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Spatial Distribution and Behavioural Causes with Prevention of Non-Communicable Diseases in Urban Populations: A Case Study of Salamulla, Kolonnawa, Colombo, Sri Lanka

L. D. D. N. Nanayakkara

Department of Geography and Environmental Management, Sabaragamuwa University, Sri Lanka

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*Corresponding author
E-mail address:
dnanayakkara8@gmail.com

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ABSTRACT

At present, non-communicable diseases record an extreme prevalence around the world, and Salamulla Grama Niladhari Division is no exception. Therefore, this study aimed to identify the spatial distribution of non-communicable diseases in Salamulla, effect of the behaviour and lifestyle of urban population on the occurrence of NCDs, most common non-communicable diseases, and the prevention measures taken by the community and the government. The mix-method approach was employed, collecting primary data through questionnaire surveys and semi-structured interviews. Analysis was performed by displaying GPS locations, creating kernel density maps through ArcGIS Pro 3.2, performing descriptive statistics with histogram through IBM SPSS 21 and MS Excel 2016, and thematic analysis. The findings indicate that the distribution of NCDs in Salmulla spans the South-eastern, Western, Central, North-western, and Northern regions. South-eastern, North-western regions and central area, which were urbanised during a 10-year period, are the highest kernel density areas recorded from the majority of NCDs. Gastritis is the most abundant non-communicable disease. Further, internal factors like bad habits, attitudes, age, posture, occupation, daily activities, socio-economic status, parenthood, and external factors like religious ideologies, food patterns, and physical activities were identified. It indicates that the behaviour and lifestyle of respondents play a significant role in the prevalence of NCDs. The community takes preventative interventions like controlling sugar and/or salt intake, and meditation. Government contributes by distributing pots for cultivation and implementing awareness programmes to address the issue.

1. Introduction

Health can be known as the fitness of the individual both physically and mentally. However, diseases lead individuals to physical and mental suffering in their lives. Unfortunately, with the development of mankind, people have to suffer from communicable and non-communicable diseases (NCDs) separately. A study was done to identify the trend of the burden of NCDs across developing countries as it was revealed that there was a high burden of NCDs in these nations, particularly regarding four main types of NCDs. It was identified that cardiovascular diseases (CVDs) were increasing rapidly. According to the predictions, changing lifestyles of people due to industrialisation and urbanisation was the primary factor behind the emergence of NCDs in developing countries. In the case of diabetes, individuals aged 35 to 64 were most affected in developing countries, whereas in developed countries, the most affected group was those aged 65 and older. Further, the number of cancer patients increased by 73% during 2000 to 2020 due to the ageing population, urbanisation, and diet patterns in developing countries. The main reasons for the prevalence of NCDs were smoking, use of alcohol, obesity, diet pattern, and physical inactivity. Lack of adaptation to pragmatic measures, followed by developed countries, was one of the issues in developing countries. Insufficient enforcement of laws, poor diagnosis of the diseases specially related to cancer, CVDs, and diabetes, lack of strategies to improve the health of the community, and expansion of multinational tobacco companies in developing countries caused the presence of NCDs in developing countries (Boutayeb & Boutayeb, 2005; Joossens, 2000).

Several risk factors related to the occurrence of NCDs are observed. A study conducted to examine the risk factors contributing to NCDs in the semi-urban population in Thailand has identified that insufficient intake of fruits and vegetables, consumption of high-fat foods, and instant foods were the main causes of NCDs among urban population. Further, population with low income and low educational level has also showed a high amount of NCDs (Nawamawat, Prasittichok, Prompradit, Chatchawanteerapong, & Sittisart, 2020). On the other hand, a shift in health trends in urban areas has been observed, characterised by the transition from communicable diseases to NCDs, a phenomenon known as epidemiological transition among the urban population. Specifically, urban poverty resulting from overcrowding and improper working conditions serves as a determinant contributing to health issues, including insufficient diet patterns, lack of sanitation, and stress (Knox & McCarthy, 2011). Individuals with higher incomes are more likely to adopt Western dietary patterns and engage in less physically active lifestyles, largely due to their reliance on personal vehicles. The sedentary lifestyle of the people was also identified as a factor of obesity. Further, it has been identified that prevailing obesity has risen with the growth of urbanisation in urban Nigeria (Olatunbosun, Kaufman, & Bella 2010).

Considering the spatial distribution, Asemanya, Agan, Danasabe, & Makyur (2021) identified the distribution of Diabetes Mellitus spatially in Makurdi Metropolis which has 11 wards. The wards are clustered as Bar, Wailomayo and Fiidi and they showed Diabetes Mellitus as 19.1%, 18.6% and 18.1% respectively. It was identified that the Federal Medical Centre had 63% cases of which 83.3% of Diabetes Mellitus reported in Fidi ward while the General Hospital had 37% cases of which 79.2% of Diabetes Mellitus reported in the NorthBank I ward. It was assumed that the high usage of alcohol due to high concentrations of beer parlours may be the cause for such a clustered pattern.

Shil, Puri, & Prakash (2017) aimed to investigate NCDs' prevalence in agro-climatic and political regions in India. They revealed that South Kerala had the highest prevalence

of NCDs while Cachar Plain Assam had the lowest prevalence. In addition, NCDs were highly present in Southern and some parts of Northern areas due to the presence of ageing population (≥60 age) and percentage of widowed, divorced or separated individuals. Northern, Southern, Western and some parts of Central regions were also observed with NCDs due to the presence of urban areas. In Sri Lanka, a study was done to examine the spatial distribution of Chronic Kidney Disease of unknown aetiology (CKDu) by using GIS and GPS in North Central region. It identified five areas of high CKDu prevalence: Medawachchiya, Padaviya and Girandurukotte as main three and Medirigiriya and Nikawewa as two small foci, while some of the villages in Kebithigollewa were identified with low prevalence of CKDu. According to the GIS mapping, high prevalence areas were located below the reservoirs and canals which have stagnant irrigated water while population in low prevalence areas received natural spring water (Jayasekara, Dissanayake, Adhikari, & Bandara, 2013).

Regarding 2016 statistics in Sri Lanka, heart diseases (2.6%), high blood pressure (10.3%), wheezing or asthma (5.2%), diabetes (8.2%), high blood cholesterol (7.5%), and cirrhosis (1%) were more prevalent in urban areas, while paralysis (0.5%) was more prevalent in both rural areas and estate areas, cancer (0.4%), and Chronic Kidney Disease (0.6%) were more common in rural areas. Colombo, the most urbanised area, recorded the highest rates for high blood pressure (11.7%), diabetes (9.2%), and high blood cholesterol (8.5%), with heart diseases (2.9%) at the second highest (Department of Census and Statistics, 2016). According to the news telecast by "Rupavahini Sinhala News 8.00 pm 2020-11-11" (2020), non-communicable diseases accounted 93% of the Covid-19 deaths in Sri Lanka in 2020 where people with NCDs specially CVDs, diabetes, kidney diseases and cancers were rapidly affected by the Covid-19 virus. According to Hansa Jayarathne Andradige & Liwan Liyanage (2024), more than 80 % of the deaths are caused by NCDs as a result of lifestyle changes and socio-economic improvement. Therefore, they emphasised the necessity of conducting a comprehensive study by focusing on trends and patterns, and further determining the factors that contribute to prevention strategies.

Kolonnawa, a suburb on the periphery of Colombo. With the migration, Salamulla, a suburban area, became developed and is still in the process of development. Hence, with the urban lifestyle, it was identified that many people have NCDs which need to be controlled in addition to Communicable diseases. Though the main research areas in Sri Lankan context have mainly focused on the effects of unhealthy dietary patterns on NCDs in Colombo district (Jayarathne, 2019), particularly regarding the risk factors of selected NCDs within the private sector (Swarnamali et al., 2017), as well as risk factors of NCDs among three-wheel drivers in Gampaha Urban Council (Dissanayake, Kisokanth, & Warnakulasuriya, 2021), there is a lack of literature addressing spatial distribution and behavioural impacts of NCDs of urban population. Therefore, this study aims to fill that gap by identifying the spatial distribution of NCDs with the behavioural impacts. It will enable more effective resource distribution and strategic planning by identifying patterns, behaviour and lifestyle of urban population, and identifying the current methods of prevention from NCDs that have been taken by the community themselves and by the government in Salamulla Grama Niladhari Division (GND).

2. Materials and Methods

Salamulla GND, the study area of this research, lies within the Kolonnawa Divisional Secretariat Division (DSD) in Colombo district in Western Province of Sri Lanka. It is one of the GNDs out of 46 total GNDs in Kolonnawa DSD, and one of the

urban areas out of 13 GNDs which belong to Kolonnawa Urban Council area. As Kolonnawa is one of the suburbs located at the periphery or first crescent of Colombo, Salamulla also undergoes direct effects of urbanisation. With the high migration of people into suburban areas like Kolonnawa, Salamulla GND has also become a highly densely populated area. The study area is located 79°53'35.89"E, 6°55'37.2"N, and covers 0.559km^2 land area.

Salamulla GND has total population of 6124 which comprises five major ethnic groups and few other groups while there are four major religious groups and few other groups.

The female population (3244) is higher than the male population (2880). There are 572 people without any formal education, and 428 people educated up to grade 8.

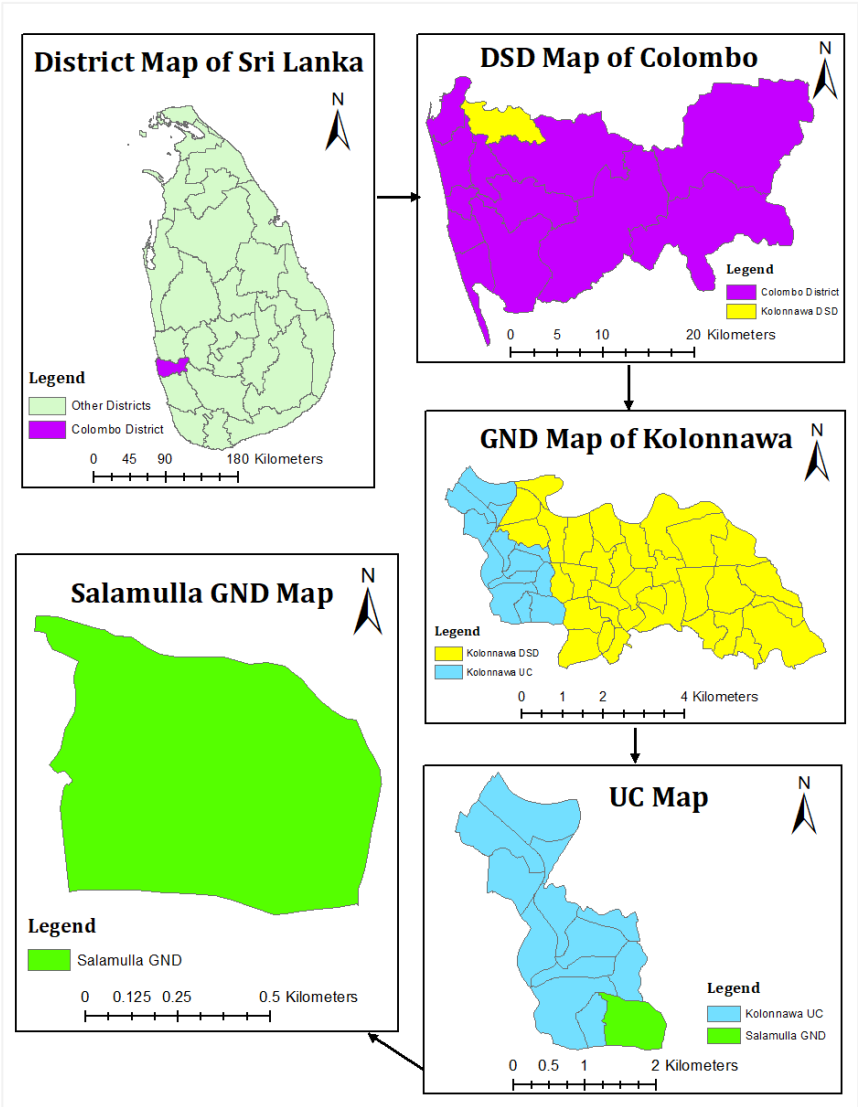


Figure 01. Map of the study area

Samples were selected using stratified random sampling in accordance with three strata that created based on the age as less than 18, age between 18-60 and above 60. Primary data including both qualitative and quantitative data were obtained from 100 community members in Salamulla GND through a questionnaire survey, and from the Public Health Inspector (PHI) of Salamulla GND and Grama Niladhari of Salamulla GND through the semi-structured interviews. A semi-structured questionnaire with closed-ended and open-ended questions was employed to collect data from the community in Salamulla GND. Closed-ended questions allow respondents to choose the answers which describe his/her opinion with regard to the questions asked (Kumar, 2011). Therefore, closed-ended questions used to collect quantitative data. On the other hand, open-ended questions do not allow respondents to select answers directly; instead, they enable them to write the answers using their own words descriptively according to the questions (Kumar, 2011). Therefore, open-ended questions were used to collect qualitative data. Interviews are beneficial when collecting descriptive data which are qualitative data with more explanations. Semi-structured interviews consist of structured and unstructured questions, allowing the researcher to manage the questions based on the situation to investigate the opinions of the respondents (Merriam & Tisdell, 2016). Further, GPS location data of households was collected. Secondary data was obtained as historical images related to two years- 2010 and 2020- from Google Earth Pro.

Data analysis was done based on the defined objectives. The objective is to identify the spatial distribution of NCDs of urban population in Salamulla GND. Data were analysed using historical images related to two years 2010 and 2020 through Google Earth Pro. Next, digitising was performed in the same software to identify the expansion of the built-up areas. The location of each patient (household) was used to display the spatial distribution. Using the Kernel density tool, effect of each NCD was determined by observing the highest and lowest density zones. Kernel density analysis was performed through ArcGIS Pro 3.2 software. Then, the behaviour and lifestyle of urban people, and current methods of prevention from NCDs taken by the community themselves and by the government were analysed thematically using a qualitative approach. Three themes, namely: the existence of non-communicable diseases, factors affecting non-communicable diseases, and quotidian lifestyle of people developed under behaviour and lifestyle of urban population, and one theme which is preventing non-communicable diseases developed under current methods of prevention. Further, most common NCDs were identified through descriptive statistics which include mode, mean, standard deviation and histogram. This was performed using IBM SPSS 21 software and MS Excel 2016.

3. Results and Discussion

3.1 Spatial distribution of NCDs of urban population in Salamulla GND

When considering the digitised map of Salamulla GND in 2010 (Figure 02), it shows more non-built-up areas than built-up areas. Mainly the southern side was entirely under the non-built-up areas. Centre and the North-western region contained the built-up areas. But, when compared to 2010 digitised map, built-up areas have increased more than non-built-up areas in 2020 (Figure 03). Specially, north region of the water body that flows in Southern area was almost converted into built-up areas except some small areas. Compared to 2010, some areas of the water body in North-eastern region were also converted into built-up areas. Considering the conversion of non-built-up areas in 2010 into built-up areas in 2020, the urbanisation of Salamulla GND is clearly apparent. Within a 10-year period, that area became urbanised.

But the southern and South-western region areas remained the same.

Figure 04 shows the distribution of respondents' locations with NCDs in relation to urbanisation in Salamulla GND. Households can be identified in South-eastern region, Western region, centre, North-western region and Northern region.

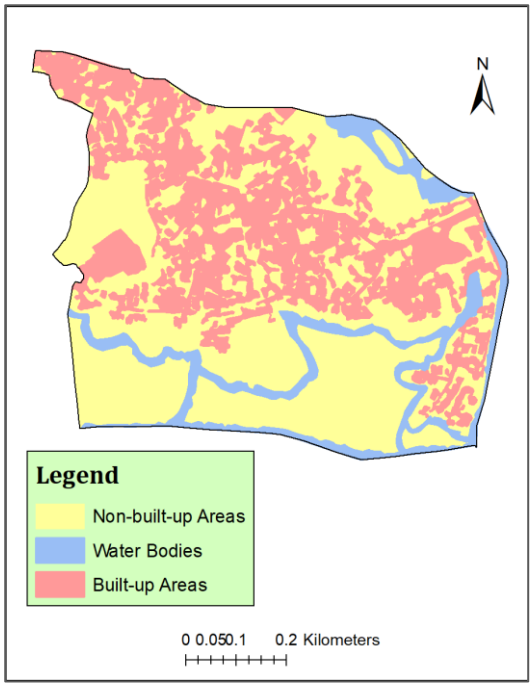


Figure 02. Built-up Area map of Salamulla GND -2010

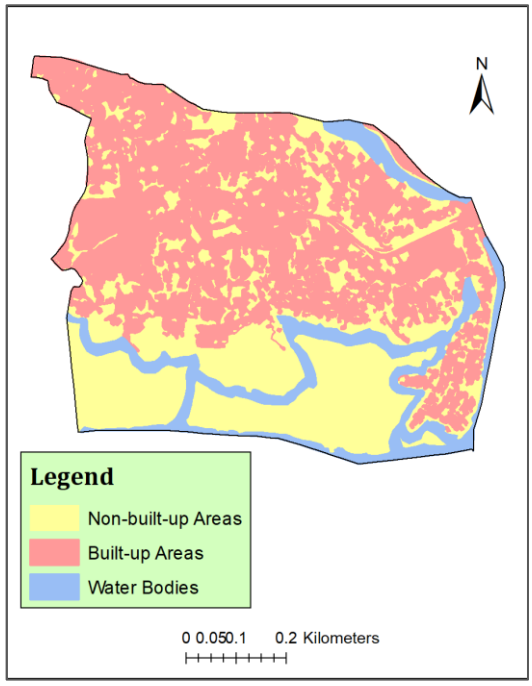


Figure 03. Built-up Area map of Salamulla GND -2020

This map (Figure 05) was created to separately identify the distribution of respondents according to the number of NCDs which are CVDs, Diabetes, Respiratory Diseases (Wheezing/Asthma), Cancer, Stress/Depression/Migraine, Arthritis, Cholesterol, Kidney Diseases, Low Back Pain, Obesity, Gastritis, Varicose Veins, Numbness, Spondylosis, Epilepsy, and Thyroids. These diseases were categorised into three main groups: 1 or 2 diseases, 3 to 5 diseases, and 6 to 9 diseases. Accordingly, there are 51 respondents with 1 or 2 diseases, 36 respondents with 3 to 5 diseases, and 13 respondents with 6 to 9 diseases. Majority of the respondents have 1 or 2 diseases while the minority of the respondents have 6 to 9 diseases. When considering the distribution, respondents who have 1 or 2 diseases are highly dense in South-eastern region, secondly dense in both Western and North-eastern regions.

Most respondents with 1 or 2 diseases are distributed in a scattered way compared to other two classes. Respondents with 3 to 5 diseases are also highly dense in South-eastern region while some other respondents can be seen in centre. Similar to the distribution of respondents having 1 or 2 diseases but not the same way, distribution of respondents having 3 to 5 diseases is relatively concentrated in certain areas. Further, respondents having 6 to 9 diseases

are highly dense in centre. But compared to the other two, respondents having 6 to 9 diseases are distributed differently. Due to the minimum number of respondents in this class, identifying scattered distribution of Figure 06 shows the Kernel density of all the NCDs separately. Accordingly, the highest density of CVD can be observed in North-western region; the highest density of diabetes is recorded in North-western region and South-eastern region; the highest density of respiratory disease is recorded in centre; and the highest density of cancer is recorded in Northern region. Then, the highest density of stress/depression/migraine is recorded in Western region; the highest density of arthritis is recorded in centre and South-eastern region; the highest density of cholesterol is recorded in centre and North-western region; and the highest density of kidney disease is recorded in South-eastern region. Moreover, the highest density of low back pain is recorded in the Western region; the highest density of obesity is recorded within the centre; the highest density of gastritis is recorded in South-eastern region; and the highest density of varicose veins is recorded from the centre to the right. As this figure has further showed, the highest density of numbness is recorded in Western region, centre, and the South-eastern region; the respondents was relatively difficult. But respondents under this class can be seen in centre, South-eastern region, North-western region and very less in Western region.

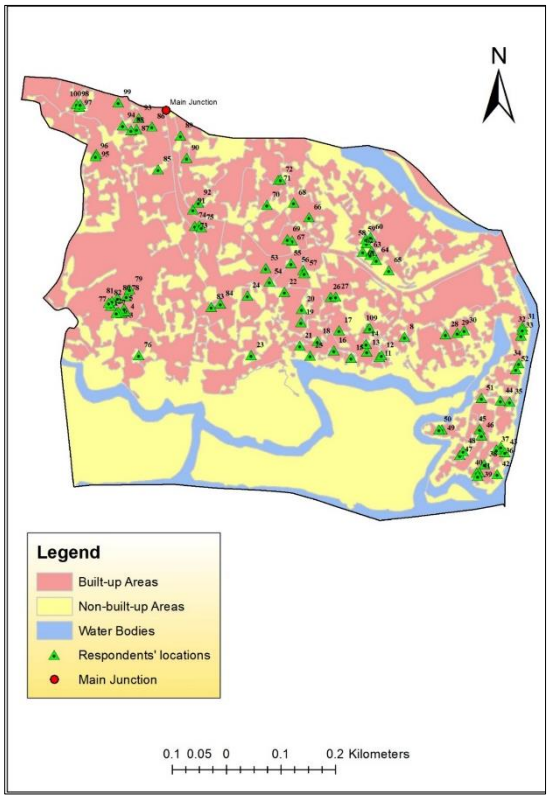


Figure 04. Spatial distribution of respondents with NCDs in Salamulla GND (Source: Google Earth Pro, 2020; Questionnaire Survey, 2022)

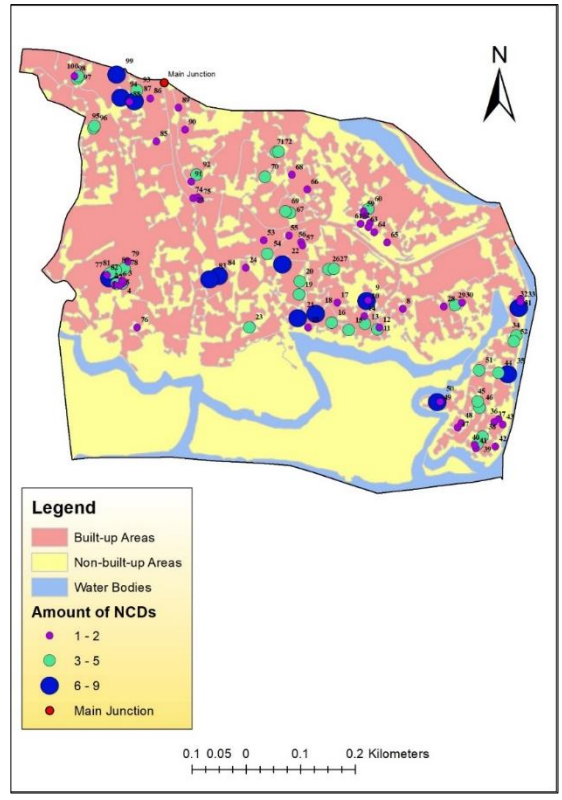
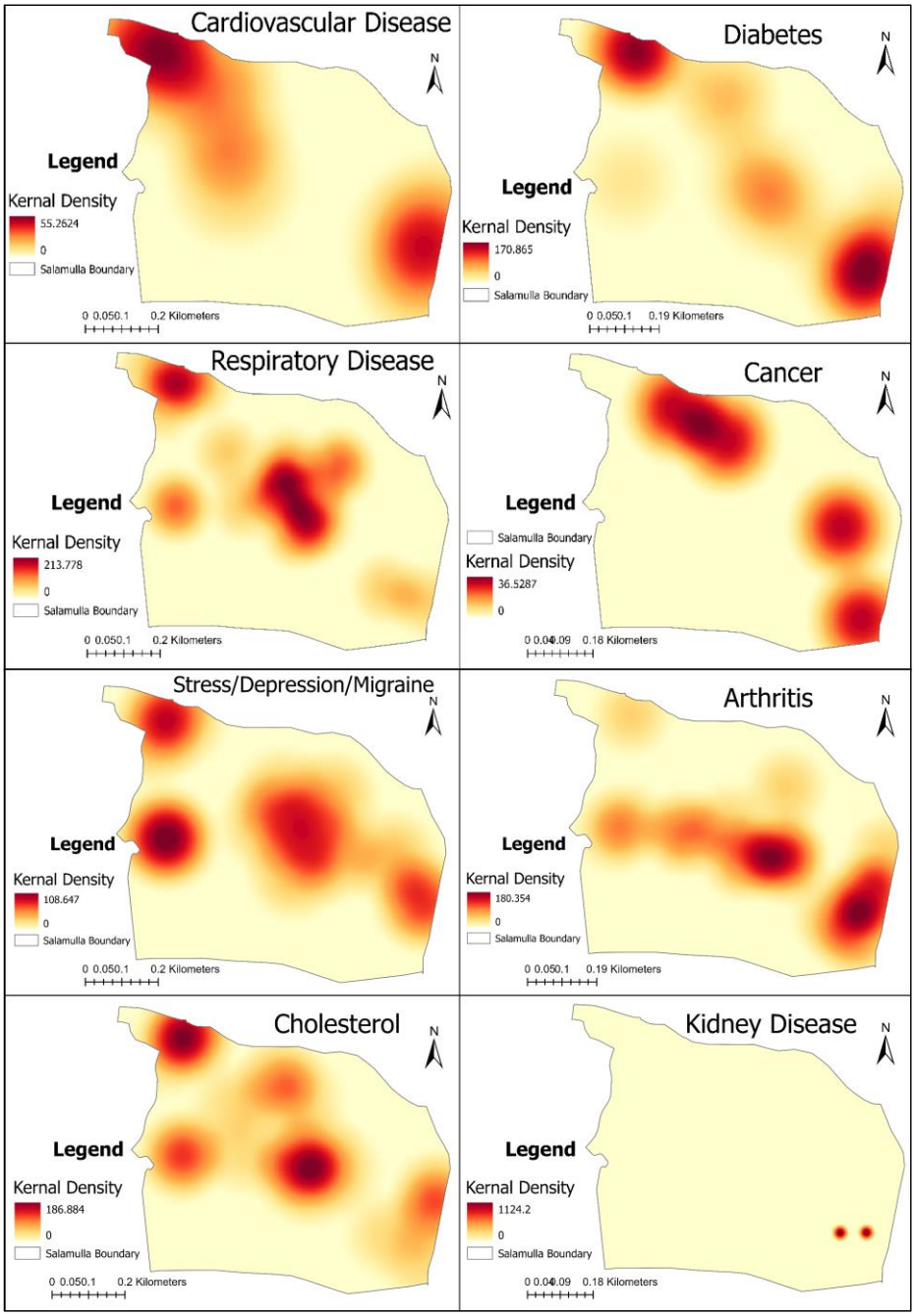


Figure 05. Spatial distribution of NCDs having by the respondents. (Source: Google Earth Pro, 2020; Questionnaire Survey, 2022)

highest density of spondylosis is recorded in centre; the highest density of epilepsy is recorded in North-western region; and the highest density of thyroids is recorded in western region, centre and eastern region. Kernel density tools provide the density of particular incidents. In the Kernel density rasters, if it is a larger value, density is smooth and more generalised while if it is a smaller value, it consists of more detail (Krisp & Špatenková, 2010).



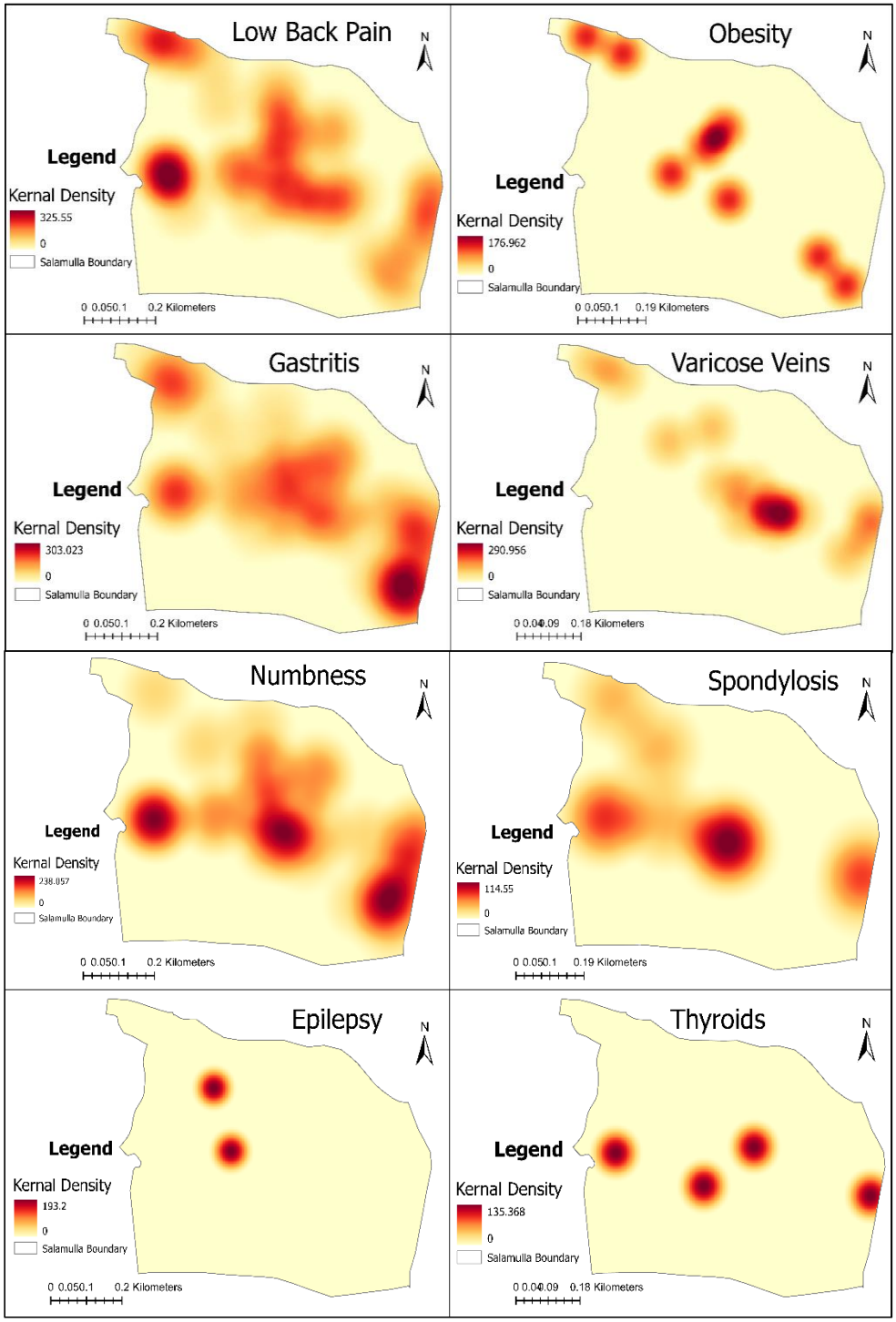


Figure 06. Kernel Density of NCDs

3.2 Effect of behaviour and lifestyle of urban population on the occurrence of NCDs

Existence of Non-communicable diseases

The community stated that, compared to the villages, NCDs are high in urban areas. They are aware that NCDs are high among rich people and the ageing population. Further, these diseases are increasing with time. The first impression of some of the community was non-availability of NCDs. Therefore, it is identified as low in urban areas. Some respondents stated that they do not aware of NCDs. Even some respondents do not aware whether NCDs are high or low in urban areas. Perhaps this is because of the lack of education of those respondents in Salamulla GND.

Factors affecting for Non-communicable diseases

Some respondents stated that instant foods directly cause NCDs. Some respondents have their own experience. According to their responses, particular foods have caused these diseases: oily foods cause cholesterol; floury foods cause obesity; surgery foods cause diabetes; and instant foods cause cancers. Some of the respondents get gastritis due to skipping their meal for their own reasons or because of job-related pressure. It also identified that many people tend to have foods from outside. In Salamulla, people in flats are accustomed to ordering dinner from outside. They do not prioritise nutrition or any other thing except having foods from outside instead of cooking.

The study has identified that attitudes of the people played a role in NCDs. As some people are more mindful of their figure, they believe that diet plan is the best method to be slim instead of having proper foods to maintain the body shape. There is a particular perspective concerning being slim in society. Therefore, some people blindly adhere to those perspectives without considering the good or bad effects of them. Some people are deeply focused on their figure and the opinions of society. They tend to behave according to others' opinions rather than their own. Moreover, their demanding work schedule which compromises their health, is another contributing factor to their diseases. Some people skip breakfast. Such habits are associated with gastritis.

In addition, certain harmful habits contribute to NCDs such as excessive consumption of sweets leading to diabetes or the drinking of tea causing migraine. Getting used to take medicines as a habit may have a negative impact on mental health after some time. Even if there is a small headache, they take Paracetamol (acetaminophen). Further, it has been identified that having a bath in the late evening could lead to diseases like arthritis. But some people continue to do so, despite having such diseases. Specially, respondents have identified that there is a possibility of getting NCDs during pregnancy due to weight gain. So, most of them get varicose veins and with their normal household activities, it is getting increased.

One of the respondents stated that pressure and low back pain often occur during pregnancy. Removing louse from long hair leads to pain in the wrist which causes numbness in a later stage. Most of the time, wrong postures can cause diseases. For example; sitting posture causes Spondylosis; sleeping posture causes low back pain; sitting for a long period causes low back pain; and standing for a long period causes varicose veins. "Rathya" occurs due to the heat of the body. It is widely acknowledged that the risk of developing diseases increases with age. There are some diseases that commonly impact elderly people after the age of 40. Doing over-work causes low back pain. Heredity is also a reason for getting NCDs. It has been established that many respondents develop diseases as a result of the nature of their occupations. Three-wheel drivers

mostly get low back pain due to sitting for a long time; arm pain or heart attack due to kick starting the wheel; and gastritis due to irregular eating patterns. Dissanayake, Kisokanth, & Warnakulasuriya (2021) revealed that 35% of three-wheel drivers in the Gampaha Urban Council area have stated musculoskeletal pain caused by driving long hours on bumpy roads.

One of the respondents who works as a teacher gets migraine due to loud noises. In addition to that, some teachers get varicose veins due to standing for a long time and gastritis due to skipping meals. Even some get wheezing due to dust coming from the chalks as they use black boards. Most of the women have low back pain due to bending their spine for extended periods while working or washing clothes by hand. Other problems were Varicose veins, wheezing due to the dust while sweeping, and numbness. Migraine, stress, and headache occur due to studying hard and attending online classes. Further, it has been identified that although the government provides nutritional education to pregnant women, they are often unable to afford the necessary nutritional requirements to avoid malnutrition. Specially, women get stress due to their social and economic background. Obesity in children may arise due to the absence of school attendance. A similar study identified that dietary habits, employment in either the private or public sector, lifestyle choices, and old age cause NCDs (Wana & Sivadas, 2020).

Many respondents have observed that the prevalence of food outlets in urban areas encourages reliance on external food, as it alleviates the burden of cooking. However, the low quality of such foods further exacerbates the issue. The inclusion of chemicals or dyes in food, degrading food, reusing cooking oil, tobacco use during food preparation or food contamination from the cooks' sweat are common prevalent occurrences. Most advertisements in Sri Lanka are mainly focused on promoting and selling products. Therefore, people are highly susceptible to NCDs due to blindly relying on these foods. Mobile phones and televisions can be detrimental to people's health as prolonged use may lead to stress, depression, and low back pain. A similar study identified that secondary students in Hong Kong experienced 13.87% severe depression, 29.74% severe levels of daytime sleepiness, and 63.27% body pain due to the overuse of mobile phones (Ng et al., 2020).

Further, staying in a limited space causes arthritis and living near main road causes wheezing. The higher concentration of vehicles in urban areas contributes to significant traffic congestion which leads to respiratory diseases. Availability of hospitals and food ordering facilities lead people not to care about diseases and adopt an unconcerned approach to everything. Mainly, dust and smoke cause respiratory diseases. As Knox & McCarthy (2011) identified, improper diet patterns, high concentration of people in area, urban poverty and improper working conditions at the workplaces cause health problems like stress.

Quotidian lifestyle of people

Majority of the respondents have three meals a day while some have only two. Due to certain reasons, some respondents have only one meal although this occurs infrequently. Most of the respondents have rice and curry for their three meals while some other respondents take rice at least for one meal. Most of the respondents stated that they have separation of meals like heavy meal and light meal. Most of them have a light meal for breakfast and dinner, and a heavy meal for lunch.

The majority of respondents follow a healthy diet as far as they can, with green leaves, meat, fish, eggs, vegetables, grains, congee, and drinking water. Most of the respondents take green leaves as either 'Mallum' or Sambol or 'Kola kenda'. Though some respondents consider nutrition, most of the

respondents do not consider it due to lack of time, inflation and focusing solely on flavour.

Most of the respondents rely on instant foods. Some of them take instant foods daily or at least for one meal especially like dinner or breakfast. Respondents mostly have instant noodles, and additionally have rice, 'Kottu', floury foods, fried or oily foods, buns, etc. Some of the respondents have soft drinks. Instant foods are taken due to lack of time to prepare something; for a change of foods; preference to eat and the taste; desire to try from popular food shops; when there is nothing to eat; must take leftovers by children. Soft drinks are taken due to high temperature in the area and due to tiredness.

Very few respondents, regardless of gender, consume alcohol. Regarding cigarettes, a few male respondents engage in smoking. But most of them who take alcohol, take it once a week or very rarely. Respondents who smoke either do so daily or occasionally. Profession, attending to functions, no family restrictions, addiction, and lack of sleep are the reasons for alcohol consumption or use of tobacco products.

Food patterns of the respondents differ based on the religion they follow. Buddhists have distinct perceptions on these. Some avoid beef but include other types of meat in their diet; others refrain from meat and fish; some avoid meat and fish only on Poya days; for some, there are no barriers to consuming any meat; they emphasise not eating greedily; and they strive to live a simple life. Islamic religion has food separation called avoiding haram foods like pork, alcohol and tobacco, and having halal foods.

They mainly take meats, floury foods, sweets, oily foods, and spicy foods. Hindu people take floury foods, oily foods, sweets, milk, and mostly vegetables and congee. Catholic people mostly have buns. According to Wana & Sivadas (2020), diet patterns based on the race of people including their food items, ways of preparing foods and cultural acceptances cause NCDs.

Majority do not do any exercises intentionally due to time constraints and certain health issues such as leg pains and back pains. A few respondents do exercises such as walking either daily or once a week; doing sports; engaging with Aerobics and Zumba; Salathe which is done by Islam people daily, and day-to-day activities like housework, gardening, and cycling. Some of the respondents have identified a lack of space in their houses as they are congested, which restricts them from engage in exercises.

3.3 Current methods of prevention from NCDs that have been taken by the community themselves and by the Government

Preventing Non-communicable diseases

Foods can be used to cure some of the NCDs. For example, cold items are good for gastritis; 'Thebu' leaves for diabetes, etc. Further, controlling the intake of certain items like sugar, flour, and salt serves as a solution for NCDs. Refraining from instant foods and limiting alcohol intake are crucial to reducing NCDs. Every disease can be cured by controlling mind as it is believed that there is a relationship between mind and diseases. Taking medicine or having treatments like warm water for respiratory diseases, applying oil or bam, or taking a rest for low back pain, having ENO for gastritis, wearing slippers on doctor's advice for numbness, and so on are used. Doing exercises or any kind of work is helpful in curing NCDs as the body begins to sweat. Some respondents said that the government has not implemented any measures to enhance their health conditions. However, respondents noted that actions are already being taken such as labelling the soft drinks according to their sugar content, raising awareness by displaying cancer related warnings on cigarette packets, establishing a system for school children to bring their own meals every weekday, and

enhancing their awareness through subjects like Health and Physical Education. Some respondents stated that government conducts clinics to make them aware about NCDs. Further, one respondent stated that jogging tracks were built by the government. The government conducted a project to distribute pots with some vegetables among the people in flats in Salamulla GND to cultivate those vegetables and use them in their daily meals, and another project called "Lassana Kolonnawa" to improve the awareness of the people which is also helpful to protect the mental health of children. Further, they conducted a programme regarding foods with the help of Kolonnawa Divisional Secretariat Office. Moreover, they conducted health programmes by targeting school children and programme for elders regarding cancer, and also they have the responsibility to check the diet of preschool kids. Providing foods in proper standards while banning instant foods, using media effectively to educate people, using practical methods to educate the people in Salamulla GND, changing attitudes of people, and using a common and easy language to educate them are essential considerations when planning prevention of NCDs. A similar study has identified the importance of fostering community awareness through the programmes and doing physical activities (Dissanayake, et al., 2021).

Table 01. Descriptive statistics of the non-communicable disease of respondents

	N	Sum	Mean	Std. Deviation
Cardiovascular disease	100	9	.09	.28
Diabetes	100	21	.21	.40
Respiratory disease	100	21	.21	.40
Cancer	100	4	.04	.19
Stress/Depression/Migraine	100	15	.15	.35
Arthritis	100	20	.20	.40
Cholesterol	100	24	.24	.42
Kidney disease	100	2	.02	.14
Low back pain	100	40	.40	.49
Obesity	100	8	.08	.27
Gastritis	100	42	.42	.49
Varicose veins	100	14	.14	.34
Numbness	100	30	.30	.46
Spondylosis	100	10	.10	.30
Epilepsy	100	2	.02	.14
Thyroids	100	4	.04	.19
Other	100	23	.23	.42
Valid N (listwise)	100			

Table 02. Other non-communicable diseases have by respondents

Disease	No. of Respondents
Mental Disorder	1
Pressure	12
Knee Pain	1
Headache	1
Catarrh	6
Rathya	1
Skin Disease	1

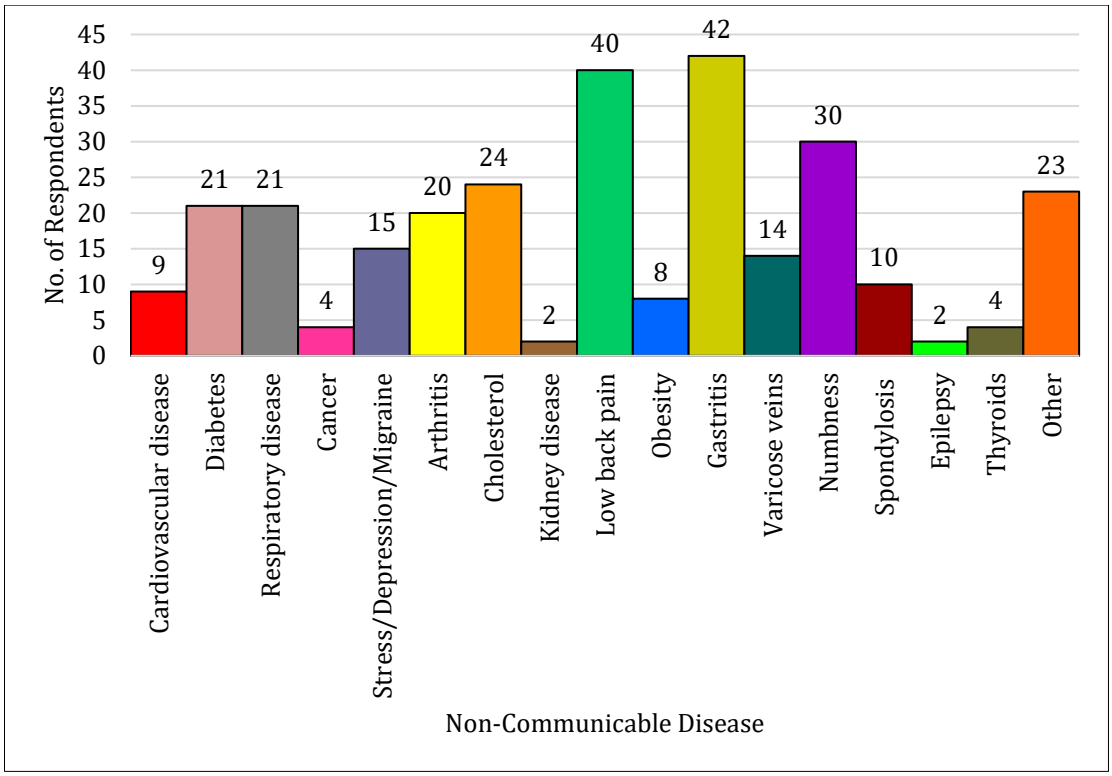


Figure 07. Histogram of non-communicable diseases having by respondents

3.4 Most common NCDs available in Salamulla GND

According to the descriptive statistics (Table 01 and 02) and the histogram (Figure 07), the disease with the highest prevalence is gastritis, affecting 42 respondents while the diseases with the lowest prevalence are kidney disease and Epilepsy each affecting 2 respondents. When arranged in descending order, diseases can be identified as Low back pain, Numbness, Cholesterol, Diabetes, Respiratory diseases (Wheezing/ Asthma), Arthritis, Stress/Depression/Migraine, Varicose veins, Spondylosis, CVDs, Obesity, Cancer, Thyroids, Kidney diseases and Epilepsy. The sample reveals that there are 11 diseases, each affecting 10 or more respondents. On the other hand, there are only 6 diseases consisting of less than 10 respondents per each. The highest mean is recorded by gastritis as 0.42 while the standard deviation is 0.496, and lower means are recorded by kidney disease and Epilepsy as 0.02, while the standard deviation is 0.141. The mean of all NCDs is 2.89.

4. Conclusion and Recommendations

As the conclusion of this study, it can be stated that the highest density of each NCD was recorded in the urbanised area that transitioned from non-built-up to built-up during the 10-year period. This encompasses the North-western region, South-eastern region, and the centre. This pattern provides insights regarding the relationship between urbanisation and prevalence of NCDs. Specially, recent urban areas have showed high density while non-built-up areas have low density.

It was further identified that the number of NCDs present in the community ranges from

1-9, with the majority reporting 1 or 2 diseases, and a smaller proportion experiencing 6 to 9 diseases. Observing kernel density maps of each disease, the highest density of the majority of NCDs was recorded from the centre, South-eastern and North-western regions respectively. The most common NCD in Salamulla GND is gastritis, followed by low back pain and numbness which rank second and third, respectively. It was identified that both kidney disease and Epilepsy are the least prevalent. Further, the average prevalence of NCDs in Salamulla GND is 2 or approximately 3 as the mean was 2.89.

When considering the behaviour and lifestyle of individuals, internal and external factors play a role in the occurrence of gastritis, cholesterol, diabetes, wheezing, numbness, lower back pain, stress, migraine, varicose veins, spondylosis, obesity and cancer. In addition, individuals often attempt to consume nutritious meal either deliberately or inadvertently, while some engage in the use of alcohol or tobacco. Further, some people engage in physical activities. For all of these, respondents have their own reasons. Dietary patterns also differ based on individuals' religious beliefs. With regard to prevention, some people believe that the government has implemented actions to educate the public, while others do not. Furthermore, individuals adopt preventive measures including self-regulation, self-medication based on the type of NCDs they have, and engagement in regular physical exercises.

By considering the prevalence of NCDs in Salamulla GND, several recommendations are proposed. Observing the spatial distribution helps to identify the trends and patterns over time. By continuously investigating these trends and patterns, it is essential to introduce new policies and implement prevention strategies. As urban areas that were recently urbanised during a 10-year period have showed high prevalence in NCDs, it is recommended to consider the urban sprawl and control the urbanisation by implementing necessary policies. When enforcing policies, attention must be given to the sprouting fast-food outlets. As every kind of NCD is prevalent in this study area, targeted interventions that involve taking necessary steps to mitigate or prevent the identified risk factors in the high prevalence areas can be done. Accordingly, a range of awareness initiatives can be organised including art or poetry competitions, street drama, stage drama, presentations with interactive activities, television advertisements, social media posts and videos, bus signages, as well as health campaigns and clinics. More attention should be placed on changing people's attitudes through the organisation of focus group discussions and personality development programmes. Further, it is advisable to promote the Salamulla ground for sports and exercises. Awareness of NCDs and their prevention methods can be enhanced among school children through the integration of Health and Physical Education modules in the school curriculum.

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