood includes factors such as sociodemographic composition, social capital, networks, cohesion, crime rates, violence, and others[5].

Crucially, neighbourhood influences across genders are also different[6]. For example, the experiences of women in neighbourhood are shaped by gendered roles, patterns of spatial mobility, and differential access to shared spaces[7]. Existing literature indicates that neighbourhood environments have a significant impact on physical, mental, and overall well-being of women[8]. Consequently, understanding the impacts of neighbourhood on the health of female residents is imperative for advancing gender-sensitive urban planning and public health strategies[9]. Hence, the main aim of the research is to assess the influences of neighbourhood environments on women's health in the old neighbourhood in Kolkata, a prominent megalopolis in India. The rationale for choosing the study locale is presented in section 3.1 of the paper. Before delving into that, a nuanced review of literature strengthens the study's core.

2. REVIEW OF LITERATURE

The literature review for this study was conducted systematically, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[10,11]. The selection of research literature criteria encompasses initial identification of potential studies,

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systematic screening of titles and abstracts, detailed assessment of eligibility based on predefined inclusion and exclusion criteria, and the final determination of which studies will be included in the review. Scopus, PubMed, and JSTOR were selected for the literature search, as preliminary searches showed they yielded the highest volume of relevant studies, totalling 1370 records. A structured keyword strategy was applied, combining neighbourhood, health, women, and India, linked by Boolean conjunctions. During screening, 680 duplicate records were removed. Subsequently, 296 documents outside the social sciences and 40 non-English articles were excluded. After these stages, 334 studies remained eligible for full-text review.

Neighbourhood environments significantly influence physical and mental health outcomes[3]. These include cardiovascular disease, adiposity, depression, anxiety, and reproductive and musculoskeletal health. Existing research highlights how neighbourhood deprivation, crime, social capital, and food environments shape women's health[12]. Built-environment indicators such as walkability, street connectivity, and active living indices are commonly used to assess the potential for neighbourhood health. Exposure to neighbourhood crime is associated with adverse mental health outcomes, including anxiety and depression[13]. Women living in areas marked by low social capital, economic deprivation, and discrimination face higher risks of poor physical and mental health[14]. Pregnant women in socioeconomically disadvantaged and high-crime neighbourhoods are more likely to engage in unhealthy coping behaviours, including poor diet, smoking, and alcohol use[15]. In the USA, African American and Latin American women residing in disadvantaged neighbourhoods experience poorer postpartum health outcomes, including higher rates of hypertension and adiposity[16]. In India, neighbourhood physical environments similarly shape health outcomes. Damaged sidewalks in cities such as Mumbai restrict mobility and discourage active living[17]. Neighbourhood deprivation is positively associated with cognitive health issues and vulnerabilities to health inequities in Kolkata, India[18]. Neighbourhood violence has been linked to substance abuse and health-compromising behaviours among adolescents[19]. Furthermore, higher mental health problems are evident among elderly populations in low-income neighbourhoods, while high-income areas show lower depression levels.

Drawing on the existing literature, research gaps emerge: studies rely predominantly on quantitative methods. There is also a scarcity of literature from developing countries and a limited understanding of how neighbourhood affects women's health, especially among the working-age population in countries such as India. Drawing on the research gaps, this study aims to understand how neighbourhood influences the health of women in Kolkata, one of India's major megalopolises.

3. METHODS

The selected study area is Kolkata, which is the third-largest megalopolis in India[20]. Shyambazar is the oldest neighbourhood in Kolkata. During the 19th century, British settlements and the residences of wealthy native elites were established in this area[21]. Shyambazar embodies the city's cultural heritage through the famous Shobhabazar Palace, the centuries-old Hatibagan market, theatres, traditional architecture, historical schools, and more. The study population comprised working-age women selected for their higher spatial mobility, shaped by employment, childcare, household responsibilities, and social engagement. Methodological scholarship suggests that samples of 150 or more respondents are sufficient to detect medium effect sizes at a 95% confidence level with acceptable statistical power in social sciences[22]. Given the relatively homogeneous socio-spatial context of Shyambazar, a sample of 170 ensured adequate population coverage while balancing feasibility and data quality. Data collection employed snowball and purposive random sampling.

Data were collected in 13 phases between October 14, 2024, and June 15, 2025, among women aged 15-59 years. Verbal informed consent was obtained from all participants prior to data collection. All data were anonymised to ensure participant confidentiality. Surveys were administered in English and vernacular languages, including Bengali and Hindi, at locations convenient to respondents. The questionnaire comprised 85 questions, with 72 closed-ended and 13 open-ended. The questionnaire was organised into five sections covering sociodemographic characteristics, neighbourhood environments, dietary habits, everyday lives, and self-reported health. After each fieldwork phase, data were coded and entered.

Quantitative analysis was conducted using SPSS 27, STATAMP 17, and Microsoft Excel. Descriptive statistics summarised health outcomes, with self-reported BMI categorised using guidelines[16]. Results were presented through charts and graphs. Inferential analysis employed Spearman's rank correlation, selected for ordinal neighbourhood and health variables[24]. However, Spearman's correlation does not assess statistical dependence between categorical variables. Therefore, Karl Pearson's chi-square test was applied to examine whether observed associations were significant beyond chance[25], identifying meaningful associations between neighbourhood stressors and health conditions. Finally, logistic regression was used to assess the relative influence of multiple neighbourhood factors on binary health outcomes[26]. Regression indicators assess the strength of

the predictors, statistical significance, and overall model fit. These include B, SE, Wald X^2, Exp B, Model X^2, and Nagelkerke R^2. Qualitative analysis involved coding the responses to the open-ended questions to identify recurring themes. Transcriptions preserved respondents' expressions, emotions, and cultural nuances beyond grammatical accuracy[23]. Thematic analysis followed a six-step approach[27], including familiarisation, line-by-line coding, theme development, review, naming, and integration of open-ended questions' responses.

4. RESULTS AND DISCUSSION

This section presents and interprets the empirical findings on women's health in Shyambazar, examining how neighbourhood-level physical and social environments shape health outcomes across age groups. The analysis proceeds in three stages. First, it outlines the age-wise distribution of major health conditions to identify demographic vulnerability patterns. Second, it evaluates the influence of the physical environment through Spearman's correlation, Chi-square tests, and logistic regression models, thereby assessing both associative strength and predictive capacity. Third, it analyses the role of the social environment using similar statistical techniques to determine how social disorder and cohesion mediate women's health risks. By integrating correlational and multivariate findings, this section moves beyond descriptive patterns to demonstrate how everyday environmental exposures, such as pollution, waste accumulation, walkability constraints, and social stressors, collectively structure women's physical and psychological wellbeing.

4.1. Health status of women

Age-wise analysis revealed distinct patterns: reproductive concerns were highest among women aged 15-29 years at 35.75%, respiratory problems peaked among those aged 30–44 years at 41.32%, and cardiovascular problems were most elevated among women aged 45–59 years at 44.96%. Reproductive conditions such as PCOS were most prevalent among younger women, linked to sedentary behaviour, hormonal vulnerability, unhealthy diets, psychosocial stress, and limited health awareness, consistent with existing literature[28,29]. Respiratory problems including asthma and bronchitis among women aged 30-44 years were associated with occupational exposure, traffic emissions, and lifestyle factors, aligning with earlier findings. Cardiovascular diseases among women aged 45-59 years were linked to ageing, genetics, stress, poor walkability, and lifestyle, supporting evidence on higher cardiovascular risk in less walkable neighbourhoods[30].

4.2. Influence of physical environment of neighbourhood on women's health

Spearman's correlation: It demonstrated that lack of walkability was associated with cardiovascular health conditions at 0.96, orthopaedic problems at 0.94, and reproductive health problems at 0.89. Air pollution was strongly associated with respiratory disorders, with a correlation coefficient of 0.56. In contrast, garbage and waterlogging were associated with digestive, dermatological, and waterborne diseases, with correlation coefficients ranging from 0.53 to 0.70. This reflects Shyambazar's high social cohesion and its influence on respondents' health. Values in Table 1, between 0.5 and 1.0, indicate a strong positive association.

Table 1. Correlation between problems in physical environment of neighbourhood and health conditions among women

Health Conditions	Attributes of physical environment					
	Crowd & Congestion	Garbage	Air Pollution	Water Logging	Lack of Streetlights	Lack of Walkability
Cardiovascular	0.52	0.33	0.38	0.31	0.96	0.22
Diabetes	0.44	0.29	0.21	0.25	0.72	0.25
Reproductive	0.28	0.38	0.33	0.41	0.89	0.57
Neurological	0.37	0.31	0.4	0.34	0.36	0.41
Digestive	0.33	0.53	0.42	0.7	0.34	0.36
Orthopaedic	0.42	0.26	0.45	0.29	0.94	0.35
Respiratory	0.32	0.48	0.56	0.32	0.46	0.27
Mental	0.45	0.44	0.49	0.36	0.8	0.61
Waterborne	0.31	0.58	0.35	0.66	0.32	0.3
Dermatological	0.26	0.38	0.41	0.58	0.36	0.32

Source: Prepared from fieldwork data

Chi-square test: It confirms Spearman's rank correlation. Garbage disposal affects digestive 13.27, respiratory 16.84, and waterborne illnesses 19.62. Air pollution is linked to respiratory conditions at 22.14. Waterlogging influences digestive 15.93 and waterborne diseases 24.88. Poor walkability is associated with cardiovascular 15.48, diabetes 16.06, reproductive 16.72, and orthopaedic conditions 18.39.

Logistic regression: Table 2 presents associations between physical neighbourhood conditions and health outcomes. Model X^2 values range from 17.88 to 26.40, confirming model significance. Nagelkerke R^2 ranges from

0.17 to 0.25, indicating that 17% to 25% of variation in women's health outcomes is explained by neighbourhood physical conditions. Constant values range from approximately -1.67 to -2.24. Garbage accumulation and air pollution consistently show the highest Wald X^2 and Exp B values, identifying them as dominant predictors.

Table 2. Association between physical environment of neighbourhood and health of women

Health conditions	Predictor variables	Attributes of physical environment of neighbourhood				Constant
		Garbage	Air pollution	Water logging	Lack of walkability	
Cardiovascular	**B**	0.37	0.49	0.33	0.25	-1.91
	SE	0.18	0.21	0.19	0.2	0.45
	Wald X^2	4.22	5.44	3.02	1.56	18.01
	Exp(B)	1.45	1.63	1.39	1.28	0.15
	Model $X^2 = 22.14$, $p < 0.01$; Nagelkerke $R^2 = 0.21$					
Diabetes	**B**	0.41	0.28	0.24	0.29	-1.67
	SE	0.22	0.19	0.18	0.2	0.42
	Wald X^2	3.47	2.17	1.78	2.1	15.82
	Exp(B)	1.51	1.32	1.27	1.34	0.19
	Model $X^2 = 18.50$, $p < 0.05$; Nagelkerke $R^2 = 0.18$					
Reproductive	**B**	0.17	0.38	0.24	0.39	-1.82
	SE	0.14	0.18	0.19	0.21	0.48
	Wald X^2	1.47	4.46	1.59	3.45	14.39
	Exp(B)	1.18	1.46	1.27	1.48	0.16
	Model $X^2 = 19.33$, $p < 0.01$; Nagelkerke $R^2 = 0.19$					
Neurological	**B**	0.39	0.24	0.28	0.29	-1.84
	SE	0.21	0.18	0.19	0.17	0.47
	Wald X^2	3.44	1.78	2.17	2.91	15.3
	Exp(B)	1.48	1.27	1.32	1.34	0.16
	Model $X^2 = 17.88$, $p < 0.01$; Nagelkerke $R^2 = 0.17$					
Digestive	**B**	0.41	0.36	0.31	0.21	-2.04
	SE	0.19	0.18	0.18	0.17	0.49
	Wald X^2	4.66	4	2.96	1.52	17.34
	Exp(B)	1.51	1.43	1.36	1.23	0.13
	Model $X^2 = 24.11$, $p < 0.001$; Nagelkerke $R^2 = 0.23$					
Orthopaedic	**B**	0.39	0.33	0.28	0.26	-1.99
	SE	0.2	0.18	0.19	0.21	0.52
	Wald X^2	3.8	3.36	2.17	1.53	14.65
	Exp(B)	1.48	1.39	1.32	1.3	0.14
	Model $X^2 = 20.02$, $p < 0.01$; Nagelkerke $R^2 = 0.20$					
Respiratory	**B**	0.41	0.36	0.28	0.39	-2.18
	SE	0.21	0.19	0.18	0.19	0.53
	Wald X^2	3.81	3.59	2.42	4.21	16.92
	Exp(B)	1.51	1.43	1.32	1.48	0.11
	Model X^2 (6) = 25.44, $p < 0.01$; Nagelkerke $R^2 = 0.24$					
Waterborne	**B**	0.52	0.31	0.25	0.37	-2.24
	SE	0.23	0.19	0.2	0.21	0.51
	Wald X^2	5.12	2.66	1.56	3.1	19.28
	Exp(B)	1.68	1.36	1.28	1.45	0.11
	Model $X^2 = 26.40$, $p < 0.05$; Nagelkerke $R^2 = 0.25$					

Source: Prepared from fieldwork data

Air pollution emerges as a strong determinant of women's health, particularly for respiratory and cardiovascular conditions. For cardiovascular disease, an R^2 value of 0.21 indicates moderate explanatory power, suggesting that nearly one-fifth of the variation in cardiovascular risk is attributable to neighbourhood-level factors. Respiratory diseases show the strongest model fit, with an R^2 of 0.24, where lack of walkability at 1.48 acts as a key trigger. These findings indicate that vehicular emissions contribute to pulmonary problems, hypertension, and related cardiovascular complications. Poorly maintained and discontinuous footpaths in Shyambazar further restrict women's physical activity, aggravating musculoskeletal conditions. Digestive conditions, with an R^2 of 0.23, are particularly sensitive to garbage accumulation at 1.51 and air pollution at 1.43, indicating that unhygienic waste disposal and blocked drainage promote bacterial and parasitic exposure. Lack of walkability also significantly

affects gastrointestinal, orthopaedic, and reproductive health through combined effects of dampness, vector exposure, and limited mobility. Reproductive health conditions, with an R^2 of 0.19, are strongly associated with lack of walkability at 1.48. Waterborne diseases demonstrate the highest explanatory power, with an R^2 of 0.25, where garbage accumulation at 1.68 and lack of walkability at 1.45 are dominant predictors.

4.3. Influence of social environment of neighbourhood on women's health

Spearman's correlation: In Shyambazar, the social environment demonstrates its strongest associations with mental health, showing consistently high values across eve teasing 0.54, theft 0.54, drunkards 0.52, loud music 0.56, and particularly lack of social cohesion 0.85, indicating that weakened neighbourhood trust and social fragmentation are closely linked to psychological distress. Drunkards also show strong associations with cardiovascular 0.82 and neurological 0.86 conditions, suggesting stress-mediated pathways. Reproductive and digestive conditions exhibit moderate links with theft and loud music, while diabetes and waterborne diseases display comparatively weaker associations, implying that social disorder in Shyambazar primarily operates through psychosocial rather than purely biomedical mechanisms.

Table 3. Correlation between problems in social environment of neighbourhood and health conditions among women

Health Conditions	Attributes of social environment				
	Eve Teasing	Theft	Drunkards	Loud Music	Lack of Social Cohesion
Cardiovascular	0.19	0.28	0.82	0.26	0.62
Diabetes	0.18	0.24	0.18	0.22	0.44
Reproductive	0.23	0.35	0.28	0.39	0.28
Neurological	0.3	0.13	0.86	0.42	0.37
Digestive	0.26	0.37	0.35	0.14	0.33
Orthopaedic	0.21	0.26	0.22	0.29	0.42
Respiratory	0.26	0.31	0.29	0.32	0.22
Mental	0.54	0.54	0.52	0.56	0.85
Waterborne	0.21	0.33	0.25	0.31	0.31
Dermatological	0.28	0.36	0.31	0.33	0.26

Source: Prepared from fieldwork data

Chi-square test: Loud music correlates with cardiovascular conditions at 13.94, while lack of social cohesion shows a strong association with mental health at 21.07.

Logistics regression: Table 4 presents logistic regression results linking neighbourhood social conditions with women's health in Shyambazar. Loud music and lack of social cohesion are associated with cardiovascular, neurological, and mental health problems. Negative constant values indicate low baseline health risk in the absence of these issues. Model X^2 values range from 8.00 to 13.52, while Nagelkerke R^2 values from 0.06 to 0.10 show that the social environment explains a modest proportion of health variation. For cardiovascular health, exposure to loud music showed a positive regression coefficient of 0.33 with a SE of 0.11, indicating increased odds of cardiovascular problems, with an odds ratio of 1.39. Similarly, lack of social cohesion recorded a coefficient of 0.34 with a SE of 0.16 and an odds ratio of 1.40, suggesting elevated cardiovascular risk. Neurological health also showed positive associations. Loud music had a regression coefficient of 0.38 with a SE of 0.19 and an odds ratio of 1.46, indicating a higher likelihood of neurological problems. Lack of social cohesion showed a coefficient of 0.18 with a SE of 0.09 and an odds ratio of 1.20, marking increased neurological risk.

Table 4. Association between social environment of neighbourhood and health of women

Attributes of social environment	Health conditions											
	Cardiovascular				Neurological				Mental			
	Predictor variables				Predictor variables				Predictor variables			
	B	SE	Wald X^2	Exp(B)	B	SE	Wald X^2	Exp(B)	B	SE	Wald X^2	Exp(B)
Loud music	0.33	0.11	9.00	1.39	0.38	0.19	4.00	1.46	0.29	0.18	2.60	1.34
Lack of social	0.34	0.16	4.52	1.40	0.18	0.09	4.00	1.20	0.36	0.15	5.76	1.40

cohesion												
Constant	0.33	0.11	9.00	1.39	0.38	0.19	4.00	1.46	0.29	0.18	2.60	1.34
Goodness-of-fit measures	Model X^2 = 13.52, p < 0.001; Nagelkerke R^2 = 0.10				Model X^2 = 8.00, p < 0.018; Nagelkerke R^2 = 0.06				Model X^2 = 8.36, p < 0.015; Nagelkerke R^2 = 0.06			

Source: Prepared from fieldwork data

For mental health, loud music was associated with higher odds, reflected by a regression coefficient of 0.29, a SE of 0.18, and an odds ratio of 1.34. A stronger association was observed for lack of social cohesion, with a coefficient of 0.36, a SE of 0.15, and an odds ratio of 1.40, indicating higher odds of mental health problems. Hence, social environmental attributes play a critical role in mental health. Although a lack of social cohesion was not evident in Shyambazar, these results suggest that its absence would adversely affect women's health. Strong neighbourly interactions, participation in neighbourhood-based organisations and social support reduce stress and promote psychological well-being, as thematised from the responses of the open-ended questions.

The presence of the Hathibagan market keeps Shyambazar overcrowded year-round. Lack of walkability emerges as a critical finding across analyses, strongly linked to cardiovascular, orthopaedic, diabetic, and reproductive health problems. Poor pedestrian infrastructure, uneven streets, and roadside garbage discourage physical activity and increase chronic disease risk. Access to active-living-friendly spaces could mitigate these burdens. Reproductive health improves with lifestyle changes in walkable neighbourhoods[29], a condition lacking in Shyambazar and identified by respondents as affecting health.

5. CONCLUSION

This study examines how neighbourhood environments influence women's health in Kolkata, India. It demonstrates that neighbourhoods are not passive backdrops but active socio-spatial contexts that structure everyday life, mobility, and well-being. Findings from Shyambazar reveal that most respondents were born in, or had long resided near, their current neighbourhoods, reflecting deep-rooted place attachment and familiarity. Such long-term settlement fostered strong emotional ties and a sense of belonging. Women's spatial mobility remained largely localised, structured around domestic responsibilities, caregiving roles, and essential daily activities, reinforcing the centrality of the neighbourhood in influencing health experiences.

Despite strong social embeddedness, the physical environment posed persistent challenges. Air pollution, traffic congestion, and garbage accumulation emerged as prominent concerns, directly affecting everyday comfort and health. However, these challenges were partially offset by high levels of social cohesion, dense support networks, and collective coping practices. Social cohesion acted as a protective buffer against health concerns of women. Age-specific health patterns further highlighted differentiated vulnerabilities: reproductive health conditions were most prevalent among women aged 15-29 years, respiratory disorders among those aged 30-44 years, and cardiovascular conditions predominantly among women aged 45-59 years.

Old neighbourhoods such as Shyambazar possess strong cultural anchoring and local institutions that can support community health engagement. Respondents highlighted equipping neighbourhood organisations with basic health knowledge, first aid, and hygiene promotion, while mobilising schools as hubs for action. Improvements in sanitation, drainage, footpaths, and waste management remain essential. With scarce open space, micro-greening and women-led walking groups, yoga, and outdoor exercise can enhance wellbeing. This study provides valuable insights into neighbourhoods as key social determinants of health and identifies important directions for future research. Time constraints prevented longitudinal assessment, highlighting the need for studies on neighbourhood transitions and long-term health outcomes. Future research could examine intergenerational and comparative gender perspectives within diverse social contexts. Exploring the health effects of digitalisation, smart city development, and post-pandemic urban change would further deepen understanding of evolving social and spatial determinants.

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