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Vulnerability to Diseases on Account of Inaccessibility to Water and Sanitation: A Case Study on Greater Mumbai

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The most important attributes of the living standards of respondents are related to their social and economic status. The variables related to access to basic services include both availability and utilization of water and sanitary facilities by the household in general.

Introduction

Water and sanitation needs are basic to every society irrespective of the levels of development or their global location.It is a known fact that developed nations have better coverage of these basic facilities for their citizens than their counterparts in developing countries.Nearly half of the world's population currently lives in urban settlements. It is estimated that in the coming decades, population in urban areas will increase from 3.4 billion in 2009 to 6.3 billion in 2050 (UN, 2010). Asia, in particular, is expected to witness an increase up to 1.7 billion, Africa 0.8 billion and Latin America and the Caribbean 0.2 billion additional city dwellers.

The pressing concern of deprivation of basic resources is faced by the urban population in a variety of ways. United Nations took cognizance of the issue of spreading awareness about the provision of safe drinking water and sanitation facilities for all. World Water Day was designated on March 22, by the UN General Assembly in 1993 and November 19, was designated as World Toilet Day in 2013. The human right to water and sanitation was clearly recognized by the United Nations General Assembly on July 28,2010 through resolution 64/292 (UN, 2022). According to UN's Sustainable Development Goals Report 2022, at the current rate, 1.6 billion people will lack safely managed drinking water in the year 2030 and 2.8 billion people will lack safely managed sanitation facilities. Further, access to safe drinking water and sanitation facilities such as toilets have not percolated down to the poor,

women and children (Singavarapu & Murray, 2013).The provision of water and sanitation availability being a major determinant of health thus needs to be studied in the urban context.

Need for the Study

It is estimated that 40% of the world's population continues to have no access to basic sanitation and 780 million people consume unsafe drinking water. With a rapidly growing urban population, large numbers of people live without adequate sanitation facilities and potable water. The metropolitan cities are unable to provide safe and clean drinking water to the ever-swelling population – especially to the urban poor. A city also depicts intra-city disparities where people residing in different municipal wards have differential access to basic services such as water and sanitation. It is observed that a common disease such as diarrhoea can be largely attributed to the environmental factors such as unsafe drinking water, poor hygiene standards and inadequate sanitation resulting in high mortality rates in developing countries (Seidu & Drechsel, 2010).

According to Census of India 2001, 28% of population was urban, residing in towns and cities. This figure increased to31.16% in the year 2010. Out of the total population of urban India, 17.4% lives in slums(Census of India 2011). While there is no 24-hour water supply in these areas,the access to basic amenities like clean water and toilets remains a distant dream for more than 40 million slum dwellers in India who cannot even afford to pay for private water tankers. Gr. Mumbai had the highest percentage (54.06%) of slum dwellers in comparison to other metro cities of India (Census 2001) which show a decline to41.3 %(Census 2011).

The Municipal Corporation of Greater Mumbai (MCGM) is the governing body responsible for provision of basic facilities to its residents. In all, MCGM is divided into two revenue districts namely Mumbai (City)district and Mumbai Suburban District. Of the total 24 wards under MCMG, 09 municipal wards are under the Mumbai (City) district while the Mumbai Suburban District has 16 municipal wards. These areas are witnessing rapid urbanization causing a change in both the land-use and land cover pattern, overcrowding, unplanned housing, increased industrialization and pollution. The city has become more vulnerable to problems of availability and accessibility of resources resulting in growing pressure on housing, drinking water, sanitation, transport, energy and healthcare facilities. Therefore, it is important to point out the areas of Gr. Mumbai that need attention and urgent action in order to address water and sanitation problems at the city level.

From the foregoing discussion, it is clear that there is a need to bring out the inequities in access to water and sanitationat the intra-city level so that the areas which might be vulnerable to diseases can be identified. Therefore, it was thought opportune to undertake a study of Greater Mumbai by selecting the Census 2011 data on Households and Amenities in Gr. Mumbaifor different wards to identify vulnerable wards based on water and sanitation related deprivation.

Objectives

In the light of the above, the Study has two specific objectives:

1. To understand ward-wise accessibility to safe water and sanitationin Gr. Mumbai.

2. To identify different clusters of wards within Gr. Mumbai which could be vulnerable to diseases on thebasis of poor accessibility to water and sanitation.

Data Sources and Methodology

The aim of the analysis presented in the present Research Paper is to describe the access to water and sanitation facilities in Greater Mumbai. The setting of the present research was at a city level as a whole going down to municipal wards having differential access to water and sanitation. For this purpose, cluster analysis was performed using Population Census 2011data for the City and Suburban Districts of Mumbai, on households based on amenities and assets. The data was organized in the following five categories for the purpose of analysis:

1. Households having the source of water near the premises

2. Households having no latrine facility

3. Households having no bathroom facility

4. Households having open drainage

5. Ward-wise total number of households

Quantitative Analysis

Section-wise data on households by amenities and assets for Mumbai and Mumbai Suburban Districts was obtained from Census 2011 on selected parameters such as the total number of households; households with the location of the source of drinking water near the premises (not in the premises); households not having latrine facility within premises; households with no bathroom facility and households connected to an open drainage network. The section-wise data was converted to a ward level data

for using cluster analysis as a method for identifying vulnerable areas in MCGM on the basis of household access to water and sanitation based on different combinations of the components of vulnerability.

Table 1 depicts the ranking of wards in Mumbai based on the selected parameters. It can be seen that the number of households were maximum in P/N ward;the percentage of households accessing tap water from untreated sources was highest in M/E ward;the percentage of households having the source of drinking water near the premises (not within premises) was highest in M/E ward; the percentage of households not having access to latrines and to bathrooms was highest in M/E ward and R/S ward respectively. Ward P/N recorded the highest percentage of households connected to an open drainage in Mumbai.

Table 1. Ranking of Mumbai Wards by Household Amenities and Assets- Census 2011

| Ward	Water near premises (%) Rank	Ward	No latrine (%) Rank	Ward	No bathroom (%) Rank	Ward	Open Drainage (%) Rank	Ward	Number of house-holds Rank
ME	1	ME	1	RS	1	ME	1	PN	1
A	2	L	2	S	2	N	2	KE	2
FN	3	MW	3	ME	3	MW	3	L	3
PN	4	N	4	A	4	S	4	S	4
PS	5	S	5	N	5	RS	5	KW	5
RS	6	PN	6	B	6	PS	6	ME	6
MW	7	FN	7	E	7	PN	7	RS	7
RN	8	GN	8	PN	8	FN	8	N	8
N	9	KE	9	FN	9	GN	9	RC	9
S	10	RS	10	MW	10	L	10	GN	10
L	11	A	11	GS	11	KE	11	HE	11
HW	12	RN	12	RN	12	HE	12	FN	12
GN	13	PS	13	PS	13	T	13	PS	13
KW	14	HE	14	L	14	KW	14	RN	14
KE	15	GS	15	GN	15	RN	15	MW	15
HE	16	KW	16	HE	16	FS	16	GS	16
FS	17	FS	17	RC	17	GS	17	T	17
GS	18	HW	18	KW	18	HW	18	FS	18
RC	19	T	19	T	19	B	19	E	19
E	20	E	20	D	20	E	20	D	20

Ward	Water near premises (%) Rank	Ward	No latrine (%) Rank	Ward	No bathroom (%) Rank	Ward	Open Drainage (%) Rank	Ward	Number of house-holds Rank
B	21	B	21	FS	21	A	21	HW	21
T	22	RC	22	KE	22	RC	22	A	22
D	23	D	23	HW	23	D	23	C	23
C	24	C	24	C	24	C	24	B	24

Cluster analysis has been widely used in disciplines as diverse as Social Sciences, Computer Science and Biology (Abhyankar et al 2013). Cluster analysis relates to grouping or segmenting a collection of observations, individuals or cases into subsets or clusters. The items assigned to one cluster are more closely related to one another than the member items of a different cluster. The overall analysis works on the idea of degree of similarity or dissimilarity between the individual items being clustered (Aldenderfer & Blashfield 1984).

Thus, the ward-wise data on household access to water and sanitation was analysed using the 'Average Linkage Method' of cluster analysis using SPSS. The method groups together items into clusters whose patterns of scores on variables are similar. The resultant hierarchical clustering was represented by a two-dimensional diagram known as dendrogram, which illustrated the divisions made at each successive stage of analysis. The corresponding dendrogram is presented in Fig.1 depicting the membership of the wards assigned to each cluster. The data analysis thus provided four clusters showing differential access to water and sanitation in Mumbai.

Fig. 1 Clusters of Gr. Mumbai wards on water and sanitation access


Dendrogram using Average Linkage (Between Groups)
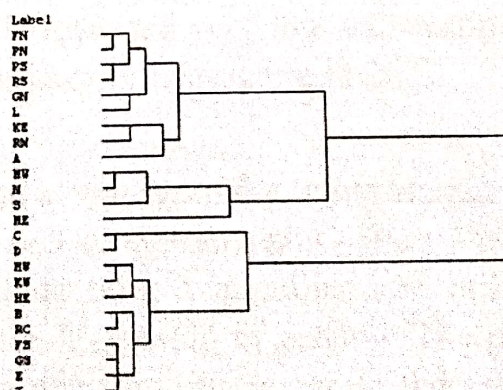
The resultant dendrogram was represented pictorially (Fig.2) through a

chorochromatic map to depict spatial distribution of Mumbai wards where intensity of shading becomes darker with an increase in poor access to water and sanitation. Thus, 24 wards of Mumbai were primarily divided into two and subsequently into four clusters showing differential vulnerability (poor standards) in access to basic services, namely water and sanitation.

Fig. 2 Vulnerability of Gr. Mumbai wards on access to water and sanitation

GREATER MUMBAI
Vulnerability of Wards on Access to Water
and Sanitary Insfrastructure : 2011
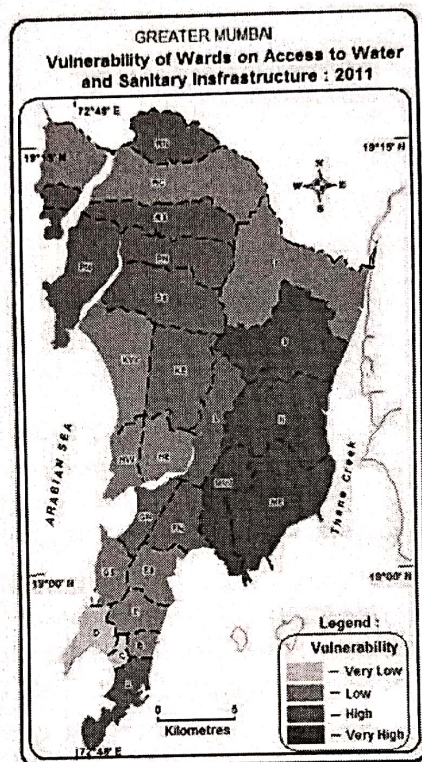
Very high vulnerability marked by poorest access was found in M/E, S, N and M/W wards. High vulnerability was recorded in A, R/N, K/E, L, G/N, R/S, P/S, P/N and F/N wards. Low vulnerability (good access) was recorded in H/W, K/W, H/E, B, R/C, F/S, G/S, E and T wards, while two wards namely C and D recorded very low vulnerability (better access) on access to water and sanitary infrastructure in 2011.

Conclusions

The most important attributes of the living standards of respondents are related to their social and economic status. The variables related to access to basic services include both availability and utilization of water and sanitary facilities by the household in general. The main objective behind performing the cluster analysis was to group these wards on the basis of similar water and sanitation related characteristics. It could be seen that out of 24 wards of Mumbai, 13 wards recorded either very high or high levels

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of vulnerability to diseases due to poor access to water and sanitation.

The results of the Study confirmthat the eastern suburbs along Thane creek show very high levels of vulnerability to diseases arising out of poor accessibility to safe drinking water and sanitation facilities. Residents in these areas mainly lack personal water taps, private toilets, bathroom and closed drainage facilities thus compromising public health and hygiene standards of Gr. Mumbai in general and of residents of four municipalwards viz.M/E, S, N and M/W in particular which is a glaring example of deprivation/ inequities present among people residing within the same city. Mumbai City district has in general less vulnerability to diseases than Mumbai Suburban district on the basis of water and sanitation inadequacies. Therefore, the MCGM should improve the supply of water and make provisions for an adequate number of toilets, both private and community, for the eradication of water and sanitation borne diseases and the overall improvement of public health.

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