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AN INVESTIGATION OF ROLE OF SPATIAL CHARACTERISTICS ON DISEASE PREVALENCE IN VADODARA DISTRICT, GUJARAT.

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Introduction:

Health is influenced and affected by several factors. Both physical and cultural elements of the environment play roles in defining the health condition of a population. During the last few decades, geographers have increasingly being paying serious attention to the differential patterns of diseases over space. One of the commonly accepted generalizations pertaining to the pattern of diseases over the World pertains to relatively higher prevalence of infectious and parasitic diseases in the developing countries and circulatory and degenerative diseases in developed countries. Historically communicable diseases were the main cause of death around the World. With improvement in medical science, health infrastructure and general public awareness, especially after the Wars, the pattern and incidence rates have underwent significant changes. Incidences of communicable diseases have declined in the developed countries, while the developing countries are yet to achieve a satisfactory target in this regard. On the whole, however, the WHO clearly shows that the global pattern of diseases is shifting from infectious diseases to non-infectious diseases with chronic conditions such as heart diseases and stroke now being the chief cases of death globally. The shifting trend indicates that leading infectious diseases-diarrhoea, T.B, neonatal infections and malaria etcetera will become less important causes of death globally in the years to come.

During the last few decades, the health status of the population of India has undergone some improvement. The death rate has gradually declined and life expectancy has gone up. Nevertheless, India's health standards are relatively low as compared to those in the developed countries. India shows wide variation in death rate between rural and urban areas. Morbidity is dominated by communicable diseases. The major problems continue to be TB, filariasis, leprosy, malaria, diarrhoea and malnutrition.

According to the National Family Health Survey (NFHS-4) - 2015-16, India, Anaemia is one of the severe health conditions in peoples. Reportedly around 58.4 per cent of children in the age of 6-59 months are anaemic in India with <11.0 g/dl. Among all such children, around 27.8 per cent have mild anaemia (10.0-10.9 g/dl), around 29.1 per cent have moderate anaemia (7.0-9.9 g/dl) and 1.5 per cent have severe anaemia (<7.0 g/dl). Among the states and union territories, the union territory of Dadar & Nagar Haveli has the highest (84%)

proportion of anaemic children, followed by Daman and Diu (73.8%), Chandigarh (73.1%) and Haryana (71.7%). On the other end, Mizoram (19.3%), Manipur (23.9%) and Nagaland (26.4%) stand out with the lowest proportion of anaemic children. Severe anaemia is the highest in Delhi (4.1%) and Chandigarh (4.0%) and the lowest in Manipur (0.2%) and Tripura (0.2%).

Spatial variations in the prevalence and types of diseases, within the country are also quite pronounced. Among all the states of the Union, the position of Gujarat state is however, relatively better. It also has a population growth rate that is lesser and a literacy rate that is higher than the National average.

Notwithstanding the achievements of the Nation in various fields, health problems in its population are not uncommon. According to NFHS 2015-16 - Gujarat, the health problems that cause considerable mortality in young children, such as fever, acute respiratory infection (ARI) and diarrhoea, are very common in the State. The average child mortality rate in Gujarat is 34 deaths per 1000 live births with variation of 39 and 27 deaths per 1000 live births in rural and urban areas. Infant mortality rate is the highest among the Scheduled Caste (SC) children. It is higher even then the children of other backward castes and children whose mother have had no school education. Besides, anaemic cases are very high (55%) among the women in Gujarat, of which around 40 per cent have mild, 13 per cent have moderate and 1 per cent have severe anemia.

Prevalence of tuberculosis (TB), asthma, malaria, and jaundice in the population is also not uncommon. Incidence of jaundice is higher in rural areas in comparison to the urban areas and more among the males than the females.

According to NFHS-4 Gujarat (2015-16), in the age group of 15-49, 1,163 women and 1,069 men in every 1,00,000 population suffer from diabetes. Cases of asthma is reported in 1, 348 women and 934 men in every 1,00,000 population. However, relatively more men (476 per 1,00,000) suffer from heart diseases in comparison to women (327 per 1,00,000) in the State. But, prevalence of cancer among women (127 per 1,00,000) is much higher than that among men (58 per 1,00,000). Goiter is not a common disease in Gujarat.

An attempt is made in the present doctoral research to study the relationship of spatial characteristics of one of the most representative districts of Gujarat, i. e. Vadodara with reference to the prevalence of major diseases. The basic intend is to evaluate the role of physical and social characteristics in the prevalence of diseases.

1.2 Objectives:

1. To identify the spatial patterns of major diseases prevalent in Vadodara district.
2. To identify the temporal variations in the disease pattern.
3. To examine the association of selected diseases with physical and social parameters at micro level.
4. To assess the impact of availability and utilization of health care facilities.
5. To understand people's perception and level of awareness on health.

1.3 Hypotheses:

1. Distinct physical and social characteristics tend to display different patterns of diseases.
2. With passage of time disease patterns and morbidity rates undergo change/display spatial variations.
3. Level of availability and utilization of health care facilities determine the morbidity rates to a great extent.
4. People's perception and level of their awareness play a definite role in the disease pattern.

1.4 Sources of Data:

The study is based on both primary and secondary sources of data. Data gathered from secondary sources, such as, Census of India publications, National Family Health Survey (NFHS), Gazetteer of the Baroda State, Sample Registration System, World Health Statistics, publications of the Bureau of Economics and Statistics, Human Development Report, have been utilized for examining the basic demographic, social, economic and other information regarding the study area. Relevant published and unpublished literatures, maps including topographical sheets were utilized to understand the demographic, economic, social and physical characteristics as well as infrastructural facilities of the study area.

Primary information pertaining to demographic, economic, social, cultural and psychological aspects of the target population have been generated with the help of structured household schedules, personal observation, conversation with the village elders and Participatory Rural Appraisal (PRA) technique. Wherever possible the local doctors and members of NGOs have been interviewed.

1.5 Methodology:

Prevalence of major diseases in the Vadodara district been measured with the help of secondary data pertaining to various indices like number of cases, incidence rate, morbidity rate and mortality rate etcetera. The secondary data have been tabulated and computed using appropriate statistical techniques, including SPSS and Microsoft Excel software. Different mapping techniques been used to analyze the patterns .To show the variation in the variable, choropleth maps have been prepared using Arc GIS 10.3.Available data on presumed causal factors collected from secondary sources have been analysed to comprehend the cause-effect relationships.

To compensate the limitations of secondary level data, the study has analyzed data generated at the primary level. For the purpose of primary investigation, stratified random sampling has been used at all levels, i.e. at the *taluka,* the village and the household levels. The regional frame of the district has been adopted to group the *talukas*. One *taluka* from each frame is selected for detailed investigation. Analysis of secondary level data for the villages of the selected *talukas* has enabled the study to identify intra-*taluka* variations and selection of a maximum of two *talukas* for detailed study at village level. Based on the detailed study, the villages have been categorized into two groups and one village from each group has been selected for detailed investigation at the household level.

Detailed investigation at household level has been undertaken using structured household schedules as well as PRA technique**.**

To measure the nutritional status of people, anthropometric data is collected on height and weight for the population above 15 years of age and Body Mass Index (BMI) is calculated.

Correlation and Regression: There is a linear relation between two variables. In order to find out whether there is significant association or not between two variables (x and y are two variables) we calculate what is known as *Co-efficient of Correlation*, which is represented by the symbol "r" (Park, 2009, 755) and is calculated as below.

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \ \sum(y-\bar{y})^2}}$$

Regression:

The independent variate is represented by x and the dependent variate by y. The formula used for the *regression coefficient* is as follows.

$y = \bar{y} + b\ (x - \bar{x})$

Where,

$\bar{y} = mean\ \ of\ \ y1\ , y2, y3 \ldots\ldots\ldots\ldots . yn$

$\bar{x} = mean\ \ of\ \ x1\ , x2, x3 \ldots\ldots\ldots\ldots . xn$

$$b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

The value of 'b' is called the *regression coefficient* of 'y' upon 'x' (Park, 2009, 755).

Sample Design:

For the purpose of micro study, eight *talukas* in all have been selected from Vadodara district, including four *talukas* each from the non-tribal area/plain area and four *taluka* from tribal area/hilly area. From each *taluka,* one village has been chosen randomly for detailed investigation. Household schedules were administered to around fifty randomly selected households of each sample village for the generation of primary data. The four *talukas* of the non-tribal/plain area includes Tundav village (Savli *taluka*), Kelanpur village (Vadodara *taluka*), Vadu village (Padra *taluka*) and Handod village (Karjan *taluka*). The four villages selected from the tribal/hilly area of the District are Chalamali village (Pavi Jetpur *taluka*), Tezgadh village (Chhotaudepur *taluka*), Palasani village (Naswadi *taluka*) and Navelja village (Kawant *taluka*).

1.6 Organization of the Study and Research Findings

The introductory **first chapter** deals with the research question, objectives and hypotheses, methodology and sample size of the study area.

The **second chapter** deals with the literature review. Health is studied by different scholars in different parts of the world and associated with the various physical and cultural factors. Kamara's (1998) study indicates the relationship between health performance and

economic growth in India. Mukherjee and Nayak (1998) have studied the different communicable diseases of Meghalaya and related it to the undulating topography. Mathur and Singh (1998) have studied TB and related it to industry, mining, thermal power plant, inadequate diet and agriculture. Unorganized occupations are found to be directly linked to human health. Mohd (2014) has studied waste picking and found that waste pickers are exposed to medical wastes and animals and get injuries by cut and bruises, allergic disorders, TB and Scabies etcetera. Physical environmental circumstances have been found to have played perceptible role in the incidence of certain diseases. A study (Malini, 1985) has identified a goiter-prone zone in the north-western part of Vishakhapatnam district, and ascribed the situation to its characteristically iodine deficient hilly topography, soil and climate. Ground water with higher fluoride level tends to cause pain in joint, bones and head, and is considered responsible for curved feet and stiffness in backbone. This fact has been vindicated in the study of the Dausa district of Rajasthan (Sharma and Khan, 2003). Hazra's study (1998) brings out the importance of women's health with reference to South Asia and reveals the multifarious social and economic problems associated with women as the root causes of their poor health. Kumari et.al. (2006) have brought out the relationship between social attributes of the population and their relationship with utilization of health services. The above studies make significant revelations pertaining to discrete aspects of health. The issue of health cannot be understood and analysed in a piecemeal manner. Rather a holistic perspective needs to be developed to comprehend the issue. An attempt would be made in the research to approach the issue of health in its totality involving both the physical and social parameters. For the purpose, it was intended to undertake an in-depth investigation of the related physical and social parameters at micro level selecting a few representative villages of Vadodara district.

The **third chapter focuses** on the study area of the research. Vadodara district extends over the eastern part of the Gujarat state. Vadodara district is a part of the Gujarat plain. The terrain of the district is flat level plain in the west while the eastern part is a hilly tract and elevation varies between 300 meters and 520 meters above M.S.L. The district is spread over 7,546 sq . km and covers 3.8% of total area of Gujarat state. In the northeast, the hilly area comprises of plateaus, ridges and isolated relict hills. The hilly tract is also covered by thick forests at some places. It is mainly inhabited by the tribes. Narmada and Mahi are the principal rivers. The climate of the district is by and large hot and dry in summers and cold in winters.The soils of the district are of three types namely black soil, alluvial soil and

forest soil. Agriculture is the main occupation of people of the District and in which both food and non-food crops are grown. The principal food crops are maize, jowar, bajri, rice, wheat, pulses (tur and gram), groundnut and sugarcane etcetera. Non-food crops include cotton, tobacco and castor. Vadodara district has good reserves of minerals include fluoride, black trap, quartz, fluorspar (Kawant *taluka),* agate, granite, gravel, marble, manganese ore and graphite.Vadodara district is well connected with Delhi (1028km) and Mumbai (448km) by the Delhi Mumbai industrial corridor. The National Highway 8 (NH-8) passes through the District and connects it with the major industrial centres of Gujarat making the access to the major industrial cities of Ahmadabad, Rajkot, Ankleshwar and Surat much easier. According to the 2011 census count, the district has a total population of 41,65,626 persons, in which the SC population of 2,21,629 persons and ST population of 11,49,901 persons account for about 5.32 and 27.60 per cent respectively. Sex ratio in the district has satisfactorily improved at the 2011 census, from 914 in 2001 to 934 females per thousand males. Rural sex ratio is relatively higher than urban sex ratio and in the tribal/hilly area *talukas* than in the non-tribal/plain area *talukas*. While two of the tribal/hilly area *talukas* reported the highest rural sex ratio in Chhota Udaipur (992) and Kavant (991), the lowest rural sex ratio was reported in the non-tribal/plain area *taluka* of Padra (919). Even with regard to urban sex ratio in the District, the tribal *talukas* have an edge over the non-tribal *talukas* with the tribal *taluka* of Chhota Udaipur (968) at the lead and the non-tribal Vaghodia *taluka* (907) at the end. Average literacy rate of Vadodara district is 78.92 per cent. The Vadodara *taluka* (89.86%) ranks first having the maximum proportion of literate population. Religious composition wise, the population of the District is divided into Hindus (89.16%), Muslims (9.23%), Christians (0.57%), Sikhs (0.22%), Jains (0.66%), Buddhists (0.05%), others (0.03%) and religion not stated (0.07%).

The **fourth chapter** is on the disease pattern in India. It focuses on health status of people in India, provides information on house type, drinking water, infant mortality rate, family planning, child health, maternal health, health care facility and prevalence of diseases in India. Health status and health facilities in India are highly unevenly distributed over space. In terms of basic amenities in India, 89.9 per cent of the households have improved source of drinking water (91.1 % in Urban and 89.9% in rural areas). The highest percentage of population in Chandigarh (99.5%) and the lowest percentage population in Manipur (41.6%) have access to improved source of drinking water. Slightly higher than 55 per cent (56.4%) of the households in the country have *pacca* (concrete) houses (84.5% in urban and

41.3% in rural). Electricity connection is available to a very high proportion of the country's population (88.2%). Around half (49.0%) the population have a separate room for cooking (64.3% in urban and 40.9% in rural households) and 98.8 per cent use open fire/*chullah*.

According to (NHFS4, 2015-16), among all the states/UTs, Uttar Pradesh (78 deaths per 1,000 live births) has the highest under-five mortality rate and Kerala has the lowest (7.1 per 1,000 live births). Coverage of vaccination has increased from 44 to 62 per cent between NHFS3 to NHFS4. About two-third (62%) of the children in the age of 12-23 months have received all the basic vaccines. The female segment of the country's population, particularly belonging to the productive age (15-49) is more anaemic (53.0 %) with an average anaemia level of 12.0g/dl). While Dadar & Nagar Haveli has the highest proportion (84%) of anaemic children, and Mizoram has the lowest (19.3%) proportion of such children.

With a significant variation between urban (1.8) and rural (2.4), the Total Fertility Rate (TFR) in the country is 2.2 children per women in the productive age (15-49). Awareness about contraception methods in these women of the country is almost complete (97.8%) and almost the entire women population (99.6%) in this age is currently married.

The country is experiencing increase in the prevalence of communicable diseases. Proportion of diabetic patients in the population of 15-49 years of age has been recorded at about 1.7 per cent. Highest seen in Andaman & Nicobar Islands (4.6%) and Kerala (4.3%) in women and in men highest in Meghalaya (4.6%) and Kerala (4.3%).Asthma has affected less than 2 per cent of the population with minor variation between men (1.2%) and women (1.9%). However, prevalence of asthma is relatively higher in the southern states and women of the country. Andaman & Nicobar Islands (4.5%) and Tamil Nadu (3.0%) have returned almost a double of asthma cases. Prevalence of Goitre or any other thyroid disorder is 2.2 per cent in women and 0.5 percent in men. Among women the highest prevalence of Goitre is in Kerala (8.1%) and Jammu & Kashmir (7.0%), and among men in Tamil Nadu (2.0%). Difference between the two segments of men (1.0%) and women (1.3%) with respect to heart related ailments is rather minor. The highest proportion of men in Lakshadweep (2.9%) and women in Jammu and Kashmir (4.5%) and Meghalaya (3.8%) seem to suffer from heart problems. Prevalence of cancer is 0.3 and 0.2 per cent in women and men respectively. The highest percentage of women in Meghalaya and Tamil Nadu (0.4%) and men in Tamil Nadu (1.8%) are affected by cancer. Awareness about HIV/AIDS is 75.6 per cent among women and 88.9 per cent among of men in the age group of 15-49. A small segment of the country's

population (0.24%) is affected by such diseases and the variation between men (0.25%) and women (0.23%) is also insignificant. The southern and north eastern states have the highest proportion of population affected by HIV/AIDS. The incidence of HIV/AIDS cases is the highest among group - 7 states (Mizoram, Manipur and Nagaland - 1.48%) followed by group – 1 states (Andhra Pradesh and Telangana-0.92%) and group 5 states (Karnataka-0.53%). On the other hand, the group - 4 states (Himachal Pradesh and Jammu & Kashmir - 0.08%) and the group – 11 states (Uttar Pradesh, Madhya Pradesh, Uttarakhand and Rajasthan - 0.53%) have reported the lowest incidence of these diseases. Use of any form of tobacco in women in the age group of 15-49 is 6.8 per cent (urban 4.4% and rural 8.1%) and men are 45.5 per cent (urban 16.2% and rural 12%). Consumption of *paan masala* or *gutka* is much higher among men (15.3%) in comparison to women (2.2%). The highest percentage of tobacco consumption is seen in the population with no schooling, ST population, Christian population and people with lower wealth Index. Around 1.2 per cent of women and 29.2 per cent of men in the age group of 15-49 drink alcohol. Arunachal Pradesh (26.3%) and Sikkim (23.0%) top the list of states in women consuming alcohol and Arunachal Pradesh (59%) in men consuming alcohol. Use of public health care system (44.9%) is relatively less in comparison to private health care system (51.4%). The non-use of public health care system is found mostly ascribed to poor quality of care (48.1%), waiting time (40.9%), facility timing not convenient (26.4%) and absence of hospital staff including doctor (14.8%). Non-communicable diseases claim almost half the (49%) deaths, while around a third (30%) is due communicable, maternal, perinatal and nutrition conditions.

The state level disease pattern is analysed in the **fifth chapter.** The chapter focuses district-wise information pertaining to housing condition, child, adult and women health and on the prevalent diseases. Major portions of the present geographical extent of Gujarat state was under the erstwhile Baroda State (1721-1949). Historical data pertaining to the Baroda State indicate prevalence of communicable diseases like malaria, lungs infection, diarrhoea, bronchitis, alimentary canal fever and skin diseases. During that period epidemics of leprosy, scrofula and influenza were also common. According to the National Family Health Survey (NFHS4, 2015-16, Gujarat) 91 per cent of households use safe drinking, 77 per cent households live in *pucca* houses and almost all (96%) households have electricity connection. Less than a third (29%) of the households do not have toilet facility and go for open defecation. A large proportion (81%) of children between 6-17 years of age attends school. The TFR is 2.0 children per women in Gujarat state, which has declined by 0.6 children. In

Gujarat state almost everyone has knowledge of contraception. A large proportion (81%) of mothers has received Antenatal Care (ANC) during their last child delivery from skilled health personnel. Child mortality rate is 34 deaths per 1000 live births. Exactly half (50%) of 12-23 months of children of have been administered all the basic vaccinations prescribed for the childhood diseases such as TB, diphtheria, pertussis, tetanus, polio, and measles. Highest proportion of children in the districts of Navsari (75%) and Tapi (73%) has been administered these vaccinations, while in Panchmahal district it has been the least (30%). Anemia is acute problem among women and children of Gujarat, where more than half (55%) of the women population is anemic.

People are affected by communicable as well as non-communicable diseases and recently the shift is towards non-communicable diseases. The common diseases are TB, diabetes, heart diseases, cancer and hypertension. Some 169 persons per 100,000 population suffer from TB. The State has more diabetic females (1,163 per 100,000) than diabetic males (1,069 per 100,000). Asthmatic patients are also higher among women (1,348 per 100,000) than among men (934 per 100,000). Similarly, cancer affected women (127 per 100,000) outnumber cancer affected males (58 per 100,000). However, more males are affected by heart diseases (476 per 100,000) than females (327 per 100,000). Goiter is not common a disease in Gujarat. Hypertension is 11 per cent in women of 15-49 ages. Consumption of tobacco in the form of *gutkha* , *paan masala* and cigarettes or *bidis* is higher in rural areas of Gujarat. Around two-third (64%) households in the urban areas of the State use private health care facility. According to a report (Sample Registration System: Causes of Death 2007-2013), the highest number of deaths are caused by non-communicable type of diseases (47.%) followed by cardiovascular diseases (19.9%), ill-defined/all other symptoms, signs and abnormal clinical and laboratory findings (11.5%), respiratory diseases (9.9%), perinatal conditions and malignancy (7.1%), other neoplasm (7.0), TB (6.4%), diarrhoeal diseases (4.4%) and digestive diseases (3.3%).

The **sixth chapter** of the thesis is devoted to the analysis of morbidity patterns in Vadodara District. According to the Integrated Disease Surveillance Project (IDSP) Vadodara (Gujarat) report-2009, the most prevalent diseases in the district are water borne diseases like, acute bloody diarrhoea, acute diarrhoea and vomiting, acute viral hepatitis, cholera, vaccine preventive diseases e.g. diphtheria, neonatal tetanus, measles, pertussis, whooping cough and vector borne diseases like, malaria, measles, chikungunya, dengue fever and other diseases like suspected meningitis, acute LRTI and pneumonia, acute encephalitis syndrome,

leptospirosis and chicken pox. Prevalence rate of fever in the year 2009 varied between 1.22 to 4.43 per cent and was recorded to be the highest in Chhotaudepur *taluka* (4.43%) followed by Savli *taluka* (4.27%). On the other end were Jetpur Pavi (1.22%) and Karjan *talukas* (1.57%). The prevalence rate of acute diarrhoeal diseases was the maximum in Vaghodia (1.44%) and Vadodara *talukas* (0.92%), and the lowest was in Jetpur Pavi *taluka* (0.47%). Malaria P.V. (*P. falciparum*) is generally common in India and is a more common type of malaria. Highest prevalence rate of Malaria P.V is found in Vadodara (0.10%) and Chhotaudepur *talukas* (0.09%). Perhaps the water logged areas of the densely populated urban areas of Vadodara *taluka* and the hilly terrain with dense forest cover in Chhotaudepur provide conducive environment for the growth of the mosquitoes. Malaria prevalence rate is the lowest in Dabhoi (0.02%) and Sinor *talukas* (0.02%). Prevalence rate of Malaria P.F (*P.vivax*) in the Vadodara district is very low, but in that too it is high in Chhotaudepur *taluka* (0.02%). Vadodara district is relatively better endowed with health care facilities in State. The district accounts for around 6.3 per cent sub centres, 6.9 per cent PHCs and 5.3 per cent CHCs.

Seventh chapter is deals with the micro level analysis of the disease patterns in Vadodara district. For the purpose, information has been gathered through primary investigation with the help of structured schedules administered at household level in a few selected villages of the district and tabulated. The study has been conducted on eight *talukas* selecting one village from each *taluka*. The *talukas* have been grouped as plain or non-tribal *talukas* and hilly or tribal *talukas*. The four *talukas* from the plain area are Savli (Tundav village), Vadodara (Kelanpur village), Padra (Vadu village) and Karjan (Handod village) and the four *talukas* of the tribal area are Pavi Jetpur (Chalamali village), Chhotaudepur (Tezgadh village), Naswadi (Palasani village) and Kawant (Navelja village).

On the whole, a higher proportion (59.76%) of households in the non-tribal villages was found to be landless, while the same category of households was less (40.24%) in the tribal villages. As above in the category of households by land size, the proportion of households keeps fluctuating in both non-tribal and tribal villages.

The tribal villages are predominantly Hindu villages, while the non-tribal villages have mixed population of Hindus and Muslims. Both type villages have diverse communities. The non-tribal villages have most common castes belonging to *Patel, Rajput, Bhatt, Brahmin, the* tribal villages are composed of *Tadvi, Vaniya, Rathawa, Nayak and Vankarvas* etcetera.

The SC community out numbers other castes in the non-tribal villages with a share of 78.85 per cent in the total households. A significant proportion (19.78%) of ST population is also accommodated in the non-tribal villages. The SC community has a similar share (21.15%) in the tribal villages.

Age and sex structure of the sample villages display lower proportion of the child population. The age-sex pyramid of both the non-tribal and tribal villages portray a constrictive shape, due to smaller share of the child population in the total village population. It may be due to decreased birth and death rates. The latter is also vindicated by the fact that the villages have a higher share of the elderly population. It also indicates increase in the life expectancy rate. Availability of better medical facilities and improvement in the general health awareness might be ascribed to the current demographic situation in the study villages. The villages also have a higher share of the working population.

Assessment of BMI of the population of the sample villages revealed that around a two-third (63.75%) of the population has 18.5 - 24.9 BMI, implying their normal weight. Around a fifth (17.89%) of the population are thin or underweight having BMI of less than 18.5, around a tenth (12.92%) of the population are overweight having BMI between 25 to 29.99 indicating over weight and around five (5.43%) of the population are obese having BMI over 30. There is not much of variation in this context between the two types of villages.

Majority of the population in the sample villages of both the categories are illiterate. It is interesting to note however that level of education of the population in the landless and small and medium farmers is limited to primary stage and those with higher levels of education mostly belong to the large land owning households. The observation holds true for both types of villages.

Occupation is one the most important aspects of demographic characteristics. The people in the sample villages are engaged in more than one type of occupations for sustenance, of which one is their main occupation and the others as a supplement to the main occupation or subsidiary occupation. Respectively about two-fifth (41.58%) and half (49.19%) of the population in the non-tribal and the tribal villages are cultivators. A significantly high (37.99% in the non-tribal and 37.57% in the tribal villages) proportion of the workers however depend on agricultural wage market as a supplement to cultivation. A portion of the population depends completely on the agricultural wage market either due to landlessness or due to less productive small and medium sized land. A small segment

(1.79%) of the workers in the non-tribal villages engages in rearing animals. Business of different kinds including grocery and other type of shops, accommodates slightly less than one tenth of the workers (7.89% and 9.05% in the non-tribal villages and tribal villages respectively). Around a similar percentage (10.75%) of the workers in the non-tribal villages are absorbed in Government and Non-Government services at Vadodara city. Such type occupation has accommodated a small proportion (4.19%) of the workers of the tribal villages.

Electricity connection to the houses in the sample villages is almost complete with all houses having the connection, excepting a few of the landless and, small and medium sized land owners of both types of villages. Piped drinking water connection is however limited to around two-third (64.93%) and half (48.89%) of the households in the non-tribal and the tribal households respectively. Variation across the land holding size however does not yield any pattern in this context.

Another important aspect having direct relationship with human health is closed defecation facility. It is worth noting that majority of the households in the non-tribal (60.50%) as well as in the tribal (66.0%) villages do not have toilet facility within the residential premises. Rather people go out to the field or the nearby forest for defecation. In fact, most of the landless and small and marginal farmer houses do not have the facility. The facility is available in the houses of the large farmers only in either type of villages.

Financial assistance is provided by the Government under different schemes like Sardar Awaas / Indira Awaas to people living below the poverty line (BPL) for construction of house. Around 15 (14.95%) and 20 (21.00%) per cent of the households in the non-tribal and the tribal villages respectively have availed the assistance under Sardar Awaas scheme to construct house using concrete, bricks and cement. During the primary survey it was learnt that money for the construction is provided in three instalments to the concerned house owners. While households belonging to all categories of land size are provided the assistance in the tribal villages, in the non-tribal villages only around 18.28 per cent landless and 16.67 per cent small (0.01 to 1.00 acres) and 13.79 per cent (1.01 to 2.00 acres) land owner families were provided the assistance.

House is one of the major assets that gives protection to the human body from different forces of nature and in the process prevents ill health. The type of houses also affects human health. For example, *kutcha* houses made up of mud floor and thatched roof

permits easy access to rodents and insects which work as agents of different diseases. It is noticed that in non-tribal villages are dominated by *pucca* houses and tribal area is dominated by partially *pucca* houses. Rather, a good proportion of the houses are *kutcha* in the non-tribal (27.50%) and tribal villages (21.00%). The share of semi *pucca* houses are 34.50 per cent and 43.50 per cent respectively in the tribal villages and the tribal villages. Highest per centage of semi *pucca* houses belong to the landless, 0.01-1.00, 1.01-2.00 and 3.01-4.00 acres of land size categories in both types of villages. Only around a one-third of the houses are *pucca* in the non-tribal (38.00%) and tribal villages (35.50%). Highest per cent of *pucca* house belong to the households with 2.01-3.00 (80.00%), 4.01-5.00 (77.78%) and 5.01 & above (89.47%) acres of land in the non-tribal village *pucca* houses in the tribal villages are highest in 3.0-4.00 (45.45 %), 4.01-5.00 (44.44%) and 5.01 & above (68.18%) acres of land size category. It is seen that *pucca* house floor is made up of concrete and roof is of concrete and asbestos whereas *kutcha* and semi *pucca* floor mostly made up mud and sometimes concrete. Roof is thatched or made up of asbestos. Ventilation is found to be bad in 11.00 and 4.00 per cent households in the non-tribal and tribal villages respectively.

Location of house is one of the indicators for human health. In the non-tribal villages, most of the houses (35%) are located in the flood prone area. During monsoon season, in these areas the possibility of flood and spread of different infections and diseases is quite probable. Besides, around a quarter (24.23%) of the houses are located near the major road, around one-eighth (16.54%) of the houses located near rail track e.g. in Kelanpur village. Similarly, around one-tenth (12.69%) of the houses of the village in Savli *taluka* are located near the industrial area. From among the other houses in this village, 6.92 per cent houses are near the river, 1.92 per cent houses are on the steep hill, and 0.77 per cent houses are near a garbage dumping area. The latter houses belong mostly to the land less families. Houses in the tribal villages around 50 per cent of the houses located on the road side, e.g. in Tezgadh, Navelja and Palasani. Another quarter (26.37%) of the houses is near the Orsang River in Tezgadh and Chalmali villages. Flood prone area location is rather less (17.03%) in the tribal villages as these are hilly areas.

Majority of the houses in the sample villages were found have to have no separate space earmarked for cooking purposes. The share of such houses is 58.00 per cent and 54.50 per cent respectively for non-tribal villages and tribal villages. Use of cooking fuel is also an important aspect with respect to human health. If the cooking fuel creates a lot of air pollution, it leads to breathing problem and diseases related to respiratory system. Wood is

the major source of kitchen fuel in the non-tribal villages (50.78%). This is rather the maximum among the landless, 0.01-1.00, 1.01-2.00 land size category households. The larger land owners (4.01-5.00, 5.01 and above land size category) have started using LPG (19.31%) for the purpose. Besides, kerosene (15.58%), dung cakes (13.71%) and biogas (0.62%) are also used by the villagers particularly belonging to land size category of 0.01-2.00 and 3.01-4.00 acres.

The concluding **eighth chapter** summarises the research and draws the conclusions. It can be concluded that health is not unidirectional rather it is multidirectional and is influenced and affected by several physical and cultural elements of the environment.

Health problems related to communicable diseases have been declining in India. A similar decline is also noticed in Gujarat and also in Vadodara district. On the whole, however, pattern of diseases is shifting from infectious diseases to non-infectious diseases with chronic conditions such as heart diseases and stroke now being the chief cases of death globally. The shifting trend indicates that leading infectious diseases such as, diarrhoea, T.B, neonatal infections and malaria etcetera will become less important causes of death globally in the years to come.

The study has unraveled that in all the surveyed non-tribal and tribal villages, some 44.19 per cent of the population has been suffering from non-communicable disease like body pain, paralysis, diabetes, heart attack and cancer etcetera. Some 27.78 per cent of the population has been suffering from respiratory diseases like, whooping cough and tuberculosis, in which TB accounts for the maximum share. Some 13.38 per cent of the population has arthropod-borne diseases like, malaria and dengue. Some 7.32 per cent population complained of intestinal diseases like, typhoid, cholera, jaundice, viral hepatitis etcetera. Some 3.03 per cent of the population suffered from surface infection diseases, some 2.02 per cent from physical and mental impairment, and some 1.26 per cent from zoo nose diseases such as chikungunya.

However, the overall pattern of diseases does not hold when compared with the situations in the two types of villages. The population in the non-tribal villages suffers more (55.07%) from non-communicable type of diseases, which has affected only around a third (33.87%) of the population in the tribal villages. On the other hand, the effect of respiratory diseases like, whooping cough and TB is much more acute (34.11%) in the tribal villages in comparison to the non-tribal villages (15.94%). Similarly, a higher proportion (14.73%) of

the population in the tribal villages is affected by arthropod-borne diseases like, malaria and dengue, which relatively less in case of their counterparts (10.87%). Reverse is the case with respect to intestinal diseases like typhoid, cholera, jaundice, viral hepatitis etcetera. The proportion of the population suffering from such diseases is relatively higher (10.87%) in the non-tribal villages in comparison to the percentage of population in the tribal villages. Zoo nose diseases such as chikungunya, is also affecting higher proportion of (2.7%) of population in the non-tribal villages.

Exorbitantly high proportion of people in the non-tribal villages are affected by non-communicable diseases is a definite repercussion of the negative influences of unplanned urban-industrial growth, changed life style and different types of non-primary occupations. On the other hand, higher rates of respiratory disease cases in the tribal areas is directly related to use of kitchen fuel wood and consumption of *bidi*.

Limitations of the Study:

Morbidity related data are not always available systematically, for example health records maintained by hospitals, health centres, dispensaries etcetera are inadequate as well as unreliable many a times. There are gaps in recording of data. Quality of recording data varies from one institution to another. Many a times no standard classification procedure for the disease is followed which makes it extremely difficult to analyse the patterns and causes of diseases in the proper perspective. To overcome the lacunae in the available sources of secondary data, the present research has depended heavily on self-generated data.

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