Study of Neighborhood environment for Cardiovascular Health in a Squatter Area in Nepal

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ABSTRACT

Background

Behavioral risk factors for cardiovascular diseases are prevalent among the urban poor in Nepal. Understanding environmental factors such as the availability of retailers selling tobacco, alcohol, and junk food, as well as neighbourhood access to and the built environment's support for physical activity is critical for addressing the rising burden of cardiovascular disease in the community.

Objective

To identify aspects of the community environment that contribute to behavioral risk factors, focusing on the food supply system, built environment, walkability, and the marketing, availability, and accessibility of tobacco and alcohol.

Method

Spatial data were collected in the Sinamangal-Minbhawan squatter area of Kathmandu using a mixed-method approach. Geographic Information System tool, direct field observations, including spot observation and transect walk, and Market Basket Surveys were done by a trained research team during the period March-May 2022. Data were analyzed using methodological triangulation, combining interviews, observations, GPS data, and Google Earth imagery in ArcMap 10.8. Thematic analysis of market basket survey interviews involved coding transcripts for cardiovascular disease-related behaviors, with codes refined into six key themes, including sociodemographic characteristics.

Result

We reported a few vegetable outlets and no fruit shops. There were 84 fast-food outlets and local restaurants with junk food and soft drinks available. We observed 77 tobacco outlets with a variety of tobacco products easily available to all. There were 48 alcohol outlets in the area, which, except for four outlets, were present together with tobacco and junk food outlets. Tobacco and alcohol products were largely consumed by men of all age groups.

Conclusion

Community-based health programs can raise awareness about the importance of healthy behavior. Advocacy efforts to promote policies that support improved access to healthy foods, smoke-free public spaces, and safe environments for physical activity are important to provide community members with healthy choices.

KEY WORDS

Food supply environment, Geographic information system, Market basket survey, Spatial analysis

INTRODUCTION

Cardiovascular diseases (CVDs) and their behavioral risk factors such as tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol are rising public health issues in Nepal.[1,2]

Nearly half of Nepal's population of 30 million resides in urban areas with around 10% of the urban population being slum dwellers.[3] Sinamangal-Minbhawan squatter area is one of the largest squatters of Kathmandu Metropolitan City, the capital of Nepal, and our previous cross-sectional study found that behavioral CVD risk factors such as alcohol consumption, smoking, unhealthy diet, and physical inactivity are very common among the adults living in this community.[4]

The study aimed to identify aspects of the community environment that contribute to behavioral risk factors, focusing on the food supply system, built environment, walkability, marketing, and the availability and accessibility of tobacco, alcohol, junk food, fruits, and vegetables, as well as the presence of open spaces suitable for physical activity in the Sinamangal-Minbhawan squatter area.

This study is a part of the formative research to inform a community-based CVD prevention intervention in the locality. The findings of the formative participatory research shall inform a theory-based multi-sectoral, community-based intervention project that is contextual and locally--tailored.

METHODS

This study used a mixed-methods approach, which allowed cross-validation of important issues regarding behavioral risk factors for CVD. The study was done in the Sinamangal-Minbhawan squatter area (Fig. 1) in the capital, Kathmandu, along the bank of the Bagmati River. This squatter area is one of the largest among the estimated 57 slums in Kathmandu, with approximately 700 houses and around 5,000 people. Three trained research assistants collected data between December 2021 and May 2022.

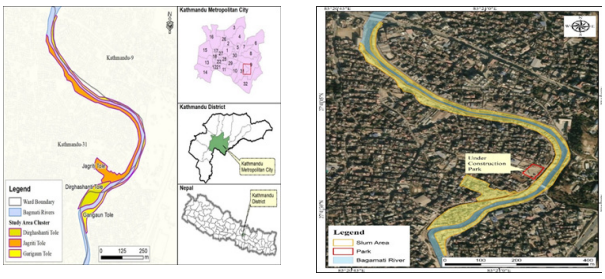

Figure 1. Sinamangal-Minbhawan squatter area. (A) Study area in administrative boundary (B) Study area in geographical location with Google satellite image (WGS 1984).

Geographic Information System (GIS) tool

Spatial data were collected using Geographic Information System (GIS) tools, direct field observations, including spot observation and transect walk, and Market Basket Surveys (MBS) were used to identify the food-supply system, built environment, and walkability, tobacco and alcohol marketing, availability, and accessibility about the behavioral risk factors in the community. We employed a purposive sampling method to select participants for both the quantitative and qualitative components of the MBS, taking into consideration of the number of active marketplaces, population density and relevance to the study topics. We selected the adults above the age of 18 and those who have been residing in the locality for more than a year.

In addition to field observations, local facilities and services within the study area and its vicinity were identified through consultations with residents and then mapped using GIS tools. Android GPS devices and Google Earth images were used as base maps to precisely locate and assign attributes to the behavioural risk factors. Android GPS devices and Google Earth images data were managed and analysed in QGIS desktop 3.28.0 version computer software. QGIS, an open-source software licensed under the GNU General Public License (GPL), which allows free use, modification, and distribution. The point coordinates used in the study were collected using handheld mobile GPS devices with an accuracy of ± 5 meters with a basemap of Google Earth Pro satellite image referenced in the WGS 84 coordinate system. A total of 239 geolocated data points were used, distributed across the area. A specific application named "SW Maps" was used for this purpose. These data were located as the point data feature. The recorded data were then exported to Arc Map for further analysis. Preliminary information on outdoor parks was gathered through consultations and later verified through field observations.

Direct observation

The direct observation technique was employed by applying two major tools, namely the transect walk and spot observation. The variables in the checklist were categorized into three different themes, namely dietary practices, physical activities, and environmental aspects. Three observers simultaneously did spot observation so that rich and diverse information could be drawn. The observed information was first noted on the mobile phone to avoid the attention of the public. Mainly, the existence of the attributes, their present condition, and usage were noted during the observation. Altogether, two spot observations, 20-25 minutes each, were done at an interval of five days. The information on people buying food items, alcohol, smoking, eating practices, physical activity, and environmental aspects was noted on the mobile phone.

A transect walk was done at three places, namely Gairigaun, Dirghasanti and Jagriti. A transect walk was employed for 3 rounds on separate days. Each round of the transect walk was made in the complete study area. Each walk was for around 1 hour and 30 minutes on average. The observations were noted on mobile and later filled in the checklist (tool for transect walk). Four themes were observed for which information was collected. They are summarized in those themes, with further categorization of variables.

Market basket survey (MBS)

We conducted a market basket survey (MBS) to identify the food supply chain to assess the in-built environment for the prevention of risk factors of CVDs. MBS consists of quantitative and qualitative components. A structured observation checklist (MBS checklist) was used to collect quantitative data and included a list of grocery items relevant to the study, as well as a list of some commonly available fruits and vegetables, along with their quality ratings. Similarly, we conducted 12 in-depth interviews (IDIs) to explore the food supply system and the consumption pattern in the community. Five consumers, five shopkeepers, and two vendors selling fruits and vegetables were selected purposively for the interviews.

We applied methodological triangulation, which promotes the use of several data collection methods such as interviews and observations to increase the credibility and validity of research findings 5) Android GPS devices and Google Earth images data were managed and analysed in ArcMap 10.8 computer software.

For observations, the information collected and noted in a mobile phone by each observer was subsequently filled into the checklist separately. Information obtained from the transect walk and spot observations was then summarized in a table, which highlighted positive, negative and neutral attributes, based on the consensus of the research team. Each observer was assigned to prepare a separate summary table to ensure inter-observer reliability.

We adopted thematic analysis for the analysis of the MBS interview findings. All MBS audio recordings and field notes were transcribed and translated. Researchers read the transcription multiple times to become deeply familiar with its content and noted down initial ideas and impressions through which a codebook was prepared. Codes were labeled as they related to the CVD health behaviors like type of meal consumed, buying and consumption patterns, fruits and vegetables serving, availability and quality of food items, seasonal effects in vegetable and fruits consumption, affordability for food, and storage. The codebook is filled with the data from the transcription along with important verbatim. Then the codes were grouped into potential themes to represent the findings of the MBS survey. Research assistants reviewed and refined the codes into themes to best reflect the data. The data was presented in six major themes, including the sociodemographic characteristics of the respondents.

We carefully maintained all the principles of ethical research conduct. We obtained ethical approval from the Nepal Health Research Council (Ref. N 1094, 14 November 2021). The research assistant obtained informed verbal consent by the research team members from each respondent before data collection and voice recordings when applicable. Confidentiality and privacy were maintained by the research team throughout the process. The study strictly considered the individual rights of the participants and ensured volunteer participation.

RESULTS

Community physical environment and walkability

The Sinamangal-Minbhawan squatter area occupies 0.049 sq. km, including 69 percent area on the East riverbank area (1.3 km linear extension) and 31 percent on the West riverbank area (1.5 km linear extension) of the Bagmati river. The temporary houses were built packed on the riverbank and were made of corrugated zinc, wooden windows, plastics, mud, and bricks. Roads were blacktopped only on the eastern side of the river. Besides the crossroad, there were no open spaces for sports or exercises. Playground, gym hall, and places for doing physical exercises were not present in the community. The street is the only open space where people walk, cycle, and where children play. There were two outdoor parks captured by the GIS mapping assessment. One public park was under construction.

Most of the adult men were engaged in physical work in the surrounding city areas whereas the women went for household chores in the nearby communities. Young children went to a public school near the community. The elderly women and men took care of the children and remained at home. Thus, we performed data collection work mostly in the morning and evening. In the morning, people were seen gossiping and walking around. Children were observed cycling, and playing football in the streets while women were busy with household chores. Adult men have engaged in labor work like lifting loads, cutting logs, plastering houses, etc.

Community Diet and Food-supply System

None of the families in the community grew any type of food and vegetables on their own. All of them bought their food, including vegetables, fruits, and meat products from the surrounding market. There were two vegetable shops selling fruits and vegetables regularly in that area. The shops had seasonal vegetables like cauliflower, eggplant, tomato, beans, spinach, carrots, cucumber, radish, and pumpkin which looked fresh but there were no fruit shops. However, mobile vendors in cycles and carts almost daily in

the morning and evening were selling seasonal fruits and vegetables (Fig. 2, A). Apple, orange, banana, papaya, and pomegranate were some of the varieties of fruits observed in the basket of fruit vendors. The vendors shared that people bought seasonal vegetables regularly, whereas fruits were only occasionally purchased.

Figure 2. Mobile stalls with vegetables (A) and packaged junk food, (B) observed during transect walks in the Sinamangal-Minbhawan squatter area.

"I buy fruits and vegetables for around 500 rupees per week. I buy vegetables on every alternate day. However, I buy fruits less because it is more expensive. We share the fruits among family members".-Consumer

"We get vegetables according to the season which also affects the price. The current season is of cauliflower, and therefore, cauliflower is cheaper now, it will be more expensive in the off-season."-Vendor

The consumers shared they could get fresh vegetables but less so in the case of fruits. They also perceived that the fruits and vegetables available in the market were not free of pesticides and preservatives.

"I don't think we can get good quality food products in Kathmandu, unlike in rural villages, because everything here comes from long distances. Everyone eats the same products here, so I also have to eat. Everyone buys thinking it is good".- Consumer

There were 11 meat shops seen in the community, with chicken as the most common meat available. The sanitation conditions of the meat shops were poor. People consumed meat products almost daily, especially in the evening and on Saturdays. Fried and cooked meat snacks are available in the eating outlets throughout the day.

There were many grocery shops in the study area selling packed noodles, biscuits, snacks, bakery items, sack juice, carbonated drinks, salty chips, chocolates, and tobacco products.

Moreover, many small fast-food outlets and mobile stalls (Fig. 2, B) sold junk foods like locally made noodles (chowmein), momos (dumplings), fried meat items, oil-fried snacks, and such as doughnuts. Adults and children were seen eating momos, noodles (chowmien), biscuits, carbonated drinks, and spicy snacks (panipuri and chatpate) in the eating outlets on the way from workplaces and schools. Such food items were found deep fried in oil, high in salt, and openly kept in non-hygienic utensils. It was common for mothers and children to buy those food items for daytime snacks. Mostly school-going children bought noodles, biscuits, sugary drinks, and packaged juices.

When asked about the cost of buying junk food, a consumer respondent paused for a while and said it was fine for her. Similarly, another consumer responded with hesitation that, rather than cost, buying instant food items reduced her workload, and they were also easily available. Almost all respondents knew that such food items are more harmful and may lead to raised blood sugar and blood pressure. They also shared that oil-fried food can raise blood cholesterol levels, increase body weight, and may increase the risk of developing cardiovascular disease.

The GIS mapping assessment captured 64 junk food outlets and seven vegetable outlets in the community (Fig. 3).

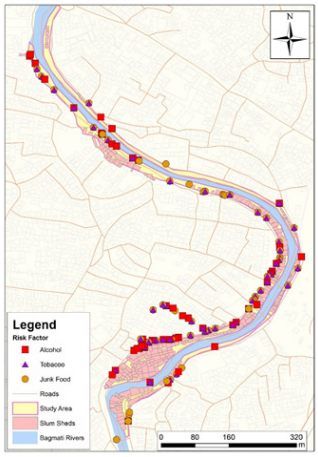

Figure 3. GIS map of the Sinamangal-Minbhawan squatter area showing distribution of outlets where alcohol, tobacco, junk food is available.

Community alcohol and tobacco environment

Alcohol and tobacco were easily available in the grocery shops. Alcohol was mostly sold to adults and middle-aged men in the eating outlets along with meat items. According to the shopkeepers, alcohol was consumed largely by men of all age groups, especially by daily wage labourers.

A large number of men were observed smoking and chewing tobacco products. However, no children were observed buying or consuming tobacco products and alcohol. Women were not observed smoking, except for a few elderly women. There were 48 alcohol outlets and 77 tobacco outlets captured by the GIS mapping assessment.

Distribution of alcohol, tobacco, and junk food outlets in the community

In the study, alcohol, tobacco, and junk foods, local restaurants are considered as factors that contribute towards risky behavior, whereas the availability of vegetables, fruit outlets and outdoor parks are considered as the factors contributing towards protective behavior.

In the study area, 239 environmental behavioural factors to cardiovascular diseases were found, with 3.3 percent (8 outlets) protective factors and 96.7 percent (231 outlets) risk factors. Whereas 3 protective factors two outdoor parks and one vegetable outlet are in the influencing peripheral zone to the study area based on the frequency of visits and proximity.

Within the 0.049 sq. km (49000 sq. m) study area, tobacco outlets were most common (3.1 per 2000 sq. m) followed by junk food (2.6 per 2000 sq. m), alcohol outlets (2 per 2000 sq. m) and local restaurants (1.7 per 2000 sq. m). In contrast, the distribution of vegetable outlets and outdoor parks in the study area was least present (< 1 per 2000 sq. m) (Table 1).

Table 1. Distribution of risky behavioural factors and protective factors in the Sinamangal-Minbhawan squatter area.

Factors	Frequency (%)	Density per 2000 sq. m	Average Distance (m)
Risky behaviour factors	**231 (96.7)**	**9.4**	
Alcohol outlets	48 (20.0)	2.0	26.8
Tobacco outlets	77 (32.2)	3.1	19.7
Junk Food outlets	64 (26.8)	2.6	20.8
Local Restaurants	42(17.6)	1.7	25.4
Protective Factors	**8 (3.3)**	**0.4**	
Vegetable Outlets	6 (2.5)	0.3	477.5
Outdoor Park	2 (0.8)	0.1	975.8
Total	**239 (100)**	**9.8**	

Coinciding protective and risk factors

Among 239 behavioural factors in the study site, 37 factors occur singly and 201 either coincide with another risk factor that contributes towards risky behavior or with a factor that contributes towards protective behavior. Among the 201 coinciding factors, 99 risk factors coincided with another risk factor, whereas 102 coincided with both risk and protective factors. None of the protective factors coincided with another protective factor.

Table 2. Availability of coinciding protective and risk factor in the Sinamangal-Minbhawan squatter area.

Factor	Singly	Coinciding with other risk factors	Coinciding with protective and risk factors	Total
Risk factors				
Alcohol outlet	4	14	30	48
Junk Food outlet	14	40	10	64
Tobacco outlet	5	45	27	77
Local Restaurants	9	0	33	42
Protective factors				
Vegetable Outlets	4	0	2	6
Parks	2	0	0	2
Grand Total	**38**	**99**	**102**	**239**

Out of the 159 factors occurring together with other factors, tobacco and junk food outlets were found to occur the most (41.5%) followed by alcohol, tobacco, and junk food together (22.6%). In addition, there were 42 local restaurants (khajaghar) selling junk foods and meat items and 11 butcher houses selling varieties of meat. Local restaurants were the main outlets of alcohol.

DISCUSSIONS

The community environment strongly impacts the community members' health and contributes to the high burden of CVD behavioral risk factors.[6,7] Understanding environmental factors that include - the presence or absence of retailers of tobacco, alcohol products, and junk food, and neighborhood availability of, and built environment conducive to physical activity - is critical for developing individual and community-level interventions.[8]

Unhealthy diet environment

Evidence shows that high consumption of fruits and vegetables is associated with a reduced risk of cardiovascular disease.[9] Moreover, it is known that access to food retailers who sell fruits and vegetables can positively influence people's food procurement and consumption.[10,11] The assessment of the Sinamangal-Minbhawan squatter area showed few vegetable outlets and no fruit shops in the community. However, few mobile vendors were filling the gaps in the availability of seasonal fruits and vegetables, but were selling them only in the morning and evening. Mobile vendors use a bicycle, four-wheel cart, or baskets to carry their goods. We found that single fruit and vegetable vendors did not have all the types of fruits and vegetables. No households in the community had their garden as well.

Our study reported a high number of fast-food outlets and local restaurants (84 outlets) in the community that were selling junk foods like locally made noodles, deep-fried meat items, oil-fried snacks, and sweets such as doughnuts. Carbonated drinks were commonly consumed by children in the slum community. Respondents stated that low fast-food costs and convenience make these foods attractive, especially for mothers with small children. Our finding coincides with the high availability of fast food in an informal settlement in Nairobi, Kenya.[12] Thus, research shows that the availability of sugary beverages and junk foods in the proximity could contribute to high consumption.[13]

Tobacco and alcohol

The Sinamangal-Minbhawan squatter area, though not big in terms of area, had 77 tobacco outlets with a variety of tobacco products easily available to all. Such wide availability within reach for the residents will influence smoking behaviors in the community.[13,14] High tobacco consumption was also reported in the population-based study in urban slums of India.[15]

Indeed, proximity to a tobacco retail outlet is associated with higher smoking behaviours.[16-18]

Similarly, we reported 48 alcohol outlets in the area, which, except for four outlets, were present together with tobacco and junk food outlets. A qualitative scoping review demonstrates that availability, accessibility, and visibility of alcohol may contribute to permissive drinking environments.[19] We found that tobacco and alcohol products were largely consumed by men of all age groups, especially by daily waged labor. Outlets selling both tobacco and alcohol are found to have more disadvantageous effects for the community compared to single tobacco or alcohol outlets.[20] In fact, reduced availability can lead to lower consumption rates because people have fewer opportunities to purchase these products. When access to alcohol and tobacco becomes more difficult, the effort required to obtain these products increases. This inconvenience can act as a limitation to frequent use or impulsive purchases. High densities of alcohol and tobacco retail outlets can normalize the use of these substances and reinforce social norms that accept or even encourage their consumption.[21]

Physical activity environment

The availability of public parks is a critical resource for physical activity in communities.[22] Our study showed that there is a scarcity of open spaces and other physical infrastructures for physical activity and recreational activities in the study area. The slum settlement is crowded with compromised housing and the surrounding environment. Studies show that people who live near parks are more likely to meet physical activity guidelines.[23,24]

CONCLUSION

The community environment plays a pivotal role in shaping individuals' choices and behaviors related to health, particularly in the context of cardiovascular disease risk factors.

Thus, communities where tobacco and alcohol products are readily available and accessible may increase the likelihood of individuals using tobacco and drinking. Restaurants and food outlets are sources of unhealthy foods high in fats, sugars, and salt can contribute to poor dietary choices. Diets high in unhealthy fats and sugars are associated with obesity, hypertension, and diabetes, all of which increase the risk of CVD.

Community-based health programs can raise awareness about the importance of healthy behaviors such as regular physical activity, balanced nutrition, and smoking cessation to make informed choices about their health. Moreover, advocacy efforts to promote policies that support improved access to healthy foods, smoke-free public spaces, and safe environments for physical activity are important to provide community members with healthy choices.

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