SPATIAL DISTRIBUTION OF COMMON DISEASES IN NAGALAND: A GEOGRAPHICAL ANALYSIS

A thesis submitted to Nagaland University in partial fulfilment for the award of the Degree of Doctor of Philosophy in Geography

By

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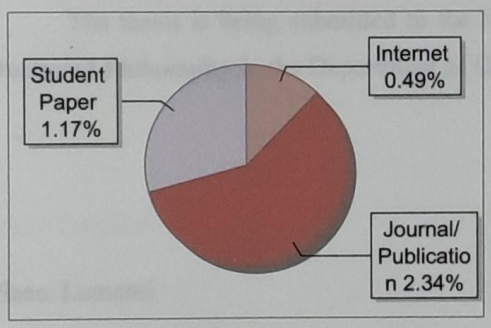

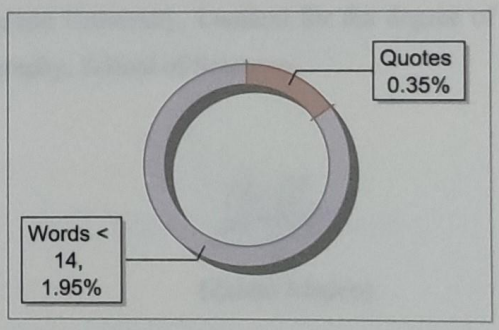

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(Zaleto Medeo)

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ABBREVIATION USED

Abbreviation	Full Form
WHO	World Health Organisation
DH	District Hospital
CHC	Community Health Centre
PHC	Primary Health Centre
UPHC	Urban Primary Health Centre
SC	Sub-Centre
MO	Medical Officer
CD	Communicable Disease
NCD	Non-Communicable Disease
Hy	Hypertension
Ar	Acute Respiratory
Oc	Oral Cavity
Ad	Acute Diarrhoel
Ef	Enteric Fever
Di	Diabetes
Ey	Eye
Cf	Common Fever
HIV	Human Immunodeficiency Virus
Me	Measles

Uo	Pyrexia of Unknown Origin
As	Asthma
Wo	Whooping Cough
Ot	Others
AIDS	Acquired Immunodeficiency Syndrome
HQ	Headquarter
GIS	Geographical Information System
ARCGIS	Aeronautical Reconnaissance Coverage Geographic Information System
QGIS	Quantum Geographic Information System
GPS	Global Positioning System
USGS	United States Geological Survey
P	Probability
SPSS	Statistical Package for the Social Sciences
Ms Excel	Microsoft Excel
Ms Word	Microsoft Word
Email	Electronic Mail
NHP	National Health Project
OPD	Out Patient Department
OT	Operation Theatre
NGO	Non-Governmental Organisation

CONTENTS

ABSTRACT

This study aims to examine the various types of diseases that are prevalent among the people of Nagaland. Occurrence and distribution of diseases are closely associated with the environment of man where he lives. Most diseases are unpredictable and can inflict pain on a man's body and his social life. Diseases do differ from one geographical area to another due to different geographical settings. Geography of Health is one of the many academic disciplines that can investigate man's health with the environment that man embraces. Geographers in the present day have become more skilled and explore new fields of research, where health study is also among the few by using geographical methods and techniques to dive into bringing newer concepts, models and theories.

Health of man and health-related studies in the present century has become an important aspect. In individual perspective, a healthy body and mind is considered to be a wealth. Health-related studies in academic discipline have become more vigorous and zeal than before because man has realized the importance of maintaining a healthy life not only individually but even in societal aspects. After the COVID-19 pandemic, health-related issues have become more vibrant and inclusive than before because in the past health issues were mostly dominated by medical science. Disciplines like social sciences contribute to health study because the spatial and social life of man is not taken into account effectively by medical science. In this context, while preparing to study the health-related issues of Nagaland, only a few remarkable contributions like Misra, Hussian etc. from the social scientists of India are found and also particularly to the North Eastern much effort is required to take up health-related issues into other disciplines. In Nagaland, no significant contribution to health-related studies is found from both the medical sciences and social sciences perspective. This emphasizes the need to study about health issues of Nagaland that have been carried out in this research work.

Nagaland lies in the remote part of India and shares its border with Myanmar. The state is dominated by hills and mountains, only a few regions are plain and are found when it shares a state boundary with Assam. The state of Nagaland is situated in subtropical regions but experience mostly tropical type of climate. This climatic condition allows the occurrence of tropical diseases like malaria, dengue, acute respiratory, enteric fever etc. which are mostly communicable and dominate other communicable diseases in the state. With the coming of Christianity to the state as well as colonizers, the state is exposed to the modernized world that has changed the social and cultural fabric of the state. With this change, the Nagas has change

in lifestyle, dietary habits etc. that cause non-communicable diseases like Hypertension to be dominant in the state. Yet the people of the state through the effective work of Christian missionaries have achieved great success in receiving in the field of education and health. The colonizers too found the unique social fabric from the tribal people called as 'The Nagas', who are different from the tribal populations of India.

Being situated in the remote part of India and with difficult terrain, the people in the state face huge problems in accessing health care facilities. The state government of the day has tried its best to let the people of the state access health facilities with a vision of affordability and accessibility but it could not achieve it. The state of Nagaland is not less than other Northeastern states of India is dominated by tribal peoples and even in the 2011 census there is no Scheduled Castes population. In 2011 census, about 72% of the population of Nagaland is involve in agriculture activity as their main source of income and also about 71% of the population still lives in rural areas. This shows that the socio-economic conditions of the people are still poor, largely unaware of how and why diseases occur, distributed and also could not avail to modern health facilities. Much to the dismay of the larger rural populations of Nagaland, most of the modern health facilities with well-equipped infrastructure are located in urban and semi-urban areas. Only a few exceptional well-equipped health care facilities are located in rural areas. Moreover, almost all human infrastructure has a certain limit, with limited health facilities in rural areas and larger rural populations can lead to constraints of health infrastructure.

The people of Nagaland not only face difficulty in affording health facilities but the state still lags in other infrastructural development which is attributed to low accessibility to health care facilities. The state is still poor in communication, transport, electricity and low quality of infrastructure build-up etc. have further deprived the health facilities. This poor infrastructure in the state have denied the people to right to access quality life. The poor infrastructures can undoubtedly influence the prevalence of diseases in the state. The setting up of the right infrastructure and all-round development in spatial areas requires proper planning and good strategy.

With all these factors, the present study tries to investigate the various diseases that are distributed and examine their pattern of distribution in the state. An objectives was placed before the research work proceeded. It was to identify the common diseases, assess their pattern and distribution, analyse the diseases in relation to the environment, examine the effectiveness

of health care facilities and their distribution in Nagaland and to suggest possible measures for disease prevention and better health care facilities in the state of Nagaland.

To fulfil the objectives of the study, various methodology was used and relevant data and informations, both primary and secondary data were collected from various sources like libraries, offices and institutions. To collect the data, stratified random sampling is used to select the number of health centre and administrative circles to be sampled. The disease recorded data were collected directly from the rural and urban health centres across Eleven districts of Nagaland. The data were gathered from 81 health centres covering about 50.63% of total health centres and 71 administrative circles, about 59.66% of total administrative circles in the state. Field surveys, interviews etc were used to ascertain the diseases causes and their distribution in the state. During data collection, certain data gaps due to poor and irregular records were detected that could not be overcome. Moreover, the Covid-19 pandemic too has affected the data collection.

The disease data collected were raw and arranged systematically to the needs of this study. All diseases identified were ranked as per the number of cases recorded in the sampled administrative circles. A total of 13 common diseases were identified of which the most common diseases are Hypertension, Acute Respiratory, Oral Cavity, Acute Diarrhoel and Enteric fever. The disease data collected for better interpretations were then tabulated and mapped using SPSS, MS Excel and various GIS software. Taking the administrative circles as the lowest unit, the incidence of diseases per thousand population was computed and mapped in the selected sampled area of administrative circles. The distribution of diseases was then explained by using altitude, temperature, percentage of forest cover, population density, literacy rate, sanitation and main source of water.

The broad interpretation of this research work is presented in six chapters. The first chapter provides details pertaining to the basics of research design with an introductory statement of the work, concept and definition of the research topic, the relevance of study, statement of the problem, status of health, study area and sampled health institutions, objectives of the research, methodology, data analysis and literature review which is relevant to the research work. In the second chapter, the physical settings and socio-economy of the state which can cause the diseases distribution were discussed. Nagaland located in the remote part of India and enjoys the subtropical climate that influence the occurrence and distribution of diseases. Sharing a porous international boundary line, the smuggling of illicit drugs to the state

influences the distribution of HIV+ disease in the state. With difficult terrain, the location of setting up and accessing to nearest health centres is a challenge. Lacking of development activities, especially in transport and communication has deprived and affected the general people to avail quality health care. For ease and convenience of the public, the government has set up the lowest unit of administration known as administrative circles. The state has a total of 119 administrative circles which cater for the needs of the public in terms of law and order and is also considered the lowest meeting point between the rural areas and semi-urban or urban areas. All these administrative circles have primary health centres which is the lowest level of health centres in rural areas. The population of Nagaland do differ from one area to area due to favourable geographical conditions. About 71.14% people of Nagaland live in rural areas. The state has a population density of 119 per sq. km. with highest population density is in the Dimapur district and the lowest is Peren district as per 2011 census. Population density does influence disease distribution like hypertension diseases, found more prominent in higher population density areas. Climatic factors influence the distribution of diseases and it varies across Nagaland. Other factors associated with disease distribution like health facilities, literacy rate, forest cover area and main source of water were discussed in this chapter.

In the third chapter, the common diseases and their distribution in Nagaland were presented through maps and graph charts for better interpretation. Nagaland has eleven districts, the interpretation is carried out across the district respectively, to know the depth of disease distribution. Of all the diseases identified in the respective district, the top three common diseases and apart from the top three diseases, the most common diseases that persist in the district were interpreted with maps and monthly distribution of diseases. The three most common diseases that are found in almost all the districts are Hypertension, Acute Respiratory and Oral cavity. Other diseases that are found common in some particular districts are Whooping cough, HIV+, Pyrexia of Unknown Origin etc.

The fourth chapter deals with disease and its environment. This chapter tries to analyse the distribution of diseases in relation to their environment. The chapter tries to find out how the environment influences the disease distribution. The top five most common diseases in Nagaland were studied in this chapter along with geographical elements like altitude, temperature, population density, rainfall, literacy rate and open defecation. There are 36 tables in this chapter for detailed analysis. Health-related studies remain incomplete without assessing the health infrastructure. The fifth chapter deals with assessing the health infrastructure in

Nagaland and how it can be addressed at times of disease outbreaks. On account of health infrastructure for detailed analysis, reports from various government levels and data obtained during field visits were used to interpret. GIS tools are used to find the location and susceptibility of health centres in the state. This chapter shows the health infrastructure in Nagaland is not uniformly distributed and needs to be addressed to bring equal healthcare facilities across the state. The sixth chapter deals with the summary and conclusion of the research work.

Some of the major findings in this research work are - the geographical area of Nagaland needs to be urgently rectified, health-related studies require a collaborative approach, the rise of non-communicable diseases cases in Nagaland is alarming, proper and well-planned health management, more modern technology is the need of hour in all almost all the health centres of Nagaland and health infrastructure needs to be distributed proportionately.

Keywords: Geography of Health, Diseases, Health, Physical environment, Social environment, Health infrastructure, Nagaland

CHAPTER I

INTRODUCTION

1.1 Introductory

Geography of health studies the physical and human aspect in a spatial dimension. The physical aspect deals largely on the various earth structure- origin, formation, characteristics etc whereas the human aspect deals largely on man and its relationship to his environment. The Earth we live in has various types of physical features, topography, numerous ethnic, mosaic culture and traditions, varied distribution of flora and fauna which has widened the nature and scope of Geography.

Diseases destroy and disturb the setup and society of man. The origin and causes of diseases to human beings remains unknown but when it happens it works not only the body but greatly hampers the social activities of men. Diseases can be considered as the disruptive element to men's health and its wellbeing. Sometimes the occurrence remains unknown and show very little effects on health, its causes often identified only by symptoms. Thus, diseases are considered as 'iceberg' (Misra, 2007).

May (1958), the founder of the theory of disease ecology in 1958 quoted as: "From the waters the people get their food, also their cholera, their dysenteries, their typhoid fever, their malaria; from the earth they get their hookworm; from the crowded villages they get their tuberculosis and their yaws; from the type of housing they have been forced to adopt they get their plague and typhus; and from the food which earth, temperature and rain produce, their protein deficiencies and their beriberi". Disease can be located in a specific area or can spread to other areas or regions. Geographers examine the distribution, intensity and severity of diseases basing on the location, topography, climate and social milieu. With varied geographical conditions from one region to another, diseases do differ in its origin, causes, intensity and consequences to man.

Geographical research of spatial variation of diseases provides important insights into what contributes to disease outcomes and options for its prevention and mitigation of disease outbreak. According to Curtis (2004), the cordial relationship between human and its physical and social environment is vital to understanding of complexity of Human health. A balanced in

this relationship eliminate and control diseases and its outbreak and thus contributes to maintenance of good health.

Medical geography is a multidimensional discipline which understand the mechanisms through which human health problems are linked to in space. It incorporates geographical parameters into the study of health and the spread of disease. The spatial distribution of physical and human race has led to differentiation of diseases paving a new branch of geography known as Medical Geography. In the year 1976, International Geographical Union (IGU) at Moscow change the nomenclature of Medical Geography to Geography of health, which brought about wider concept and allowed more geographers to involve in related health studies.

1.2 Concept and definition

Oxford Dictionary defines Health as "the state of being free from illness or injury". Free from illness means human body functions in a systematic manner which can provide wealth and proper physical structure but sometimes its functions can be disturbed by diseases.

World Health Organization constitution states that, health is defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948).

From ecological point, disease is defined as "a maladjustment of the human organism to the environment" (Gregg, 1956).

Geographers under health study do investigate and analyse diseases across territories on a spatial basis (Eyles, 1987).

Diseases are unforeseen circumstances to man's health, that can cause anxiety, stress, misery, pain, and insecurity to one's individual health and even cause a burden to his/her entire social milieu (Zaleto Medeo).

Health and diseases are not interrelated or rather opposite. In order to attain good health, he/she requires to be free from all kind of diseases. Human wealth depends on his/her good health. Good health does provide security, happiness, economic viability etc. in man's life and to possess or acquire good health man invest a lot to overcome disease.

1.3 Relevance of study

Geography of Health studies human health in space, time and environment. The occurrence of diseases and their spatial distribution can be due to geophysical conditions or the social environment of man. The study on the spatial distribution of diseases can impart to know more about disease characteristics of which the Doctors were not aware. Geography has been interlinked between both physical and human dimensions which can help to identify disease diffusion, health management studies and improve the health care system.

Geography of health or medical geography is a branch of Geography that contributes to understand the health, through the concept of man-environment relationship. It has emerged under the shadow of medical sciences and become one of the most important disciplines (Herrick, 2016). The emergence from the medical sciences has also expanded the academic discipline, allowing it to interact with more social science discipline and also improved health studies by incorporating geographical techniques like GIS have enhanced the credibility of the health care system and disease studies.

1.4 Statement of the problem

The quality of health and complete free diseases that man need is so complex that it requires studies or research collaborations in various academic fields to get the in-depth knowledge of how health function, as most of human health depends on the interaction with the surrounding environment.

Geographical settings differ from one region to another which may directly or indirectly influence the occurrence, spread, intensity and distribution of disease germs. The state of Nagaland too has different geographical conditions from one region to another which may also differ in the origin and intensity of disease for example Dengue is found only in warm and humid climate of Dimapur.

Other examples of distribution of diseases in Nagaland like water borne diseases - diarrhea, typhoid etc may be affected due to different general physiography like- altitude, climate, forest cover etc or because of different socio-economic development of the state like availability of water, education and access to health centre.

Other measures to combat diseases out-break is equal number of health institutions and effective health care system across the state of Nagaland, which is crucial for dissemination of quality and quantity health care.

1.5 Status of health in Nagaland

The Department of State Health in Nagaland was initiated in 1965. With its inception the department has been imparting in providing quality health to its people. It has also adopted and introduced various health programmes like National Vector Borne Diseases, Nagaland AIDS control society etc which contribute not only to the department but to the people of the state for accessibility of health care.

In this study on disease distribution in Nagaland, primary data collected from the various health centre indicates high number of cases of both communicable and non-communicable diseases. Some of the prominent non communicable diseases are Hypertension, Diabetes and Oral cavity related diseases and Communicable diseases are Acute Respiratory, Enteric fever/Typhoid fever, HIV, etc.

The concerning disease in Nagaland (per the study) at present is the high rise of non-communicable disease especially hypertension disease, diabetes, etc. which has become a threat. Remarkably disease like malarial fever has decline a lot or tends to be absent in almost all of the district in the state.

Table 1.1: Total number of Health Institutions (2018), Nagaland (*excluding newly created districts)*

District	**Type of Health Institution**			
	District Hospital (DH)	**Community Health Centre (CHC)**	**Primary Health Centre (PHC)**	**Sub-Centre (SC)**
Dimapur	1	2	9	82
Kiphire	1	1	5	31
Kohima	1	3	17	44
Longleng	1	0	3	14
Mokokchung	1	4	17	58
Mon	1	3	14	72
Peren	1	2	8	29
Phek	1	3	23	51
Tuensang	1	3	14	69
Wokha	1	2	12	48
Zunheboto	1	2	13	61
Total	**11**	**25**	**135**	**559**

Source: Directorate of Health and Family Welfare, Nagaland

1.6 Study area

Nagaland lies at the North Eastern most part of India bounded by a country i.e., Myanmar in the East, the state of Assam in the West, the state of Arunachal Pradesh in the North and the state of Manipur in the South. Nagaland has a total area of 16,579 sq. km with a total population of 19,78,502 (2011 census). The geographical coordinate of Nagaland lies between 25º6' and 27º4' North latitude and 93º20' and 95º15' East longitude.

Figure 1.1: Location and study area map of Nagaland

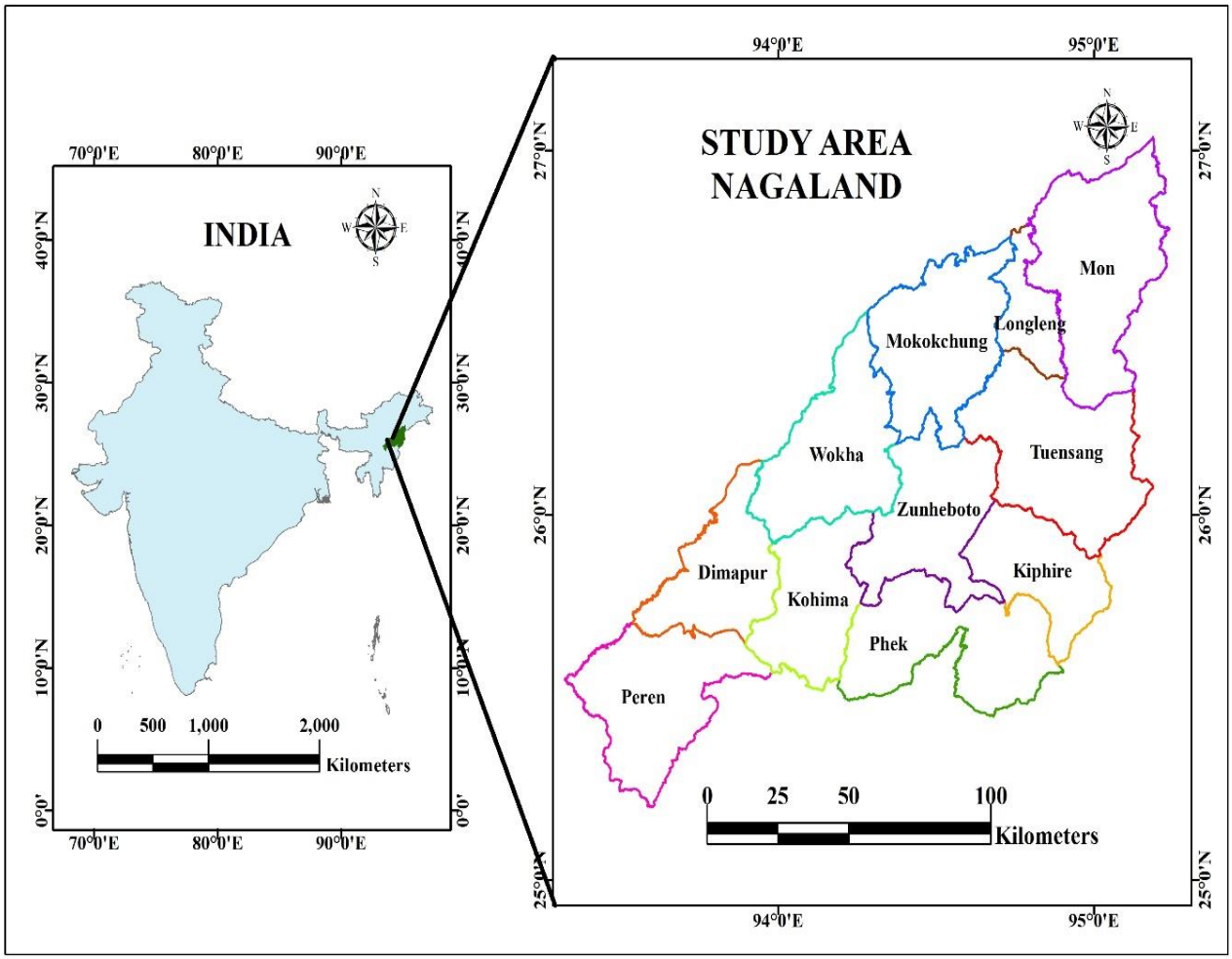

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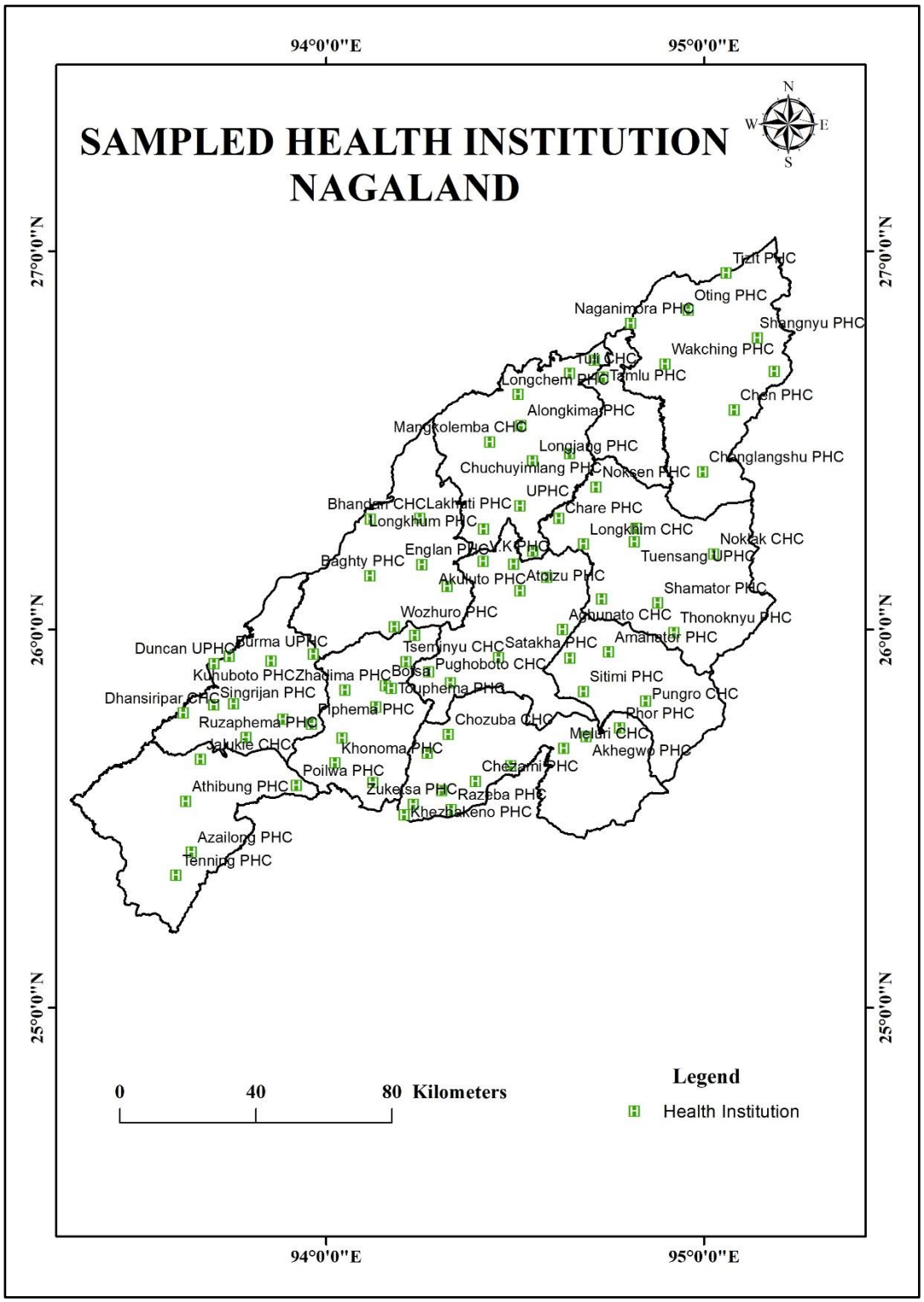
Figure 1.2: Sampled health institution in Nagaland



Source: Lab work

1.7 Objectives

The following objectives are:

- To identify, assess pattern and spatial distribution of common diseases in Nagaland
- To analyse diseases in relation to the environment in Nagaland
- To examine the effectiveness of health sector and distribution in the study area
- To suggest possible measures for disease prevention and better health care

1.8 Methodology

1.8.1 Sampled Area/health institution

Nagaland state has a huge geographical area and is divided into several district, sub division and administrative circle for effective administration. The state has total of 119 (2017) administrative circles an is headed by Extra Assistance Commissioner (EAC), appointed by respective state government. The lowest form of administration, it has a distinct political (administrative) boundary. Each of these administrative circles has one or more health institutions. In this study, disease mapping or distribution studies is carried out to selected administrative circle.

There are different types of health institutions in the state. For effective results, the lowest level of health institutions or primary care in rural health sector i.e., the Primary Health Centre (PHC) is considered for sampling/studied. But in some circles which have larger populations, Community Health Centre (CHC) is also considered in this study because this CHC's were upgraded from PHC's and it still provides primary health care to rural areas. Stratified random sampling technique is used to choose the number of health institutions to be sampled in respective district, based on administrative circles population (Highest, Medium and Lowest) as per 2011 census. About 50% of both administrative circles and health institutions of respective district and the whole state of Nagaland is studied and analyse to identify the common diseases and its distribution.

1.8.2 Data Collection

For research ethical purposes, permission was obtained from the Directorate of Health and Family Welfare, Government of Nagaland (ref. DHFW-8/31/Misc/2016-1595 dated 16th February 2021) (Enclosed annexure no. III) to collect the diseases recorded data from the selected health institution i.e., PHCs and CHCs. Recorded number of all kinds of diseases (except accident and vaccination) in this study area was collected from 66 PHCs and 15 CHCs (total – 81) health centres covering about 50.63 % and 71 administrative circles were sampled i.e. 59.66 % were covered and studied across the geographical state of Nagaland. Data collections was initiated, but due to Covid-19 pandemic where all health institutions across the state was primarily focused to control and vaccinate, also the administration or local areas or villages had imposed travel restriction and subsequent lockdown had affected the nature of the data collection and hence could not carry out as planned before covid pandemic strike. Disease recorded data collection of 15 years from 2004 – 2018 was initiated but due to Covid -19 pandemic and lack of data in health institutions across Nagaland, it was compelled to change the duration from 2018 – 2021 (4 years) of continuous twelve months in selected PHCs and CHCs.

Other secondary data like population, forest cover, meteorological data, forest cover etc, which were relevant to this study was collected from respective government department or organisations for quality and comparative study of diseases and its association. Several published and unpublished, reports and maps were also collected and studied to substantiate the collected data.

To complement the disease data collected, unstructured and structured questionnaire, interviews etc were conducted physically in the first stage from both medical professionals and general public. But due to the pandemic, physical methods/interviews had to be abandoned and shifted to electronic means like google form, telephonic conversation, emails etc. More focus was towards telephonic conversation as it provided efficient time management and convenience. Another setback in the initial stage of interviews for general public, the selected public interviewed did not provide desired or satisfactory responds, resulting to change to diseases affected patients to ascertain the environmental attributes of diseases distribution and causes.

1.8.3 Field Visit

To visit selected health centres for data collection and diseases affected areas, permission from concerned department was obtained. Due to pandemic, collection of diseases recorded data in all 11 districts (selected health centres) of Nagaland were delayed and restarted effectively in Tuensang district in the month of March, 2021 and extended up to August, 2022, Kiphire being, the last district to be covered. The duration of disease data collection from selected health centres was extended to more than a year because of the 2nd and 3rd wave of Covid across India, which also subsequently affect the state of Nagaland.

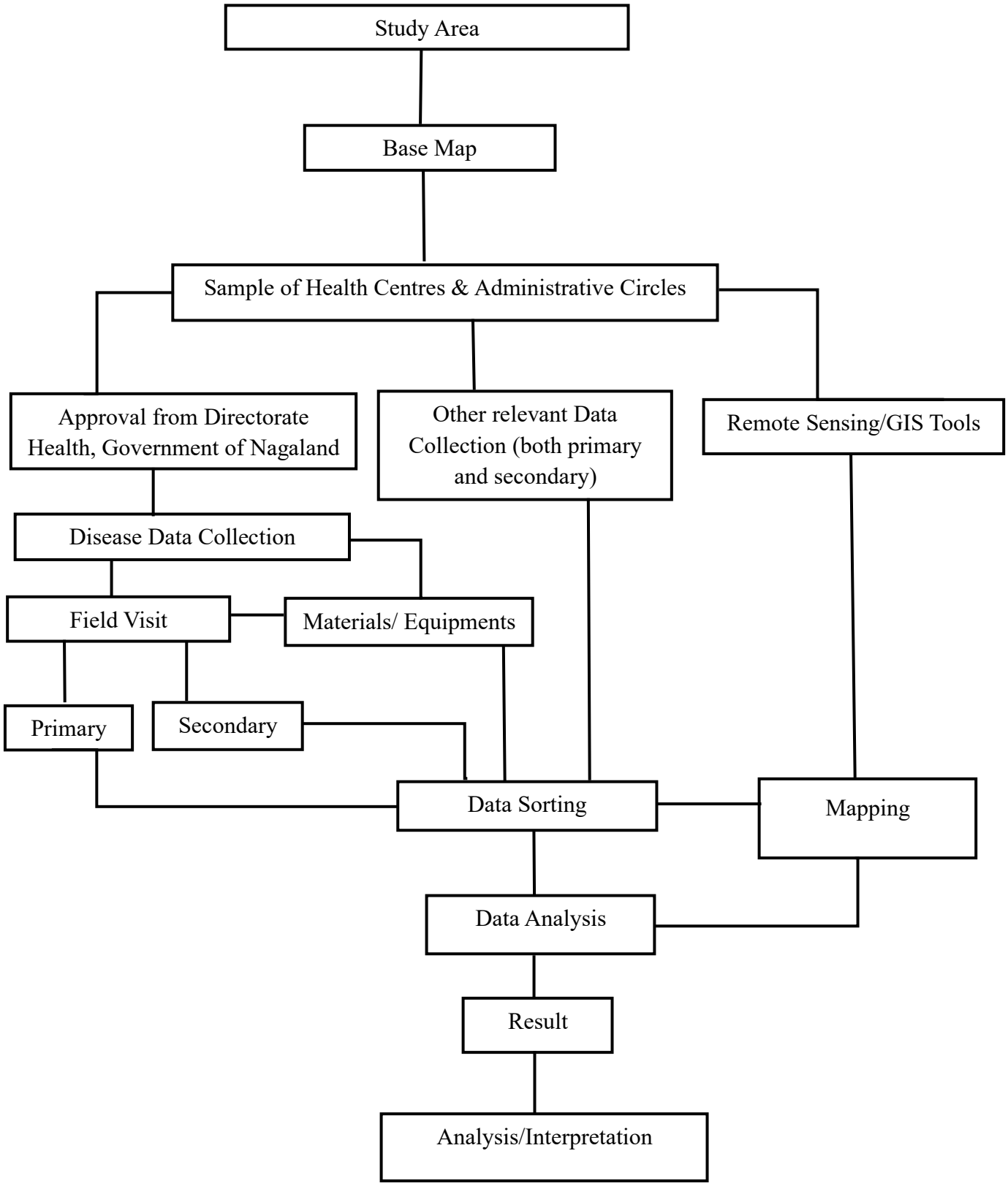
1.8.4 Remote Sensing

Remote sensing images or Landsat data were downloaded from USGS Earth Explore for geographical mapping like contours, rivers, elevation etc of Nagaland

1.8.5 Equipments

Equipments like Global Positioning System (GPS), Max-Min thermometer, digital camera and various mobile phone bases apps etc were used in the field for collection of geographical coordinates, weather data, altitude etc and other relevant information.

Figure 1.3: Flow Chart of Methodology



1.9 Data analysis

Quantitative and qualitative data were collected from both primary and secondary sources. The data collected were raw in nature and it is than sorted and computed according to the needs and requirement in this study. After the datas were sorted individually or some in group, were than calculated or tested by using statistical techniques like mean, standard deviation, range etc. in systematically manner. To verify the corelation between disease and its environment, Pearson's coefficient, p-value etc were used to test the data. All these data were arranged, calculated and tested by using statistical software like MS Excel and SPSS.

Diseases data collected were sorted and have been ranked as per the number of recorded cases in the state as well as district wise. Diseases recorded cases from sampled health centre were than clustered under the administrative circles wise for better interpretation. It was then sorted into incidence of diseases per year by applying statistical techniques. Distribution of common diseases were than mapped, anaylsed and interpreted into district wise of the sampled administrative circles. This was done to highlight the most common diseases in each district for detailed explanations and interpretations due to different geographical - Physical and Human aspects, the nature and intensity of disease differs with one another. Ranked size rule was applied for distribution of diseases as per the largest to smallest administrative circles of Nagaland (sampled area).

Geographical locations of all health centres in primary level were taken into account to study the feasibility of health centres or infrastructure of Nagaland. The techniques used were based on remote sensing and GIS.

Both ArcGIS and QGIS is used for all types of mapping, analysis of distribution, forecasting of health infrastructure etc. and especially in disease mapping of Nagaland and district wise with the help of toposheet and maps with political boundary wise of all administrative circles of Nagaland was obtained from the state nodal agency, Nagaland GIS and Remote Sensing Centre, under Planning and Co-ordination department, Government of Nagaland.

1.10 Limitation

i. The COVID-19 pandemic and lack of proper data storage in health institutions have hampered data collection.

1.11 Review of literature

1.11.1 International

Health study requires a diverse discipline and should not be confined to only the medical science field. Geography is one academic discipline that studies health with the environment (Herrick, 2016). Geographers under health study investigate and analyse diseases across territories on a spatial basis (Eyles, 1987). The discipline of 'Medical geography' is not new but it was even known to exist in time immemorial, especially to Indians and Chinese scholars even in 1000 B.C. and even to the Greeks scholars. The great Greek scholar Hippocrates was considered to be the first medical geographer to analyse disease distribution by comparative study between diseases and geographical factors like temperature and the social behaviour of man (Agnihotri, 1995). He is also known as the 'Father of Medicine'.

During the work on "Geographical Distribution of Disease in Great Britain" by Alfred Haviland gave the first term of 'Medical Geography' in Britain. In the United States, after the great work of Jacques May in producing world maps on Vector diseases and malnutrition has been considered the 'Father of Medical Geography' (Meade and Emch, 2010). In India, the great works of Misra on 'Medical Geography of India' in 1970, describes the disease distribution in India and also the nutritional problems in India whereby Misra tries to correlate with geography. Another significant contribution is Hussian in his edited volume entitled 'Medical Geography' in 1994 has focused on disease diffusion and health care planning (Nepal, 2009).

Diseases exhibit spatial variation, so the relationship between disease occurrence and a host of variables needs to be identified to provide clues to disease causation (Pacione, 1986). Various geographical factors like temperature, water, soil etc influence the quality of health and also can be the originator and distributor of diseases. A geographer's concern is on diseases and human health, and their interrelationship to the environment in a spatial location (Curtis, 2004). Geography and material health mean not only the patterning of social and epidemiological conditions across territories. However, regarding the spatial basis of policy initiatives to tackle problems enunciating. Medicines do not only dominate the policy area but are said to influence significantly the nature of social life as well (Eyles, 1987). Geographer analysis of people's behaviour and environment at scales of person, household, neighbourhood, occupational group and other populations is a valuable perspective (Armstrong, 1990). According to May (1958),

the disease is a product of interaction among the agent, host, and environment. Geographers focus on the importance of disease variation across space, with an emphasis on locations, direction, and space (Anthamatten and Hazen, 2011). The coexistence of environment and health needs to be understood and investigated properly to eradicate or minimize the spread or occurrence of diseases. Environmental health has historically focused on preventing infectious diseases spread by water, waste, food, rodents and insects. Environmental health is therefore seen as encompassing all the infections of humans with their environment and the health consequences of these interactions (Insel and Roth, 2007).

Climate modifies several physiological characteristics or functions (eg. Heart, liver, kidneys etc) of man, which affects the immunity from certain classes of diseases and their susceptibility to others, influences their temperament, their energy etc which can determine the degree or causes of diseases (Semple, 2009). Most investigations regarding changes in climate and the risk of infectious diseases involve environmental changes that facilitate the spread of disease vectors into new regions, placing new populations at risk. Weather changes provide opportunities for natural experiments, which can demonstrate the possible effects of atmospheric variables on infectious diseases. Weather conditions, such as rainfall, flooding, humidity, and heat waves have well-documented effects on infectious diseases. Prolonged periods of heavy rain increase the opportunities for vector- borne diseases to spread (Polgreen and Polgreen, 2020). Respiratory infections are more common in the warm type of climate/ regions. Bacteriological and epidemiologically respiratory infections is common in both warm and temperate regions. In the warm regions, the incidence is higher in young groups of people whereas it more in older people in the temperate regions (Cruickshank, 1976). Acute bronchitis can also cause sever implications to man health, whoever exposed themselves to dusty occupation, a smoky environment, heavy chain smokers and also to persons whose family history of bronchitis, respiratory tract and general chestiness (Edwards, 1966).

The diffusion of cholera in Africa during the early 1970s showed the importance of the degree of transportation development, the organization of the urban hierarchy and population mobility for the spread of cholera (Stock, 1990). Cholera nearly non-existent in rural areas quickly rose to epidemic in urban areas due to rapid urbanization, which is due to crowded and unsanitary conditions (Newbold, 2012). Data collected from the global burden of disease studies shows, that one of the most common diseases in the Indian subcontinent is typhoid fever. The major reasons are consumption of impurities water at the work site, non-boiled

untreated spring water, water from a non-municipal source, and contaminated tap water, whereas some factors are consumption of ice cream and consumption of food from outdoor vendors which is attributed to foodborne infection. There are also other general risk factors which include high population density, unsanitary living conditions, poor hygiene, low socioeconomic status, and recent contact with a patient with typhoid fever (Wain et al., 2014). Acute Respiratory Infection in children below the age of 5years in developing countries is a major concern. Emphasis to control this disease should be examine to etiologic studies as well as treatment and strategies for prevention (Monto, 1989). Malaria disease causes a significant burden at the global and regional levels. In most of the endemic areas where transmission occurs regularly, fatality rates are highest among children whereas in epidemic areas where transmission occurs sporadically in the form of epidemics, it is likely to cause severe fatalities in all age categories (Caminade et al. 2014). Japanese encephalitis (JE) is predominantly located in the Southeast Asia region and is commonly associated with transmission between amplifying hosts, such as pigs and the mosquito Culex tritaeniorhynchus but in recent studies, it indicates a complex interplay of the genetic variation and in combination with environmental variables such as geography, climate change and urbanization has triggered a complex understanding in JE disease origin (Pearce et al., 2018). Chronic non-communicable diseases are steadily increasing around the world, including in low- and middle-income countries, and account for 50% of healthcare expenditure and more than 60% of the disability adjusted life years (DALYs) (World Health Organization, 2010/ 2015; World Health Organization, 2017). Non- communicable diseases pose considerable threats to national development as every 10% increase in NCDs is estimated to lower the annual economic growth by 0.5%. The World Health Organization (WHO) estimates that just three NCDs (heart disease, stroke, and diabetes) may cause the emerging economies of China, India, and Russia to lose between 200 and 500 billion dollars of gross domestic product (GDP) over 10 years (Fearon et al., 2015). A higher geographical altitude can induce more NCD diseases like BP but undergoing in recent studies suggest that the disease is not only induced by altitude but rather longer exposure to man-made induce like louder noise can inflict higher elevations in BP level (Brook et al., 2011). The environment we live in can substantially contribute to increased and prevent type 2 diabetes. It found that air pollution, residential noise and socio-economic deprivation can increase the risk of type 2 diabetes, while free, clean and green spaces are closely associated with to reduction of type 2 diabetes disease (Beulens et al., 2022). Diseases like respiratory disease are common in the colder hills and malaria in lower hot altitudes, which indicates temperature not only affects the presence or absence of disease but also involves the distribution of disease (Webber,

2004). According to the 'Environmental Burden of Disease in European Countries' project report, particulate matter air pollution, together with traffic noise pollution, contribute to more than 75% of the burden of disease attributable to environmental factors (Hanninen et al., 2014).

Health concepts and modelling can be effective measures to control the spread of diseases. The concept of 'Environmental hygiene' (Haunjing Weisheng, adopted in China, 1950s) has the provision of clean water was particularly promoted as a measure to combat the rapid spread of diseases and epidemics in cities (Glasser, 1995). A geographer's main contribution to public health intervention is through studies designed to understand how the effect of an intervention might vary across space (Janko & Emch, 2016). The pattern of global most infectious diseases like HIV/AIDS, influenza and severe acute respiratory syndrome are mostly linked to human migration and disease diffusion (Drummer, 2008). To contain or prevent disease outbreaks, vulnerability mapping is a comprehensive tool that can help in decision-making for the prevention and efficiency of health management (Dickin, 2016). The first Cholera disease outbreak mapping in London, Soho district has led to the identification and control of its outbreak.

The prevalence of diseases related to environmental factors is not well known, both in terms of incidence and distribution. In health maintenance and promotion activities, reasonably effective ways to reduce the transmission of influenza include good personal health and hygiene habits. Geographical information systems (GIS) play an important role in public health promotion and protection by combining geographic facts gathered from multiple sources and displaying the resulting integrated data in images that show relationships between data and geography. Applications of GIS in health include disease mapping, spatial epidemiology, and support for spatial decisions regarding the provision of health care (Abdalla et al., 2011). GIS research in the healthcare field focuses on the methodological development of geographic accessibility to maximize access to healthcare (Higgs, 2004). GIS is a new emerging field and its applications have diversified the research, planning, academic etc. fields for development and planning purposes (Elangovan, 2006). A GIS provides a convenient means to link spatially referenced data from different sources. GIS can perform numerous tasks utilizing both the spatial and attribute information stored within them (Maclczewski, 2004). Geographical information system (GIS) research emphasizes the spatial dimension i.e. accessibility, while the rest of the dimensions may be seen as non-spatial (McLafferty, 2003). Health professionals have used maps when analyzing associations between location, environment and diseases. GIS

in public health is used for basic mapping and involves spatial analysis of disease occurrences and contributing environmental factors. GIS helps us in both visual and exploratory analysis along with an estimation of the relationship between measures of disease incidence and its surrounding environment (Rytkonen, 2004). Appropriate techniques for mapping to infectious diseases distribution would help the planners and contribute clinical significance to humans (Hay et al., 2012).

Health data i.e. primary or secondary collected in a specific geographical area is frequently used to demonstrate health inequality. However, the interpretation of such data on geographical variation in health is often equivocal. Some tend to focus more on the significance of places for health difference, arguing that processes operating at the individual level are far more important for our understanding of health inequality but others suggest that processes influencing individual health may operate differently in different places. However, it is concluded that while individual characteristics are very important for the health inequalities that are observed between people, their geographical setting also has some significance (Curtis and Jones, 1998). Geographic research in health is often dichotomized between quantitative and qualitative methodologies, with quantitative studies closely aligned with epidemiology and qualitative studies aligned with medical sociology and social sciences (Dummer, 2008). Geographers have conceptual tools to incorporate the undermining of health issues, but due to several socio-political factors have denied it (Herrick, 2016). Environmental factors are subtle, diffuse and wide-ranging. Economic and social determinants of health and disease help explain why some people are healthy and others are not. Race, socioeconomic status and geography are often included among the strongest determinants of health. Much of the race-related health inequity research has been conducted at the state or national level; there has been less focus on health inequities in rural areas compared with urban areas (Erwin et al, 2010). Improvement in the level of education and understanding was probably the most important reason why endemic communicable diseases largely disappeared in the developed world whereas lack of resources, poverty, nature of physical surroundings and human activity that destroy nature can influence disease (Webber, 2004). The land use pattern could also influence the disease, but scientifically it still remained vague. Identification and assessment of human health and managing the land use could improve the environmental conditions as well as human well-being (Votsi et al., 2014).

With the increase in unprecedented and unpredictable disease outbreaks due to human-driven environmental changes in recent years, we need new analytical tools to map and predict the spatial distribution of emerging infectious diseases and identify the biogeographic drivers underpinning their emergence (Jagadesh et al., 2019). The disease can travel so quickly and so also information required to move even faster. This is where map-based health studies become important. Indeed, health professionals have considered conventional mapping but recently Geographic Information Systems (GIS), has become a critical tool in tracking and combating the spreading of disease. The foremost map of visualizing the relationship between place and health was in 1694 on plague containment in Italy (Boulos and Geraghty, 2020). The timely and quality epidemiological transition would benefit health care planning in terms of health care and social care planning, finance, insurance and charges (Phillips, 1994). Apart from the technological and presence of health infrastructure, Community First Responders are an integral part of community resilience in the rural areas which can deliver quick health care delivery system at times of emergencies (Schneider et al., 2015).

Availability and access to health care, clean living conditions and drinking water, adequate nutrition, education, gender equality, and non-discrimination are all elements that will be required for a human-rights-based approach to intervention (KealeY and Smith, 2010). Effective planning, well-maintained public property, more housing schemes for the poor, personal hygiene, better insurance, social traditions or cultural taboos etc needs to be resolved, to reduce and avoid the spread of diseases (Abdu et al., 2013). Human well-being measurements are largely variable even though humans are broadly classified into various biological, socio–cultural, economic etc., it is required to access all-round development to bring equality to all kinds of people. To measure it the three basic measures according to B. Horvat are life, education and health (Gopi and Markandey, 1994)

1.11.2 Indian

Medicine in India was known to have existed in 800 B.C. from the brilliant healer work of Sushruta in plastic surgery is known as ‘Father of Indian Medicine’ (Mazumdar, 2022). The geographical perspective in the study of health was expanded after the great work of Misra in 1970, which has collaborated with the field of medical sciences and geography.

Ecological point of view of health is a dynamic equilibrium between human organisms and their environment, and disease is maladjustment between those (Mukherjee, 2005). More

than 1/4th of the world's population still lies in poverty. Hunger, diseases, illiteracy and restricted freedom of choice are the main problems in the less developed countries of sub-Saharan Africa, South Asia and Central America (Hussian, 2009). To eradicate diseases, the study of diseases and the environment can help in preventing and containing any epidemic diseases. To understand the distribution of diseases from their originator to affected areas, the environment needs to be taken into account and more importantly mapping of the affected areas with proper cartographic techniques (Misra, 2007). Ecologically, the disease is maladjustment to the environment that jeopardizes the survival of the individual or its living tissues for which the human body struggles and alters its physiological functions (Mathur and Raghav, 1989). In India, environmental health is neglected, in which the National Institute of Research in Environmental Health got only 0.34% (2010) of the total budget for NCDs and 4.6% (2010) of the total ICMR budget for research institutes. In contrast, environmental factors contribute, 24% of the total disease burden in India. Given the long term implications of the environment on both communicable and non-communicable disease, it is in need to robust strategy for enhancing vital environmental health research in India (Jain, 2016).

Levels of health and diseases vary between places and over time. In temperate and colder areas, most infections are derived from humans, but in the tropics and subtropics, most diseases are arthropod-borne or are zoonoses derived from animal sources. Deforestation and the introduction of new forms of cultivation may have a pronounced effect on the distribution of arthropod vectors (Akhtar and Learmonth, 1985). Health is difficult to define and the state of well-being is an objective manner. Disease may change due to imbalance and changing interrelations may be caused by changes in the agent, host or environment (Sathe and Sathe, 2005). Common diseases of old age are diseases of the heart, brain, systolic hypertension, diabetes, osteoarthritis, anaemia, lack of nutrition, osteoporosis and respiratory infection due to impaired temperature regulatory mechanism of the body, elderly men cannot able to cope with adverse weather, heat or cold (Puri, 2001). Cholera is a disease whose best medium and means of survival and transmission is water. Therefore, to minimise its spread, people must be provided with safe and protected drinking water supplies (Kapansa, 1990). Diseases like HIV/AIDS can be spread due to lack of proper education, young age, uncertainty about future prospects etc have pushed to more spreading of disease to unaffected persons. In addition, difficulty in accessibility, stigma and discrimination associated with their occupation are found to be challenges before public health experts for organizing preventive interventions among different working girls (Singh et al., 2019). Pollution can cause respiratory and cardiovascular

diseases. Economic development, urbanization, energy consumption, transportation and rapid population growth are major driving forces of air pollution. Thus, in the Indian city, Kanpur the main source of air pollution are industries, domestic fuel burning and vehicles. This has increased the number of respiratory disease cases to areas located near to highly polluted areas (Liu et al., 2013).

Hypertension is among the most important risk factors for cardiovascular diseases. It was found anybody who does vigorous physical activity has brought down mortality and lowered the danger of cardiovascular sicknesses and is termed to be physically fit (Rabha and Begum, 2022). Prevalence of hypertension was found to be 15% among the Khasi women in Meghalaya and 17% among the Chakesang women in Nagaland (Meshram et al., 2022). Hypertension is known as a multifactor disease, and its underlying causes are unknown. However, the literature has identified modifiable and nonmodifiable factors contributing to hypertension incidence. Non-modifiable factors included individual characteristics, such as age, gender, race and genetic factors. Modifiable factors tend to be related to lifestyles, such as obesity, alcohol consumption, smoking, unhealthy eating habits, stress, and physical inactivity (Hikmah et al., 2022). The health status of tribal communities in India has several interacting factors with the environment, such as the tribals inhabit behavioural patterns and lifestyles, health care services and hereditary and genetic determinants (Ali, 1994). The number of Non-Communicable disease cases are rising in an alarm factor in the South Asia regions of the world. This may be due to increasing in number of ageing population and road towards economic sustainable development is not achieved, leads to imbalance in socio-economic conditions of the populations (Ghaffer et al., 2004).

Attempt has been made to control the communicable diseases but there is still high prevalence of respiratory and gastro-intestinal tract diseases especially in the rural areas of developing countries. The disease mostly affected during the rainy seasons which shows it thrive more in warm and humid climate (Mohapatra et al., 1989). Global climate change has been affecting the climatic phenomenon leading to erratic rainfall and temperature pattern. Dengue a vector borne disease has become more varied and active during when the state of Tamil Nadu experience deficient in rainfall. It is only a single geographical factor but plays a significant role (Chandran and Azeez, 2015). Disease monitoring in terrain regions in Indian states like Arunachal Pradesh is a difficult task especially to disease like Malaria as the populations of mosquito varies due to altitude and frequent change in climatic conditions.

However, the diffusion of malaria varied between districts and high morbidity rates was reported mostly during the wet season (Rao et al., 2014).

India faces a huge challenge in maintaining water quality in rural and urban areas. The rural population largely depends on ground water as a source of drinking water and this water found to be highly contaminated with fluoride, arsenic, iron and salts. Consumption of contaminated water causes water borne communicable diseases like diarrhoel, which is the main cause of high mortality among the children under the age of five (Srikanth, 2009).

Geoinformatics technology can aid in epidemiological investigation and outbreak response which can reduce the health hazards before, during and after the epidemic. Integration of GIS and GPS enhances the quality and easy access of both spatial and non-spatial data for analysis and decision making by providing an integrated approach to disease control and surveillance at local, regional and national levels. GIS was used to map the distribution of coastal species of An. Sundaicus along the Andaman and Nicobar Islands, where it is the sole vector of malaria found out that sandy soil is favourable to growth while rainfall more than 1600mm was not favourable for species to survive, also same species were seen around Chilka Lake, Andhra Pradesh, Vishakapatnam and the southwestern coast of Kerala (Balamurugan et al., 2011). Unprecedented and chaotic growth of cities results in reducing open spaces and water bodies, worsening infrastructure facilities and changes in ecological morphology. This unregulated growth of the urban population led to uneven distribution of urban amenities, facilities and healthcare services. Thus, GIS tools help in solving and providing insight details to planners for setting up new health centre, developing existing structures and importantly providing quality health care (Dutta et al., 2021).

India may be growing faster than many other countries economically and even in other fields, but a large number of people still depends directly or indirectly to government facilities. A vast majority of over 25% of Dalits are below poverty with inadequate or no health care facilities (Ramaiah, 2015). Equitable distribution of public services with a local spatial reach poses a challenge because the allotted of resources has limitations. This distribution may also not be equitable due to unequal jurisdiction size (Rajaraman, 2014). In health sector, health facilities are the main institutions that can deliver quality and quantity treatment and prevent any outbreak of diseases. It requires easy accessibility and affordability to people. Promotion of health is the key factor for disseminating health issues which can reduce health inequalities (Sabarwal, 1999). Access to Healthcare is one of the most important facilities of the overall

population in the country. Accessibility mainly depends on the availability and affordability of the services. It also ensures that all the sectors of the society should have equal and adequate access to Primary healthcare, regardless of socio-economic and geographic factors. This is a key factor to provide a healthy environment and to minimize disease risk (Rekha et al., 2017).

1.11. 3 Nagaland

Health-related issue literature in Nagaland is poor. In Nagaland, there is a high rate of hypertension disease. The male under the age of 40 years has a higher risk of hypertension and is due to consumption of alcohol, overweight and also a family history of hypertension (Sanglir et al. 2023). Nagaland is a tribal dominated state and traditional medicines have been their main healthcare system for a very long time, even today they contribute to the healthcare system. This contribution has reduced the burden of healthcare expenditure and also promotes indigenous medicine (Ao, 2020). The basic needs of a man like water in Nagaland need to be improved and to improve it, constant monitoring is required to prevent contamination-free drinking water and also create awareness of the importance of quality water (Pamei et al., 2020). Health-related studies in Nagaland remain in a nascent stage and a more collaborative approach is required to improve the overall health system, disease diffusion study and also promote traditional medicines.

CHAPTER - II

PHYSICAL AND SOCIO-ECONOMY OF NAGALAND

2.1 Introductory

Nagaland state was inaugurated on 1st December 1963 as the 16th state under the Union of India. The state has distinct social, racial and facial features from the rest of India. It is dominated by tribals and sub-tribals and has unique language, socio-culture and traditions which differs from one tribe to another. The people of Nagaland are from Mongoloid race and people living in Nagaland are called "The Nagas". The word Naga is derived from the Burmese word "No-ka" meaning people with pierced ears.

About 70% of the people in Nagaland depends on Agriculture as the main source of livelihood. Jhum (shifting) and terrace (paddy) cultivation are the main type of agriculture practice in Nagaland. The methods, techniques and tools used in agricultural fields are still rudimentary and agriculture is based on subsistence farming. Recently, the farmers of Nagaland are changing the agriculture type from Jhum cultivation to plantation e.g., Rubber, Kiwi, Cardamon etc.

The state capital of Nagaland is located at Kohima at an altitude of 1444 m above sea level. Dimapur is the largest city in Nagaland and is the only city which is connected by railway and airport to rest of the country. The state has only one Central University with its headquarter located at Lumami, under Zunheboto district.

2.2 Location and physiography

Nagaland state lies in the North-Eastern part of India between 25º6'N and 27º4'N latitude and between 93º20'E and 95º15'E longitude. It shares an international boundary with Myanmar in the East, the state of Assam in the West, Manipur in the South and Arunachal Pradesh in the North East. The state has a total geographical area of about 16,579 sq. km.

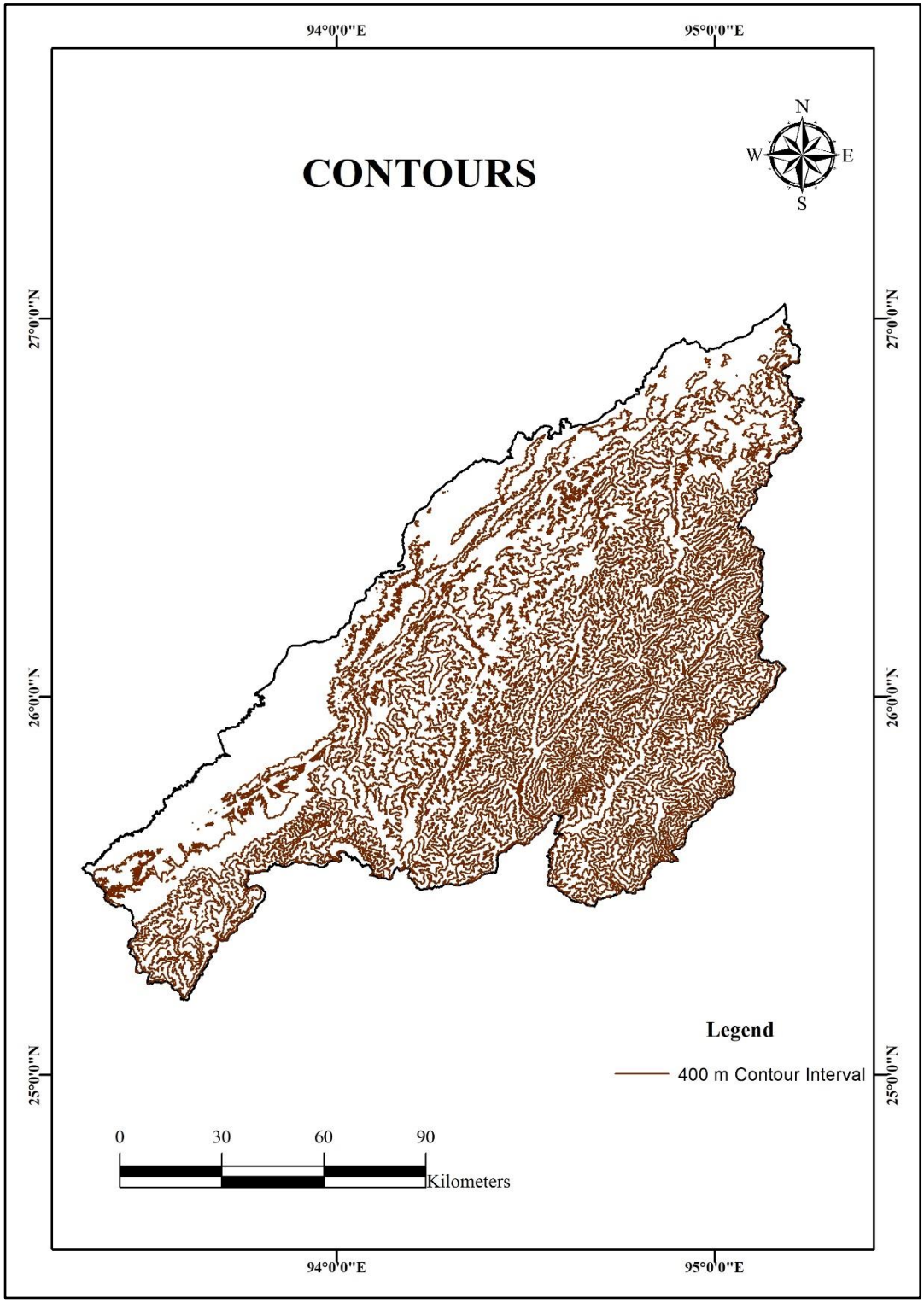
Topographically, the state is mountainous and its altitude ranges from 110m to 3840 m above sea level. The areas joining with the state of Assam namely Dimapur, Naganimora and Tizit are a few plains found in Nagaland. Mount Saramati under Kiphire district is the highest

mountain peak in Nagaland with an altitude measuring at 3840m. The mountains found in Nagaland are similar to young mountain groups of the Himalayan range.

There are two major mountain ranges in Nagaland namely- Patkai range and Barail range. The Patkai range runs from the North-South direction of Nagaland and forms an important demarcation or boundary wall, which separates Nagaland (India) and Myanmar. This demarcation also provides a major watershed for the rivers of Nagaland (India) and Myanmar. The highest mountain found in this range is Mt.Saramati (3840m) lies under Kiphire district. An important river flowing in this range is Tizu river which empties or connects to the Chindwin River system of Myanmar. The river lying on the western part of the Patkai range flows in India.

Barail range enters the state of Nagaland from North Cachar and after passing Kohima areas runs towards Wokha district. Mt. Japfu (3,014 m) is the highest peak in this range. The Barail range met with the Arakan Yoma (mountain system in Myanmar) and runs towards North and North – Easterly direction. The Barail range makes a boundary line between Nagaland and Manipur state of India.

Figure 2.1: Contour Map of Nagaland



Source: Lab work

2.3 Administrative setup

Nagaland has a total area of 16,579 sq.km and is divided into several administrative circles or area. In terms of administration, it is divided into district, sub-division and administrative circles. At present Nagaland has 16 Districts and is headed by the Deputy Commissioner. In subdivisions it is headed by Additional Deputy Commissioner and Administrative circles by Extra Assistant Commissioner which is the lowest level in an administrative set up directly appointed by the concerned state government. The state has a total of 119 administrative circles in which Ongpangkong is the largest(area) and Khezhakeno is the smallest(area).

For development purpose, the state is divided into 74 Rural development Block spread across the state. Each of this block is headed by Block Development Officer (BDO) under Rural Development department.

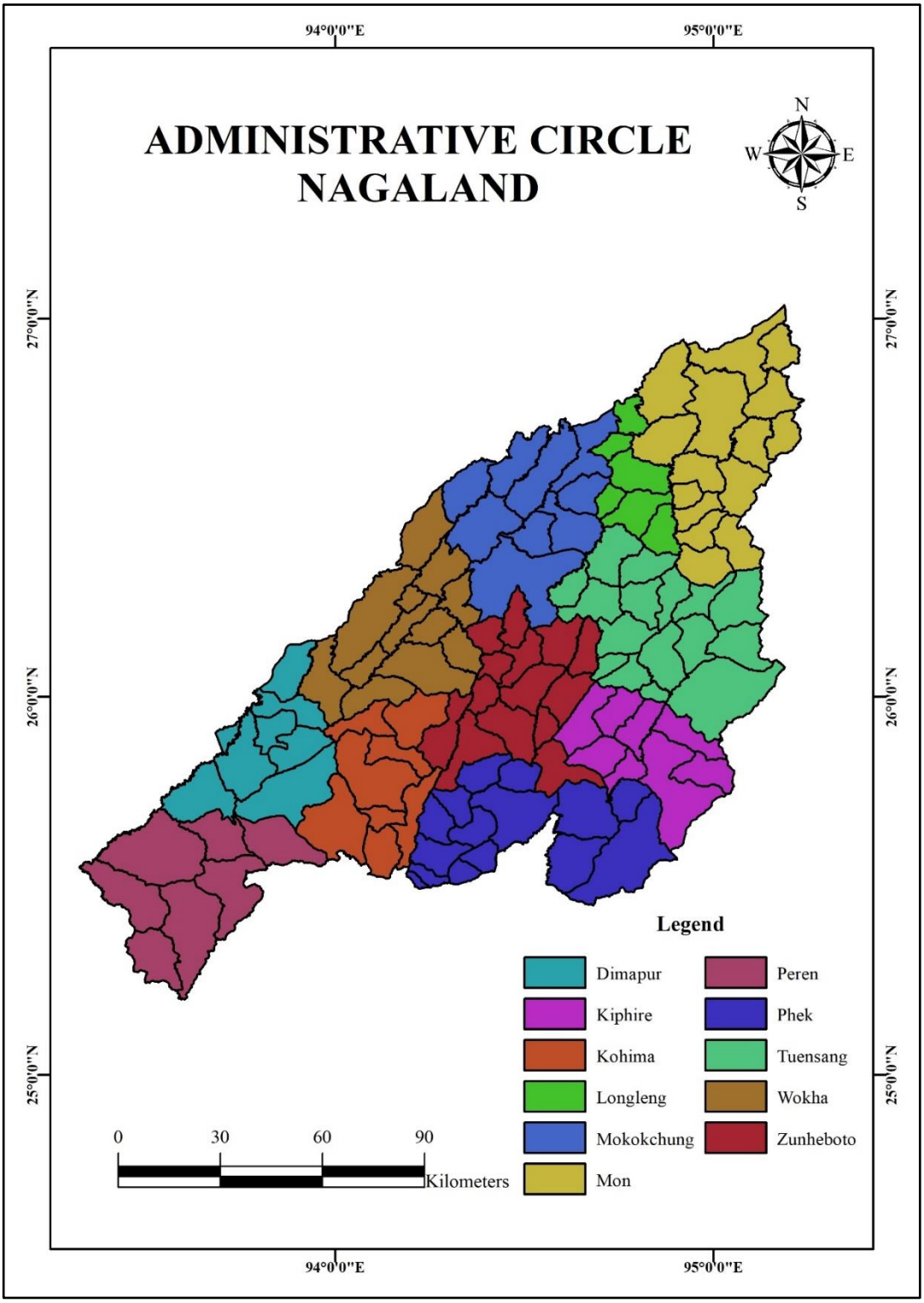
2.3.1 Village Council

Nagaland has a different administration system in village or local levels from the rest of the country. Each village has a village council and is headed by Chairman and its members for a tenure of 5 years. This village council has the authority to frame policies and programme, preserve its rich traditions and culture, etc on day-to-day basis under the guidance of Village Council act 1978 with accordance to customary law and justice. The village council members are elected democratically by their concerned village citizens.

2.3.2 Village development Board (VDB)

Village development Board is also a unique system set up for development activities in village level. It was first introduced in 1978, Kutsapo village under Phek district and emerged as a promising institution for development in the state and country. Later this institution was even appreciated and approved as a new development strategy in village levels by United Nations Organisation. The institution is headed by Secretary and members for a tenure of 3 years.

Figure 2.2: Administrative circle of Nagaland (2018)



Source: Lab work

2.4 Population

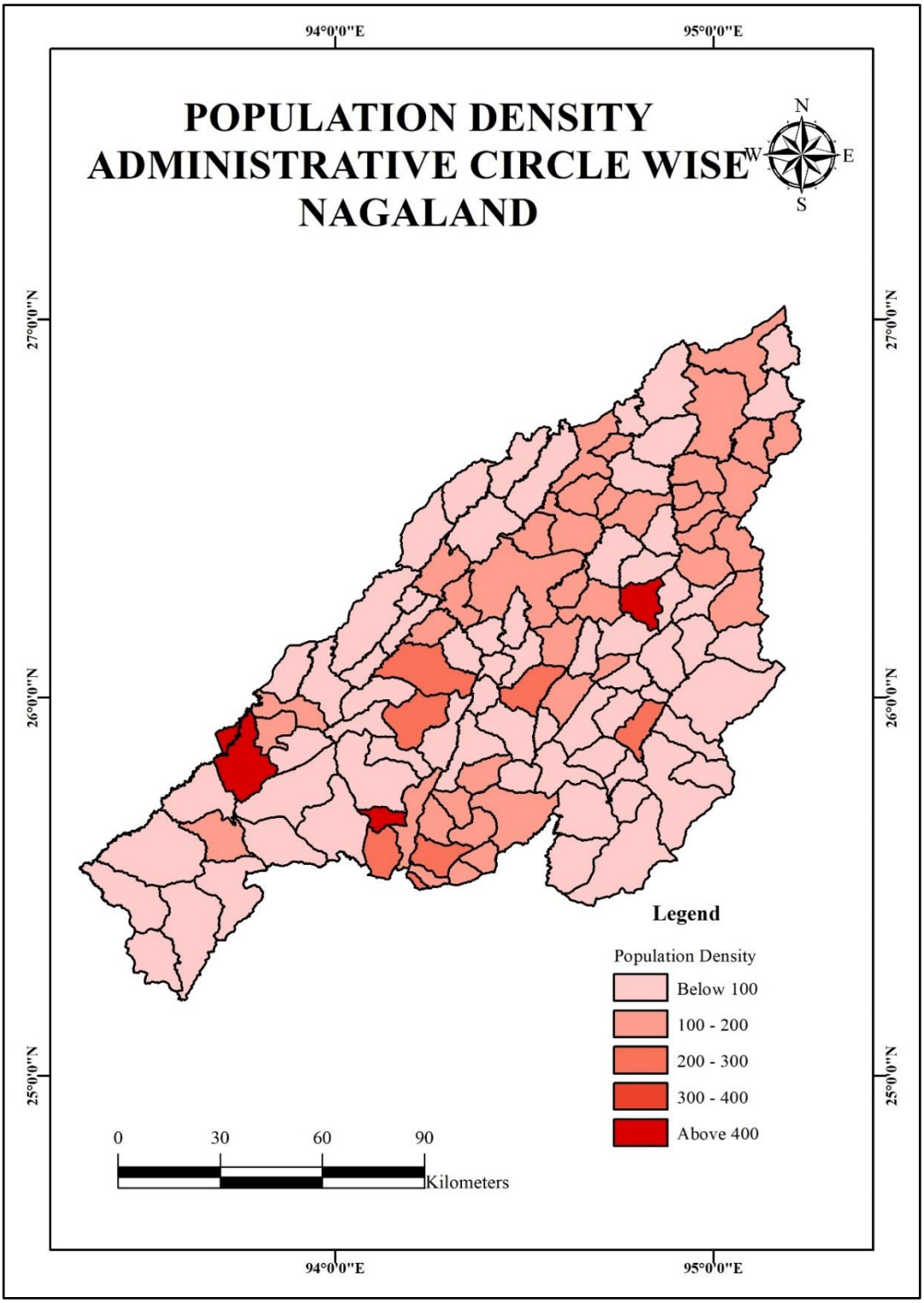
According to 2011 census of India, the population of Nagaland is 19, 78, 502 with a Male population of 10, 24, 649 and a Female population of 9, 53, 853. The population density of Nagaland is 119 persons per sq. km. with a sex ratio of 931 females per 1000 males. About 71.14 % of the people live in Rural areas and about 28.86% in Urban areas. After India's independence, the state recorded the first decadal growth rate of -ve 0.58 in 2001- 2011 census. It is also the only state in India that has a negative growth rate.

The population of age group between 0 – 6 years in Male is 1, 49, 785 and Female is 1, 41, 286 with a total population of 2, 91, 071. It has a sex ratio of 943 females per thousand males.

As per 2011 census, the largest population district is Dimapur with 378, 811 and the smallest is Longleng district with 50, 484. The highest sex ratio is Zunheboto district 976 per 1000 males and the lowest is Mon district 899 per 1000 males. The highest population density is recorded in Dimapur district with 409 sq. km and the lowest density is Peren district 58 sq. km.

In administrative circle wise, the highest population density is Dimapur sadar with 5,521.4 per sq. km followed by Kohima sadar with 2145.6 per sq. km whereas the lowest density is Phokhungri administrative circle under Phek district with 9.3 per sq. km and second least is Kebai Khelma with 12.7 per sq. km under Peren district.

Figure 2.3: Population density of Nagaland (2011 census)



Source: Lab work

2.5 Climate

The climate of Nagaland experiences tropical and temperate. The climate influences the origin, distribution and intensity to disease distribution. Favourable climatic conditions allow some particular disease to thrive more than others. As climate differs from one region to another, it can affect the distribution of disease.

The state of Nagaland can be divided into four seasons namely Winter, Pre-Monsoon, Monsoon and Retreating seasons.

2.5.1 Winter

The winter season starts in December and ends in February. During this season the temperature drastically drops to 3 - 4ºC and recently in some areas like Pfutsero and Aghunato area experienced heavy snowfall. The average temperature in the state lies between 9.5º C to 15.7º C. During this season, rainfall is negligible and all of the state remains cold and dry.

2.5.2 Pre-Monsoon

Pre-monsoon sets in, as the temperature starts to increase in the month of March and continues upto May. Temperature during this season drastically increases in the month of May and then it starts to receive some rainfall and vegetation starts to regrow during spring. The average temperature during this season ranges from 19.8º C to 21º C.

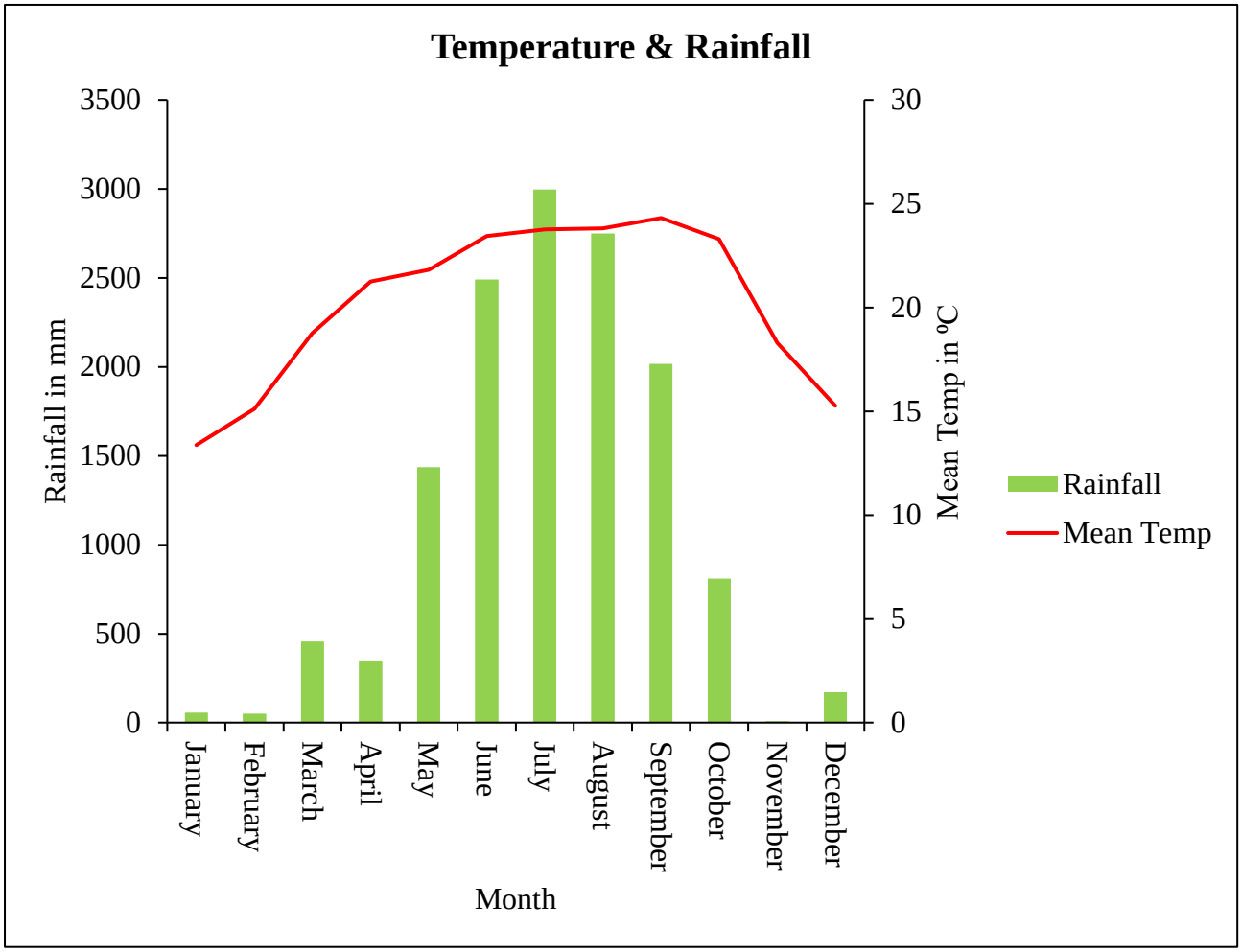
2.5.3 Monsoon

Monsoon season is the key season in the state as the whole of the state starts to receive a good amount of rainfall from the Southwest monsoon winds and farmers can start to plough their agriculture fields. The temperature remains high with an average of 25º C to 29º C and also relative humidity remains high at more than 85%. The monsoon season starts in the month of June and ends in September.

2.5.4 Retreating

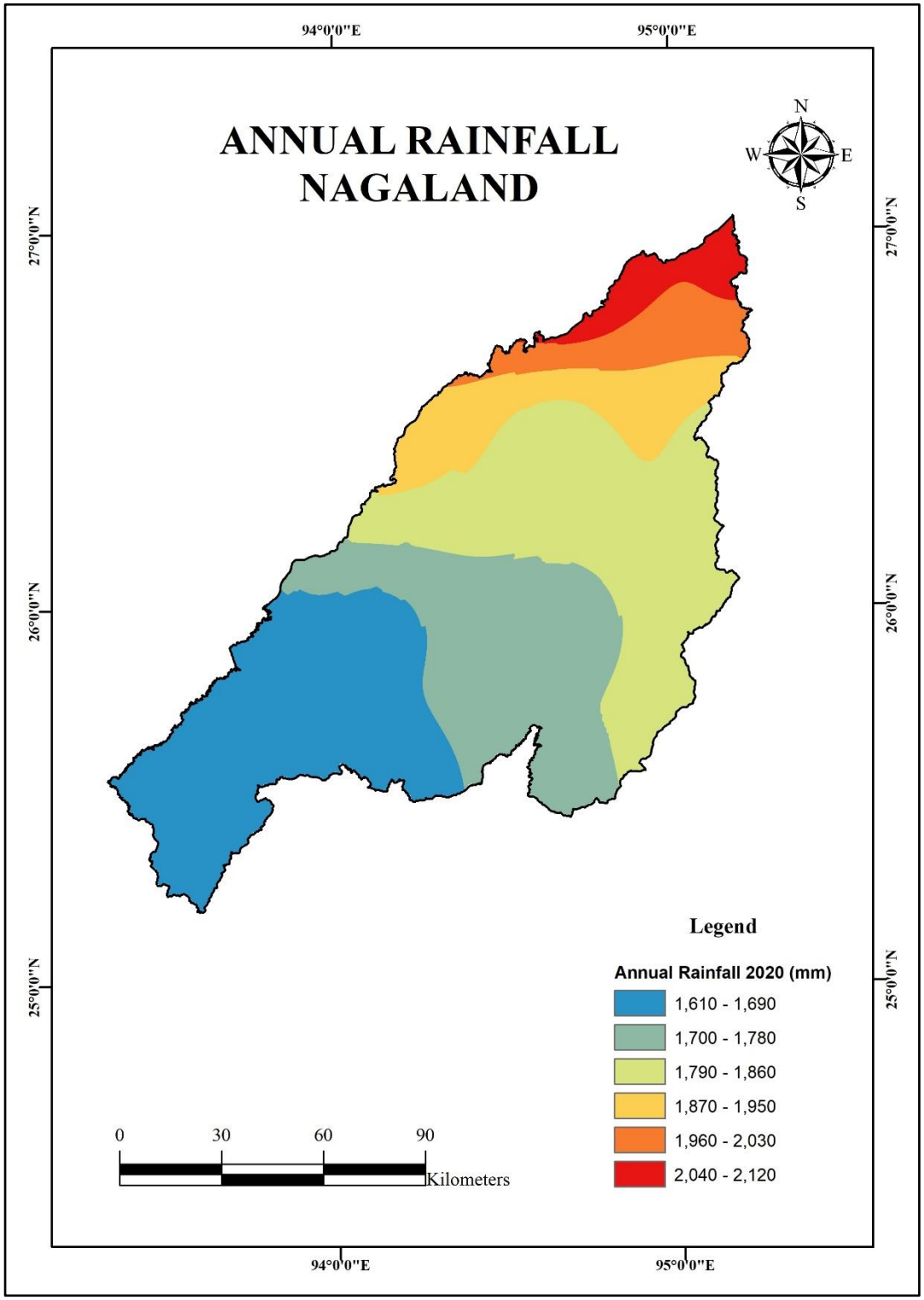
During this season, the temperature starts to drop and the winter season is about to replace the warm and humid summer season. Retreating season last into the month of October and November. The average temperature ranges between 23.6ºC to 24.2º C.

Figure 2.4: Annual Mean Temperature and Rainfall in Nagaland



Source: Lab work

Figure 2.5: Annual rainfall in Nagaland (2011 – 2020)



Source: Lab work

2.6 Drainage

Nagaland is topographically a mountainous state and is dissected into a number of seasonal and perennial rivers. Most of the rivers in the state almost remain dry during winter seasons (November to February) but runs overflow during rainy or monsoon seasons (June to August). The rivers flowing on the Eastern part of the Patkai range drain towards the Western part of the state and connect with mighty Brahmaputra in Assam whereas in the western part of the Patkai range, the river connects with Chindwin in Myanmar. Some of the major river system in Nagaland are Doyang, Dikhu, Dhansiri and Tizu.

2.6.1 Doyang

Doyang river system originates from the Japfu hill near the Northern slope of Mao in Manipur and is the longest river system. It flows in a North-easterly course in the beginning and suddenly turns to North-west at right angle and again later traverses in South-West direction. It drains into Kohima district, Tseminyu district (newly created), Zunheboto district and Wokha district and falls into Dhansiri in Sibsagar district of Assam. Doyang has a large number of tributaries that drains from some parts of Mokokchung (Chubi river) and Phek (Sedzu river) district.

2.6.2 Dikhu

Dikhu river originates near Nuroto hill in the Central part of the state. It traverses North along the border of the Mokokchung and Tuensang district. Its main tributary is Yangyu. It falls near Naginimora and merges with Brahmaputra River (Assam).

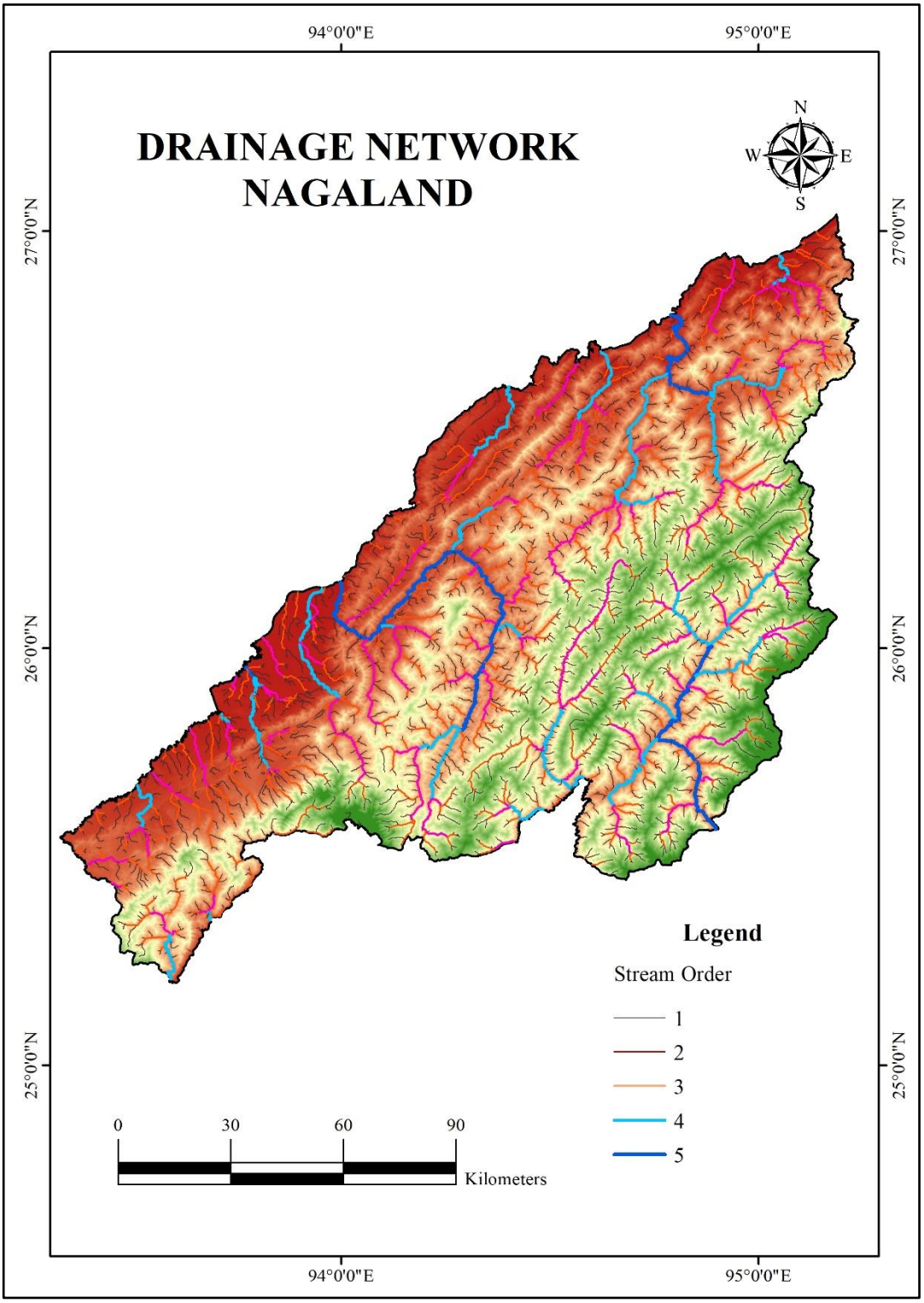
2.6.3 Dhansiri

It flows from the Southwestern part and runs westwardly and later assumes a northwardly course which forms a natural boundary with North Cachar hills. The river drains through Rangapahar and Dimapur plains and finally falls into Brahmaputra river.

2.6.4 Tizu

Tizu river is an important river system in the Eastern part of the state. It is the main river that joins with Chindwin River system in Myanmar. Zunki is an important tributary.

Figure 2.6: Drainage Network of Nagaland



Source: Lab work

2.7 Health facility

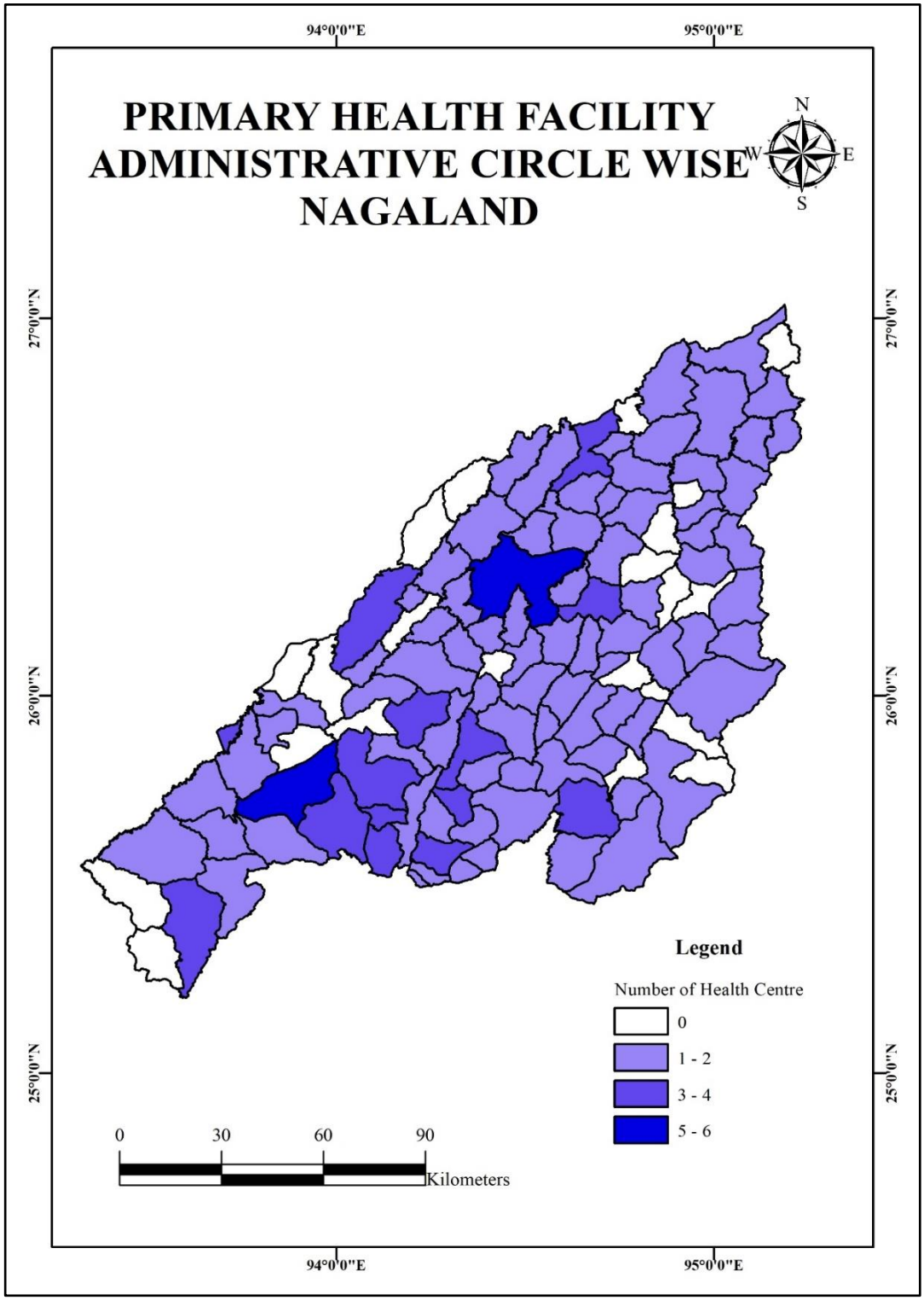
Availability and affordability of health centre play a crucial role in dissemination of good health care to people of the state. In case of any disease outbreak, the availability of health centres in rural areas provides a quick response to control and prevent further spread, especially communicable diseases to other areas. Health institutions also play a crucial role in providing information and helping the villagers to maintain clean hygiene. Health facility is almost present in all the administrative HQ and provides convenient and easy access to villagers surrounding the administrative HQ.

Nagaland has 11 district HQ (recently in 2022 increased to 16 HQ) and has one District Hospital each which is the largest health care giver in the district. There are also numerous numbers of Community Health Centres and Primary Health Centres in all almost all the administrative HQs which is headed by a Medical Officer. These health centre CHCs and PHCs are the main health institution in providing quality health care to rural areas. Nagaland as per the 2011 census about 71.14% of persons live in rural areas. Thus, the availability of health centres in rural areas is crucial for the state government to reach the unreached areas.

In terms of availability of primary health care institutions, the highest district is Phek district which has 3 CHCs and 23 PHCs and the lowest is Longleng with 3 PHCs for rural areas.

There are also some drawbacks in terms of the availability of health centres in district-wise or administrative circles. It is found that some districts or administrative circles have an excess number of health centres while some are deficient. This inequality in health centres can cause healthcare disparities in the state.

Figure 2.7: Number of Primary health centre facility in Nagaland, Administrative circle wise



Source: Lab work

2.8 Literacy

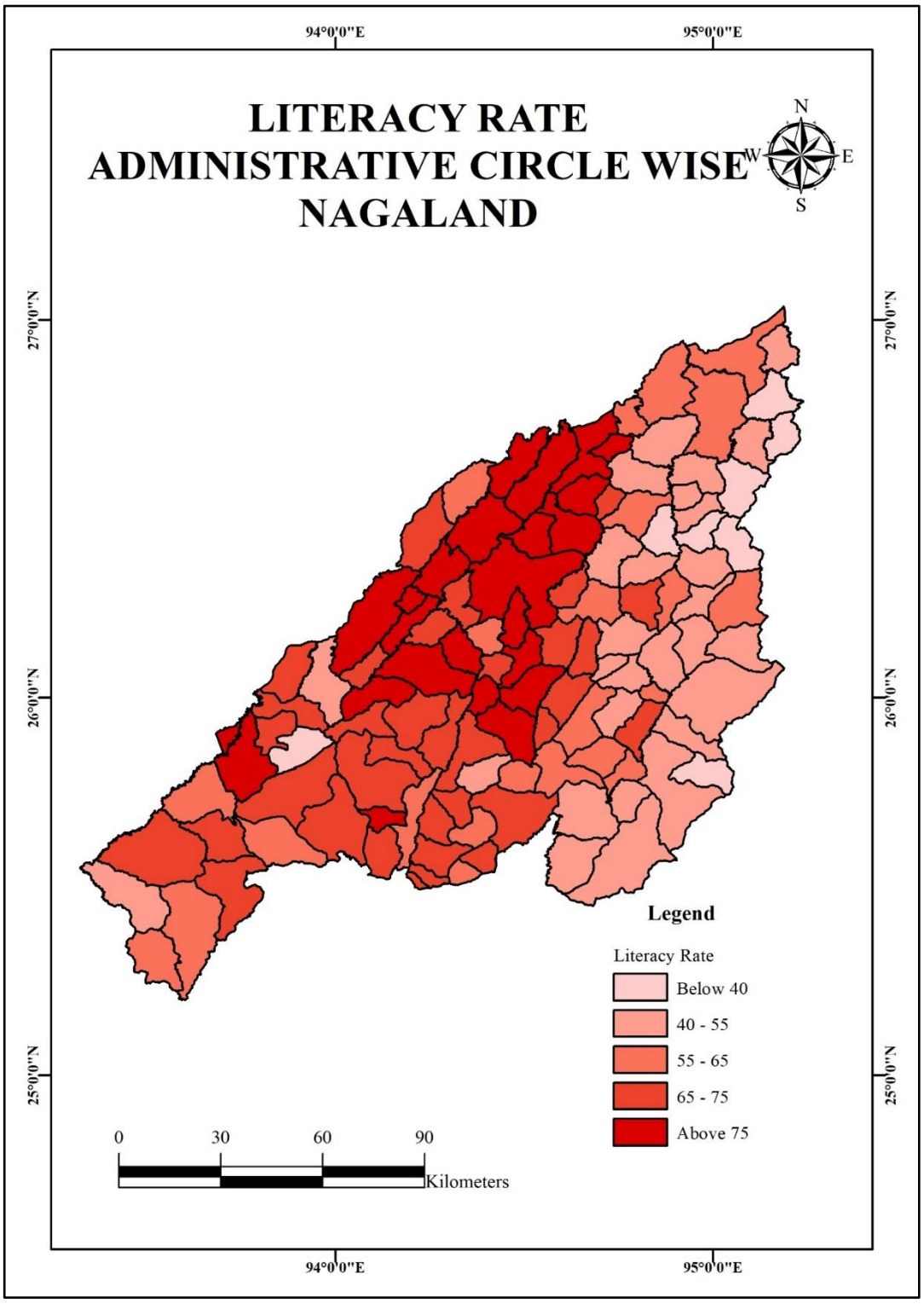
According to 2011 census, the total number of literate persons in the state is 13, 42, 434 of which males constitute about 723, 957 (82.75%) and females 618, 477 (76.11%). In percentage wise, the state constitutes about 79.55 % which is above the national literacy rate of 72. 98%.

In district-wise, the highest number of literate persons is Dimapur district with 282, 088 and the lowest is Longleng district with 30, 518. The highest number of female literate persons is Dimapur district with 129, 761 and the lowest is Longleng with 13, 970.

In literacy rate district wise, Mokokchung district with 92.68% is the highest while Mon district with 56.99% is the lowest literacy rate. The highest female literacy rate is Mokokchung district with 91.74% and the lowest is Mon district 52.58%

Administrative circle wise the highest literacy rate is Alongkima administrative circle with 86.77% and the lowest is Phomching at 24.05%.

Figure 2.8: Literacy Rate in Nagaland (2011 census)



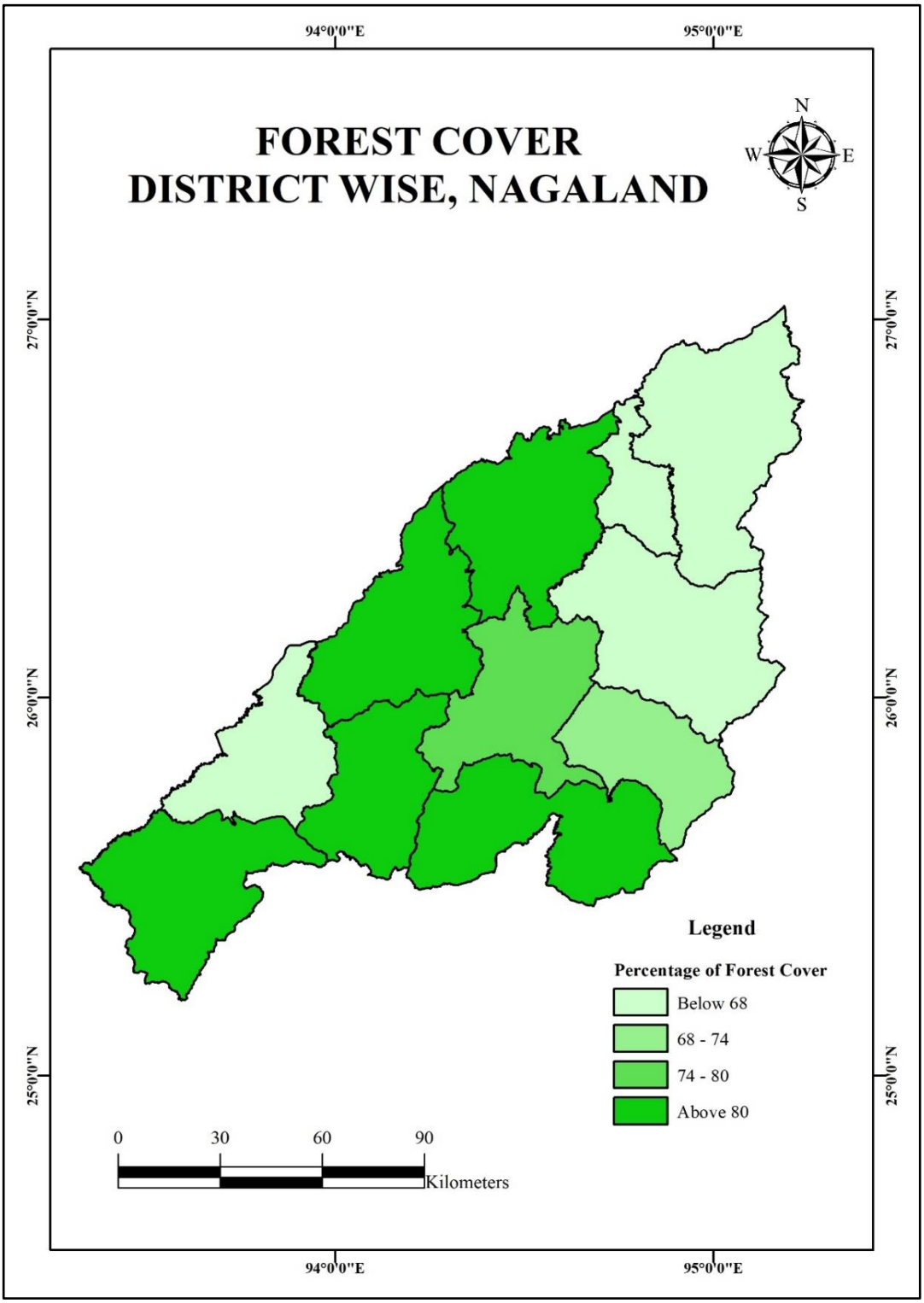
Source: Lab work

2.9 Forest

About 52% i.e., 8629.30 sq. km of the total geographical area of the state still remains under forest cover. Of which about 3.06% is under Reserved Forest, 5.51% under protected forest and 93.56% under unclassed forest. Nagaland has one National Park i.e., Intangki and three wildlife sanctuaries namely, Fakim, Puliebadze and Singphan covering about 222 sq. km which constitute about 1. 34% of state geographical area.

The state has 6 (six) major types of forest namely Tropical evergreen forest, tropical semi-evergreen forest, Sub-tropical broad leave forest, Sub-tropical pine forest, Montane wet-temperate forest and alpine forest. Some of the important trees found in Nagaland are Nahor, Hollong, Gamari, Hollock, Rhododendron etc.

Figure 2.9: Percentage of Forest Cover in Nagaland, district wise (2019)



Source: Lab work

2.10 Source of water

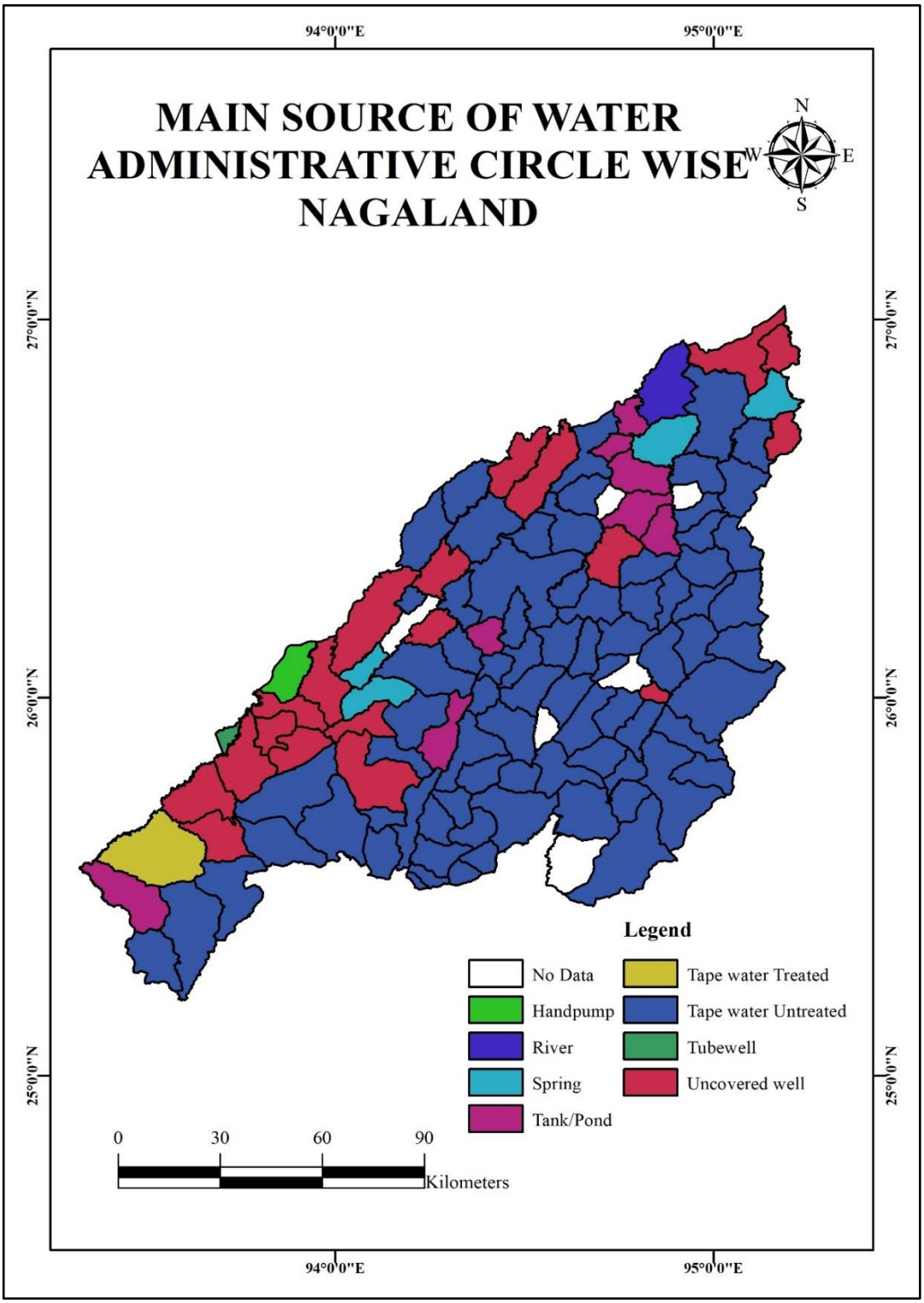
Clean and potable water is key for quality health. Polluted or poor-quality water can cause waterborne diseases like diarrhoeal which is common in Nagaland. Several villages or towns still lack access to clean water.

The main source of water is important in personal hygiene and also disease origins and distribution. As per the 2011 census, the major source of water is from tap water but the water is not chemically treated. This type of water is directly tapped from rivers or springs and directly flows to villages or towns through a pipeline. Limitations in this type of water source, the water may appear clean but once the rainy season sets in it gets polluted due to origin of numerous streams and it also polluted by animals, the water immediately becomes unclean and unfit to use.

About 64.7 % of all administrative circles in the state, their main source of water is from tap water untreated, about 15.1% main source is from uncovered well and about 5.8% is from tanks or ponds and about 14.4% is from springs or even directly from rivers. Longleng district is the sole district in the state that depends on Tanks or Lakes or Springs as their main source of water. In Mon district, some areas still depend on river water as their main source of water.

There is also a disparity in development to let people access to clean water. Unbiased development, proper planning and implementation, people's active participation and more importantly pro-tribal-based planning and policy are required to develop the state. As the state is a tribal state, mostly all the natural resources are the sole property of individuals or clans and as Nagas enjoyed customary laws which is provided in the Indian constitution can be hampered in the development process. Thus, the government needs to make policies and plans in an equilibrium that does not affect both parties i.e. government and tribal individual or community.

Figure 2.10: Main source of water in Nagaland



Source: Lab work

CHAPTER – III

COMMON DISEASES AND SPATIAL DISTRIBUTION IN NAGALAND

3.1 Introductory

This chapter deals with the identification of common diseases and the distribution of diseases in the state of Nagaland. All the health centres across Nagaland could not be covered for this study - about 50.63% of health centre across Nagaland have been sampled. The choropleth mapping technique is used for ease and convenience and to interpret disease distribution systematically with the help of ArcGIS.

The collected disease data from the health centre were sorted with the help of statistical methods like incidence of diseases and percentage of diseases. All data collected were analyse and arranged it into descending order. Delay in data collection due to the COVID pandemic and lack of data storage or recorded in the concerned health institution has deprived quantity and quality data.

On the basis of the rank-size rule, the rank of diseases was initially arranged and mapping was done. The top 3 common diseases identified from various districts of Nagaland and other common diseases prevalent in the respective district were mapped and interpreted along with the help of tables and graphs.

Table 3.1: List of Recorded diseases of Nagaland (Sampled area)

Name of Disease	**Abbreviation Used**	**Total no. of Recorded cases**	**Incidence per 1000 Population**	**Percentage to all diseases**
Hypertension	Hy	12244	4.55	22.99
Acute Respiratory	Ar	11700	4.35	21.97
Oral Cavity	Oc	9712	3.61	18.24
Acute Diarrhoel	Ad	5136	1.91	9.64

Enteric Fever	Ef	4649	1.73	8.73
Diabetes	Di	3347	1.24	6.28
Eye	Ey	3041	1.13	5.71
Common Fever	Cf	1228	0.46	2.31
Human Immunodeficiency Viruses	Hiv +ve	575	0.21	1.08
Measles	Me	296	0.11	0.56
Pyrexia of Unknown Origin	Uo	295	0.11	0.55
Asthma	As	115	0.04	0.22
Whooping Cough	Wo	110	0.04	0.21
Others	Ot	810	0.31	1.52
Overall Total		**53, 258**		**100**

Source: Health and Family Welfare, Govt. of Nagaland

3.2 Diseases ranking

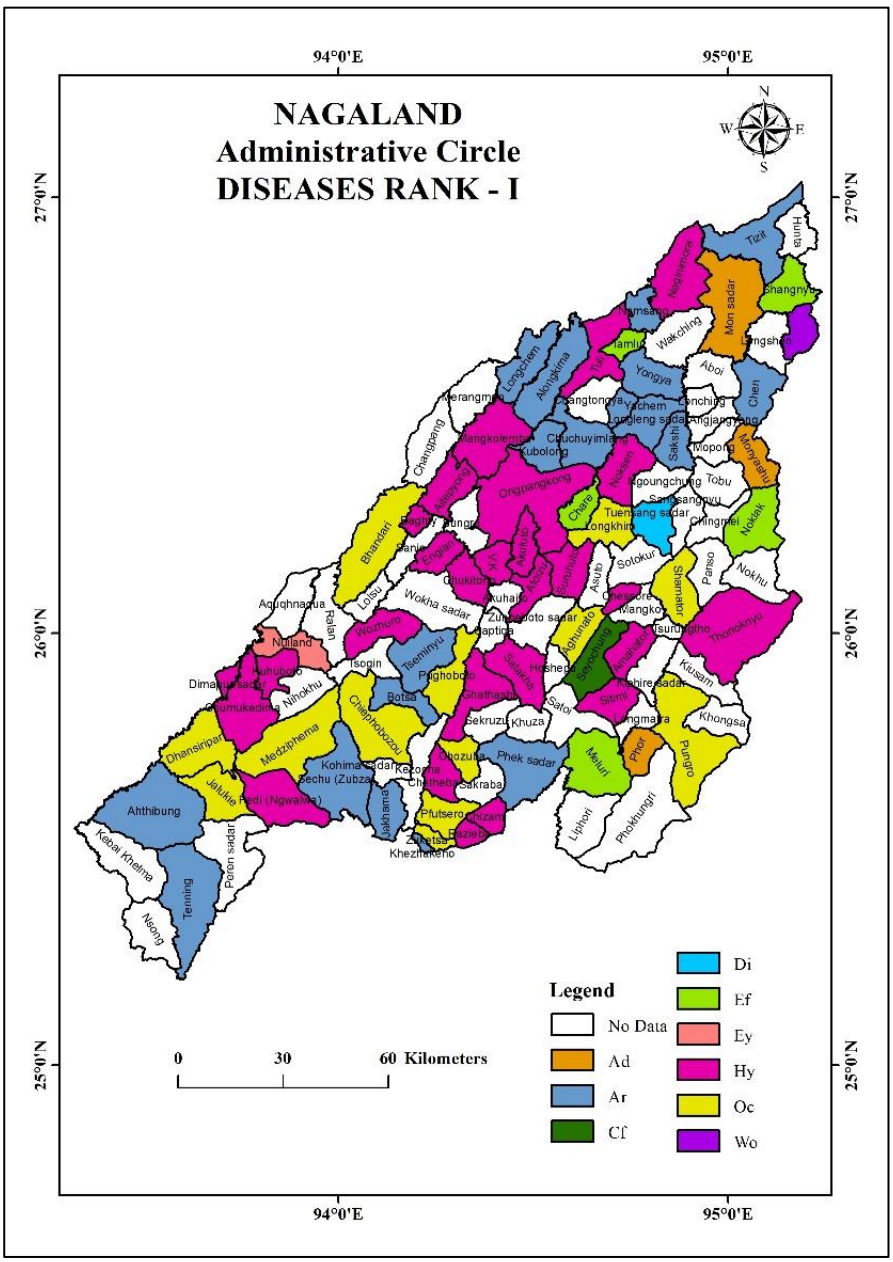
The disease ranking of all sampled health centres in the administrative circle is arranged in descending order and shown in table no. 3.2. Diseases Rank I to V were separately mapped as per the importance of diseases and identified in the sampled health centres to provide insightful information on common diseases in an administrative circle wise of Nagaland.

3.2.1 Diseases Rank I

As per the data collected, 27 administrative circles ranked I disease is Hypertension (Hy) and 18 administrative circles is Acute Respiratory (Ar). A total number of 13 administrative circles is dominated by the Oral cavity related diseases (Oc) and 3 administrative circles are ranked first in Acute Diarrhoel (Ad) disease.

To mention particularly, Eye (Ey), Common fever (Cf) and Diabetes (Di) are other diseases that have ranked I in one administrative circle each. Whooping cough (Wo) disease still persists in Nagaland and is found to be ranked I under the Phomching administrative circle, Mon district of Nagaland.

Figure 3.1: Diseases of Rank I, Nagaland (sampled area)

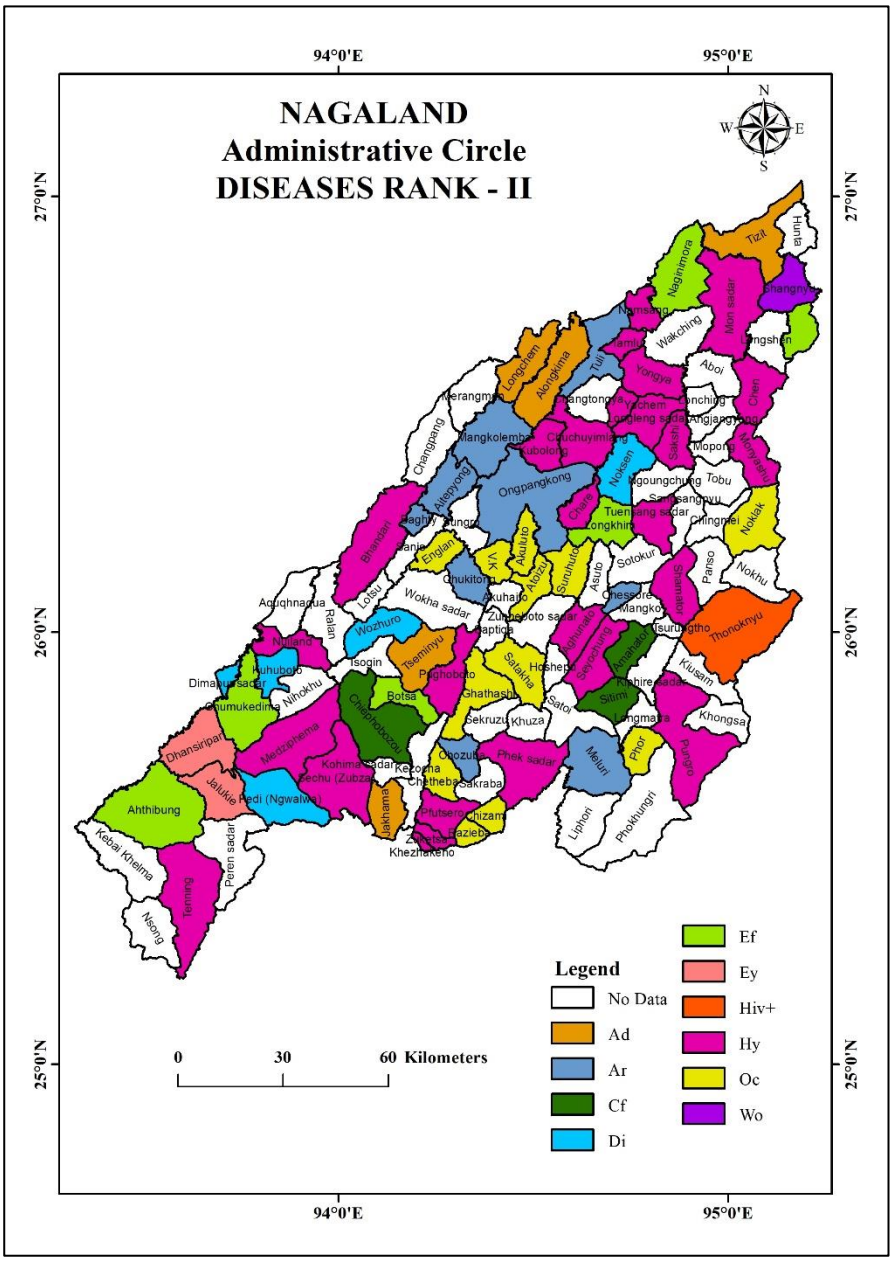


Source: Primary Data

3.2.2 Diseases Rank II

Under the disease rank II, Hy dominates in most of the administrative circles i.e., 27 followed by 12 circles by Oc disease. Ar diseases occupy 9 circles and Ef diseases occupy 6 circles. 5 circles are dominated by Ad and Di disease and 2 circles by Ey. Interestingly, one circle each is ranked II in Wo and HIV+ diseases.

Figure 3.2: Diseases of Rank II, Nagaland (sampled area)

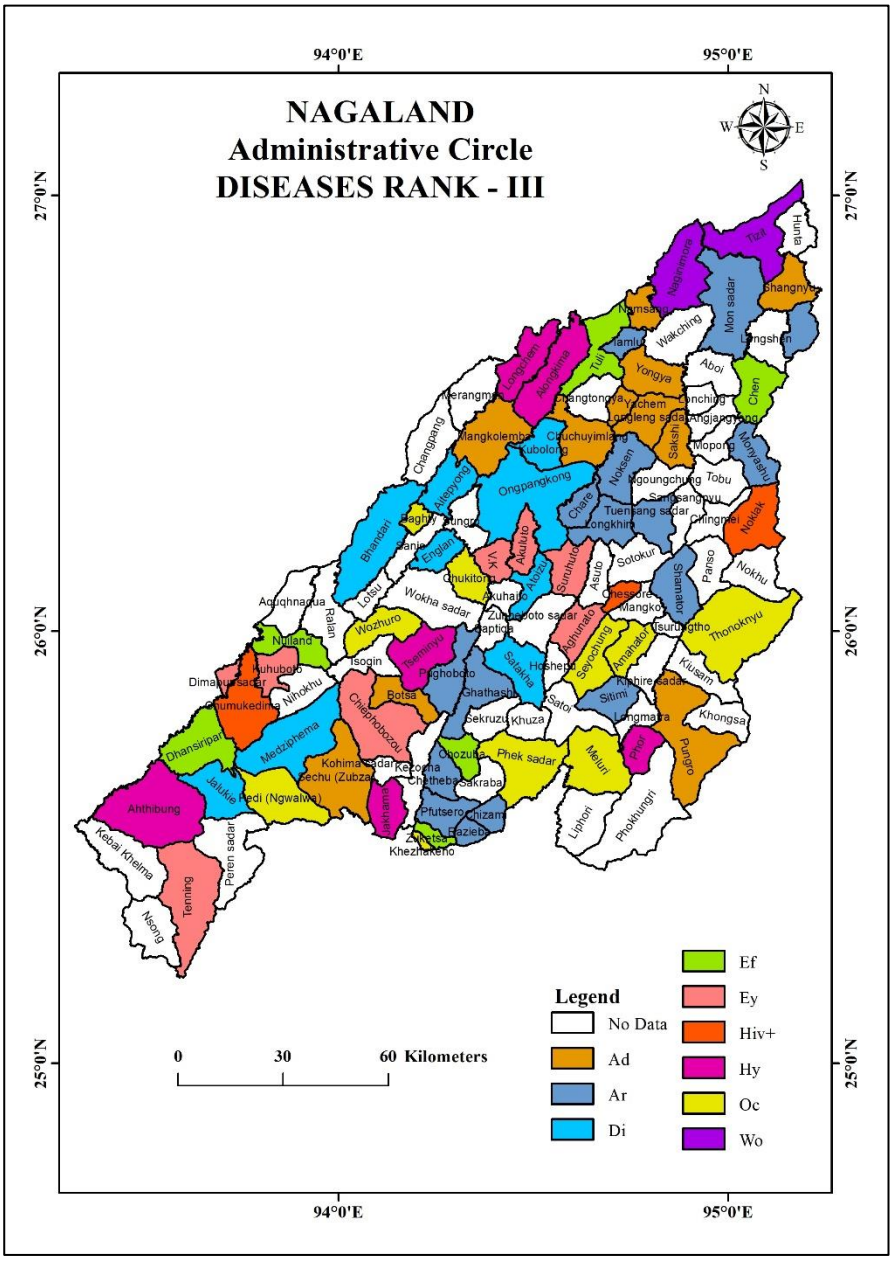


Source: Primary Data

3.2.3 Diseases Rank III

In rank III, there are 9 different diseases of which Ar disease is found in 16 circles, followed by Ad disease in 11 circles and Oc disease in 10 circles. Di disease also dominates in 9 circles with Ey disease in 8 circles. Ef and Hy are found in 6 circles each and 3 circles are found to be HIV+ disease. Wo disease is also found in 2 circles under Mon district.

Figure 3.3: Diseases of Rank III, Nagaland (sampled area)

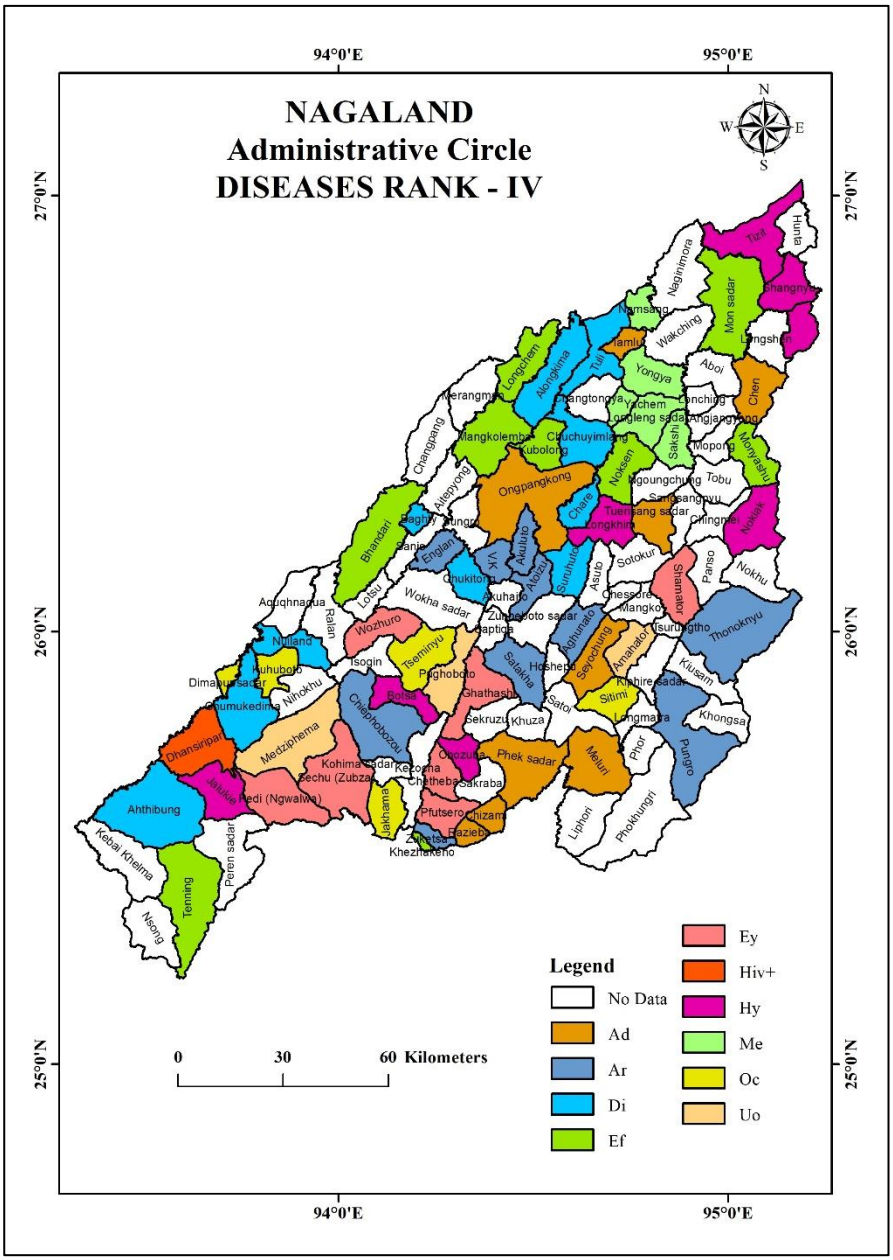


Source: Primary Data

3.2.4 Diseases Rank IV

Ar and Di diseases are found in 10 circles each followed by Ad and Ef diseases in 9 circles respectively. Hy disease is significantly found in 8 circles and Ey in 7 circles. Oc and Me diseases are found in 5 circles respectively. Uo disease is located in 3 circles and one circle with HIV+.

Figure 3.4: Diseases of Rank IV, Nagaland (sampled area)

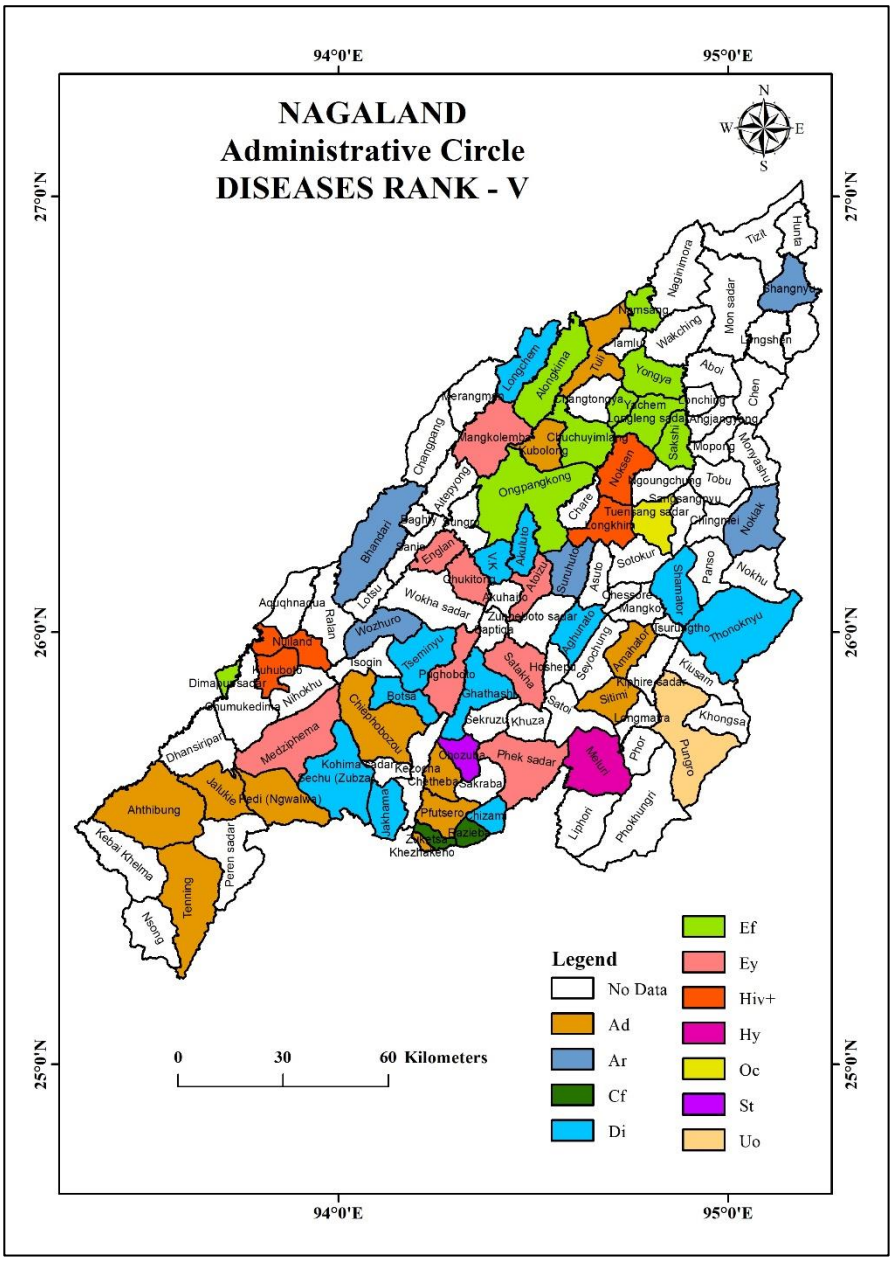


Source: Primary Data

3.2.5 Diseases Rank – V

As there is insufficient data for analyses, Rank – V is dominated by No Data source for 15 circles (sampled circle). In spite of these shortcomings, 12 circles are found to be dominant in Ad and Di diseases. Ef and Ey diseases are found in 9 and 8 circles respectively. Ar disease indicates importance in 5 circles, HIV+ in 4 circles and Cf in 2 circles. Uo, Oc and Hy disease are found in one circle each.

Figure 3.5: Diseases of Rank V, Nagaland (sampled area)



Source: Primary Data

Table 3.2: Rank wise of diseases in administrative circles of Nagaland (Sampled area)

Sl. No.	Administrative Circle	Rank I	Rank II	Rank III	Rank IV	Rank V
1	Medziphema	Oc	Hy	Di	Uo	Ey
2	Dhansiripar	Oc	Ey	Ef	Hiv+	No Data
3	Dimapur sadar	Hy	Di	Ey	Oc	Ef
4	Chumukedima	Hy	Ef	Hiv+	Di	No Data
5	Kuhuboto	Hy	Di	Ey	Oc	Hiv+
6	Nuiland	Ey	Hy	Ef	Di	Hiv+
7	Sitimi	Hy	Cf	Ar	Oc	Ad
8	Amahator	Hy	Cf	Oc	Uo	Ad
9	Pungro	Oc	Hy	Ad	Ar	Uo
10	Seyochung	Cf	Hy	Oc	Ad	No Data
11	Jakhama	Ar	Ad	Hy	Oc	Di
12	Sechu (Zubza)	Ar	Hy	Ad	Ey	Di
13	Botsa	Ar	Ef	Ad	Hy	Di
14	Tseminyu	Ar	Ad	Hy	Oc	Di
15	Chiephobozou	Oc	Cf	Ey	Ar	Ad
16	Sakshi	Ar	Hy	Ad	Me	Ef
17	Longleng sadar	Ar	Hy	Ad	Me	Ef
18	Yongya	Ar	Hy	Ad	Me	Ef

19	Yachem	Ar	Hy	Ad	Me	Ef
20	Tamlu	Ef	Hy	Ar	Ad	No Data
21	Namsang	Ar	Hy	Ad	Me	Ef
22	Alongkima	Ar	Ad	Hy	Di	Ef
23	Chuchuyimlang	Ar	Hy	Ad	Di	Ef
24	Kubolong	Ar	Hy	Di	Ef	Ad
25	Longchem	Ar	Ad	Hy	Ef	Di
26	Mangkolemba	Hy	Ar	Ad	Ef	Ey
27	Ongpangkong	Hy	Ar	Di	Ad	Ef
28	Tuli	Hy	Ar	Ef	Di	Ad
29	Monyashu	Ad	Hy	Ar	Ef	No Data
30	Chen	Ar	Hy	Ef	Ad	No Data
31	Phomching	Wo	Ef	Ar	Hy	No Data
32	Shangnyu	Ef	Wo	Ad	Hy	Ar
33	Naginimora	Hy	Ef	Wo	No Data	No Data
34	Tizit	Ar	Ad	Wo	Hy	No Data
35	Mon sadar	Ad	Hy	Ar	Ef	No Data
36	Ahthibung	Ar	Ef	Hy	Di	Ad
37	Jalukie	Oc	Ey	Di	Hy	Ad
38	Pedi (Ngwalwa)	Hy	Di	Oc	Ey	Ad

39	Tenning	Ar	Hy	Ey	Ef	Ad
40	Chetheba	Hy	Oc	Ar	Ey	Ad
41	Chizami	Hy	Oc	Ar	Ad	Di
42	Chozuba	Oc	Ar	Ef	Hy	St
43	Khezhakeno	Ar	Hy	Oc	Ef	Ad
44	Meluri	Ef	Ar	Oc	Ad	Hy
45	Pfutsero	Oc	Hy	Ar	Ey	Ad
46	Phek sadar	Ar	Hy	Oc	Ad	Ey
47	Phor	Ad	Oc	Hy	No Data	No Data
48	Razieba	Hy	Oc	Ar	Ad	Cf
49	Zuketsa	Oc	Hy	Ef	Ar	Cf
50	Chare	Ef	Hy	Ar	Di	No Data
51	Chessore	Hy	Ar	Hiv+	No Data	No Data
52	Longkhim	Oc	Ef	Ar	Hy	Hiv+
53	Noklak	Ef	Oc	Hiv+	Hy	Ar
54	Noksen	Hy	Di	Ar	Ef	Hiv+
55	Shamator	Oc	Hy	Ar	Ey	Di
56	Thonoknyu	Hy	Hiv+	Oc	Ar	Di
57	Tuensang sadar	Di	Hy	Ar	Ad	Oc
58	Aitepyong	Hy	Ar	Di	No Data	No Data
59	Baghty	Hy	Ar	Oc	Di	No Data

60	Bhandari	Oc	Hy	Di	Ef	Ar
61	Chukitong	Hy	Ar	Oc	Di	Ey
62	Englan	Hy	Oc	Di	Ar	Ey
63	Wozhuro	Hy	Di	Oc	Ey	Ar
64	Aghunato	Oc	Hy	Ey	Ar	Di
65	Akuluto	Hy	Oc	Ey	Ar	Di
66	Atoizu	Hy	Oc	Di	Ar	Ey
67	Ghathashi	Hy	Oc	Ar	Ey	Di
68	Pughoboto	Oc	Hy	Ar	Uo	Ey
69	Satakha	Hy	Oc	Di	Ar	Ey
70	Suruhuto	Hy	Oc	Ey	Di	Ar
71	V.K	Hy	Oc	Ey	Ar	Di

Source: Primary Data

3.3 Disease distribution – district wise of Nagaland

The common disease in the state of Nagaland is Hy, Ar, Ad etc. but there are some diseases that are not common in the whole state like Ey, Wo, St etc. which are found to be common and confined in one particular geographical area. The top three common diseases and some prominent diseases in the respective districts were mapped and interpreted along with tables and graphs.

3.3.1 Dimapur district

Dimapur district has a total geographical area of 927 sq. km and is considered to be the highest populous district of Nagaland (2011 census). The district has a total of 9 PHCs, 2 CHCs

and 1 DH health institution out of which 7 health institutions were sampled covering 6 administrative circles.

Table 3.3: List of diseases in Dimapur district (sampled area)

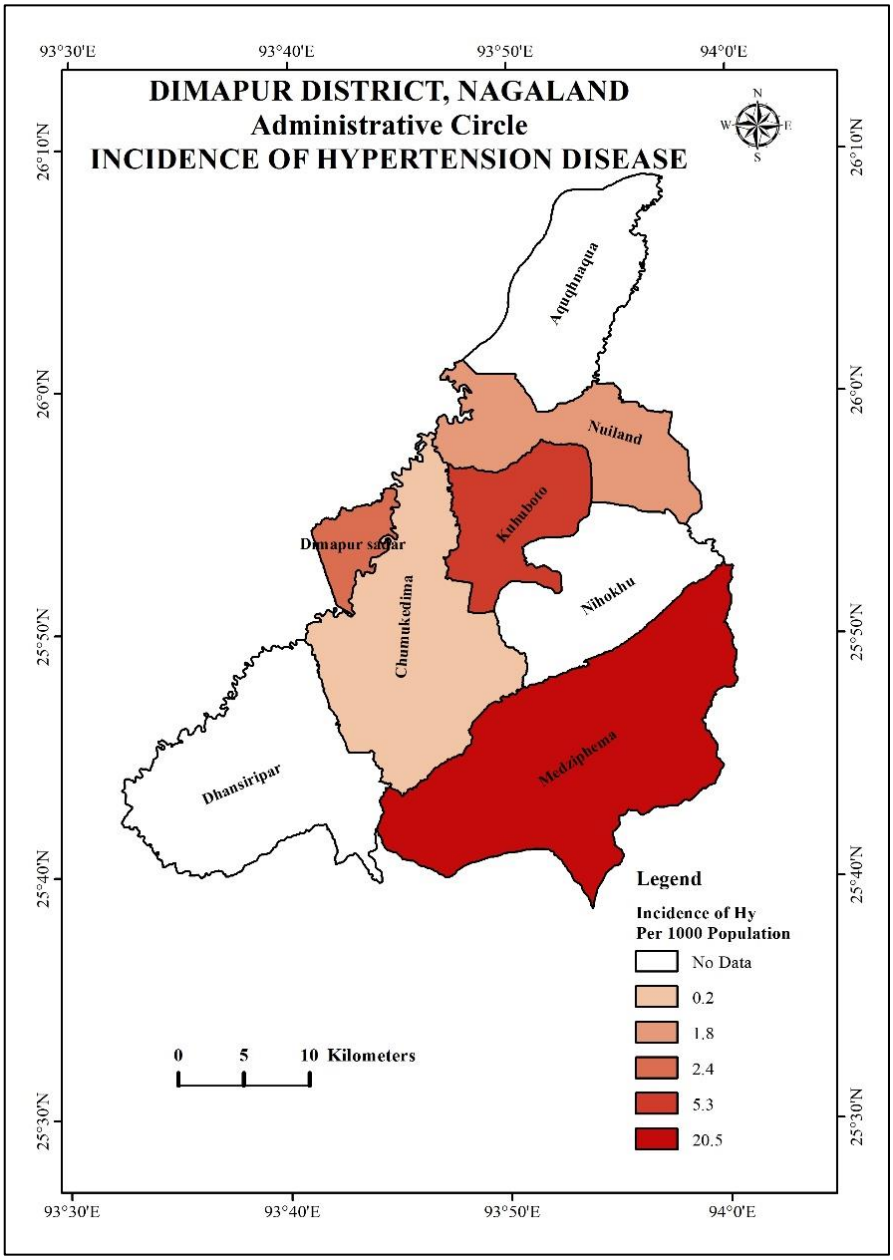
Sl. No.	**Name of Disease**	**Total no. of Recorded cases**	**Incidence per 1000 population**
1	Hypertension	2021	2.79
2	Oral Cavity	1508	2.08
3	Eye	889	1.23
4	Diabetes	796	1.1
5	Enteric fever	239	0.33
6	Acute Respiratory	226	0.31
7	Pyrexia of Unknown	93	0.13
8	Acute Dairrhoal	89	0.12
9	Others	120	0.17
Overall Total		**5, 981**	

Source: Health and Family Welfare

3.3.1.1 Hypertension disease

Hypertension is the most prevalent disease in the district of Dimapur. This disease is mostly related to human social behaviour and changes in lifestyle. During unstructured interviews with medical staff and general public, it was revealed that most case of hypertension is due to rapid change in lifestyle and most importantly lack of physical activity in urban areas.

Figure 3.6: Distribution and Incidence of Hy in Dimapur district (sampled area)

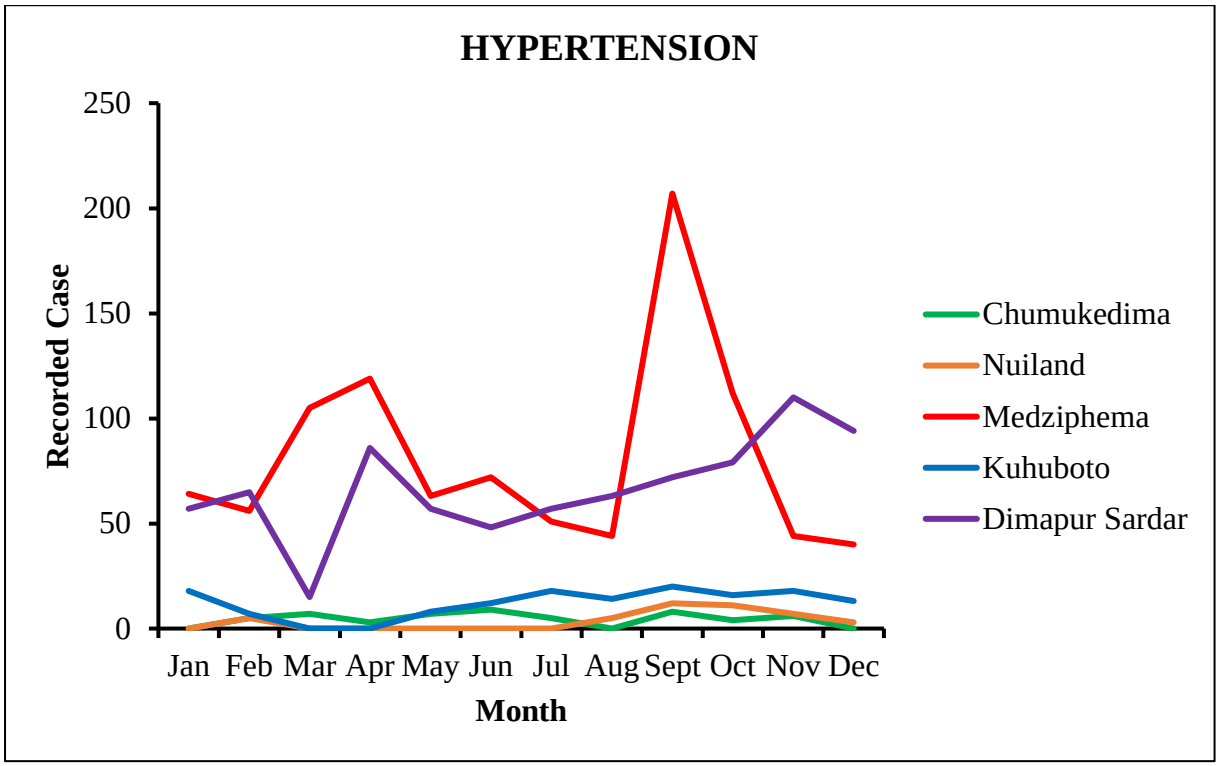


Source: Primary Data

In the above figure no. 3.6, the incidence of Hy disease in Dimapur district shows Medziphema circle with the highest, followed by Kuhuboto, Dimapur Sadar, Nuiland and Chumukedima. The number of cases is seen more in the Urban areas where human economic activity is above secondary activity (Lowest). Medziphema circle recorded highest because the health location is geographically favourable to deliver to large geographical areas and also because the health centre is a CHC which has better health facilities where nearby villages or towns also visit for treatment. Dimapur sadar also has a high number of cases recorded but

due to high populations and other private health institutions being easily available, the incidence of disease declines in the sampled health centre. Population also plays a major role in spreading or infecting the uninfected people. In some cases, a larger population has more risk, especially for communicable diseases but for non-communicable diseases human population may or may not reflect on the incidence of disease.

Figure 3.7: Monthly distribution of Hy in Dimapur district



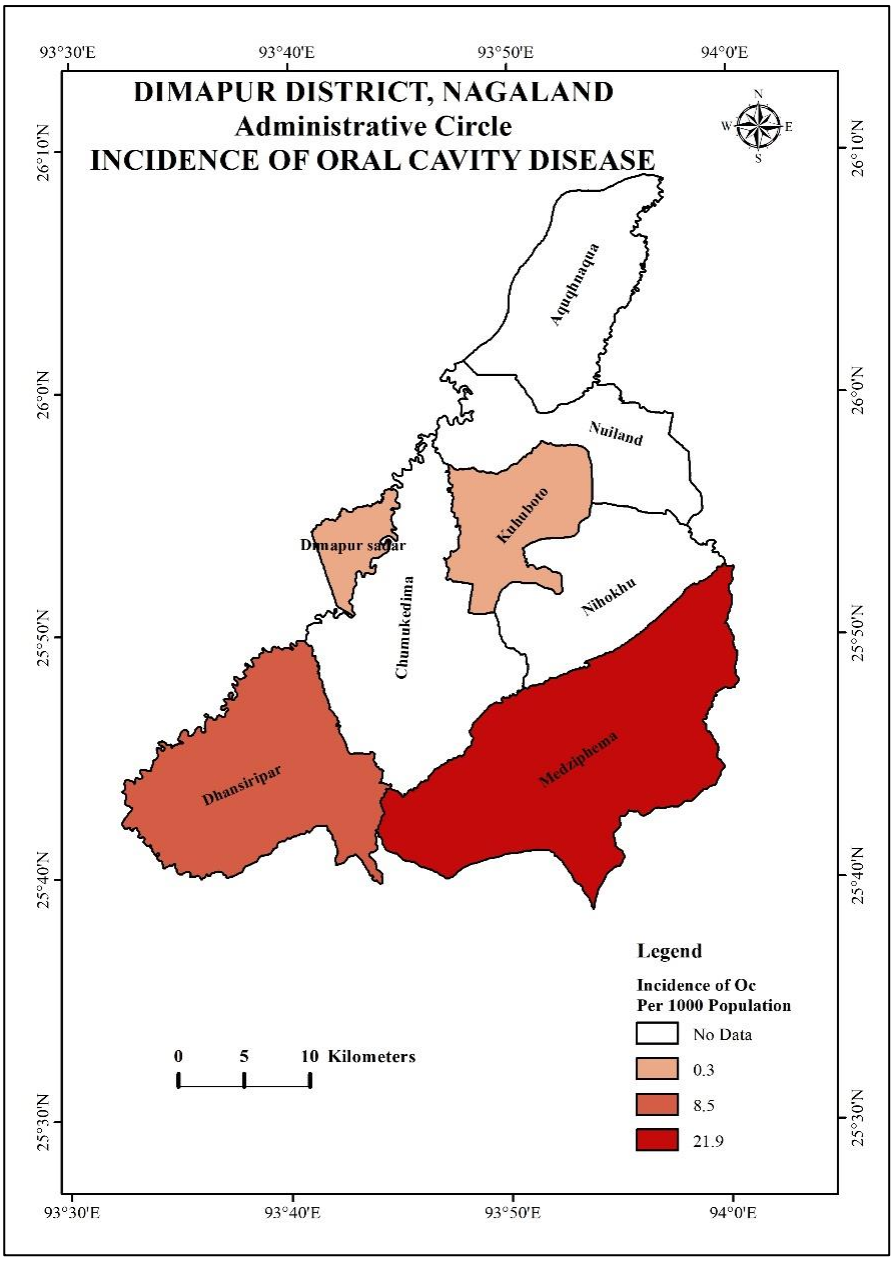
Source: Primary Data

A high number of recorded cases are in the month of March-May and again in September–November. These months are key to the whole of Nagaland due to the change of seasons i.e., from Winter to Summer and from Summer to Winter again. Thus, the influence of geographical weather conditions is changing the intensity and occurrence of disease.

3.3.1.2 Oral Cavity disease

Oc is the second most important or common disease in the district. The highest incidence is recorded under the Medziphema circle and followed by the Dhansiripar circle. Upon studying the causes of the high spike in incidence is due to improper care of teeth and changes in lifestyle especially due to chewing tobacco products.

Figure 3.8: Distribution and Incidence of Oc in Dimapur district (sampled area)

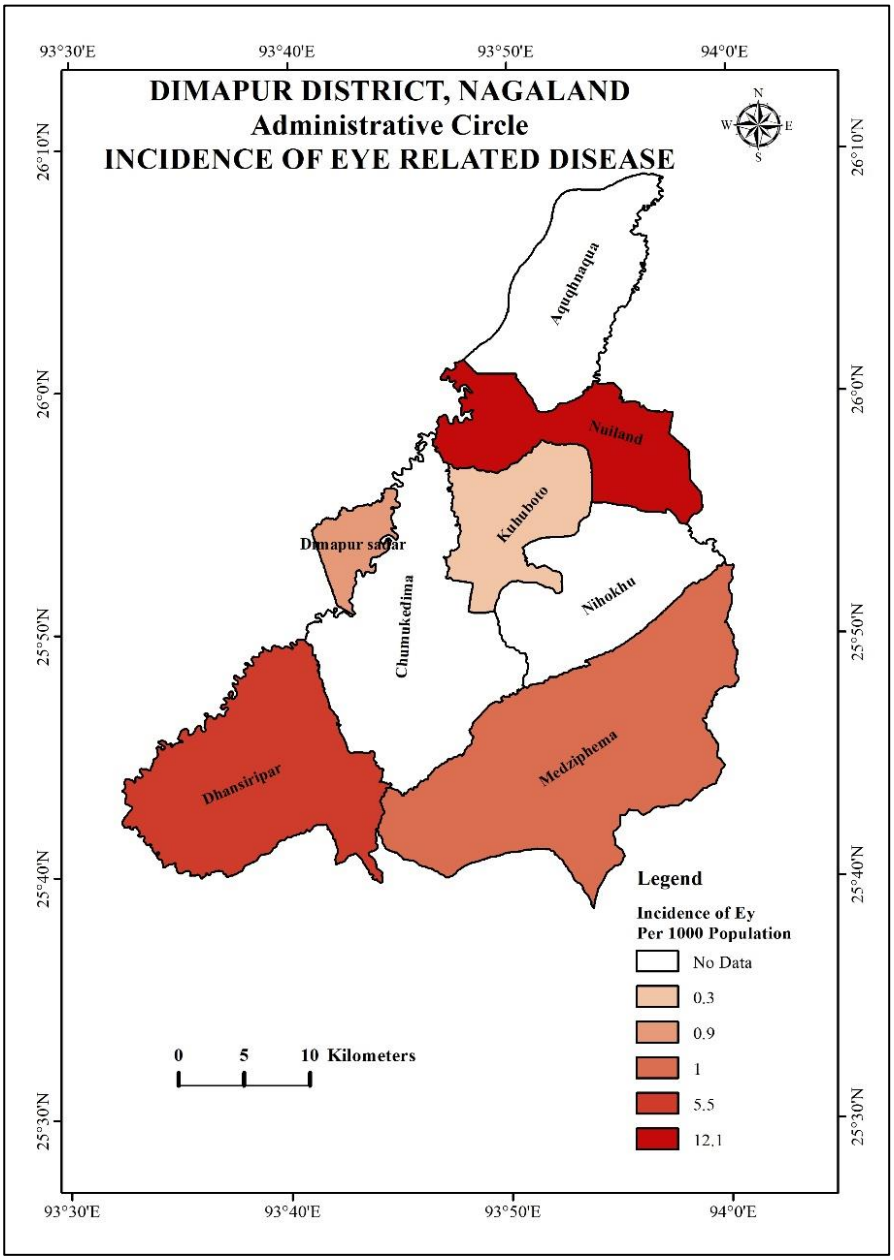


Source: Primary Data

3.3.1.3 Eye related disease

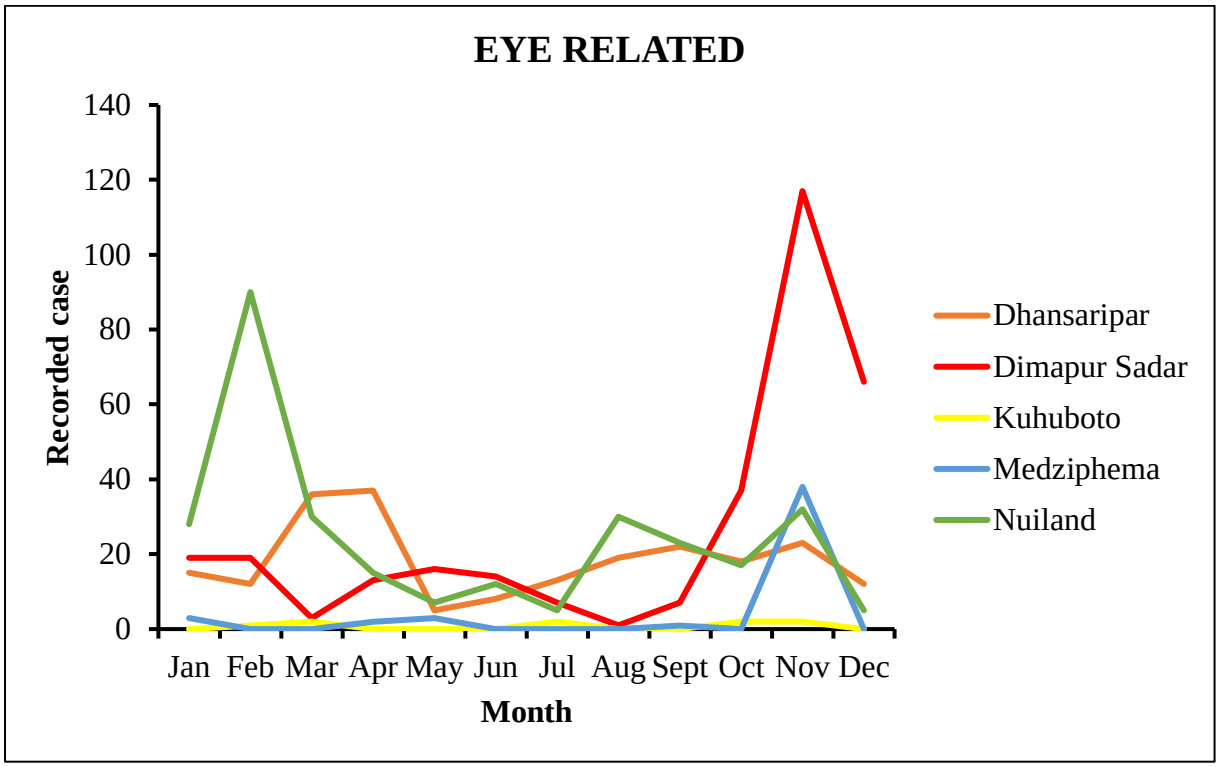
Incidence of eye related disease is recorded highest under Nuiland administrative circles, followed by Dhansiripar, Medziphema, Dimapur sadar and Kuhuboto. Eye disease is mostly related to environmental and weather conditions.

Figure 3.9: Distribution and Incidence of Ey in Dimapur district (sampled area)



Source: Primary Data

Figure 3.10: Monthly distribution of Ey in Dimapur district



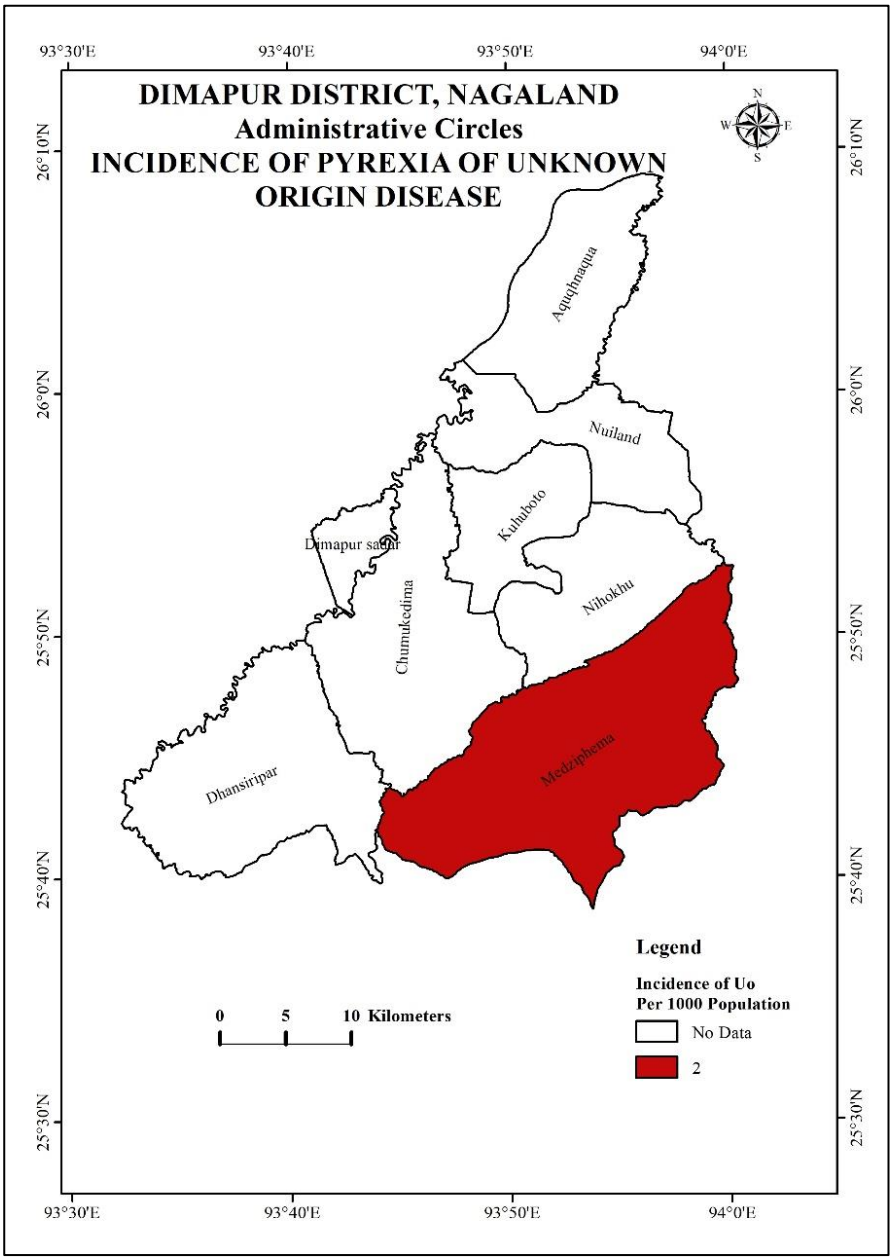
Source: Primary Data

The highest recorded cases are during the onset of the Summer seasons and Winter seasons. During these months, the district experiences dry weather conditions due to dusty winds and high temperatures which results in more infections to the eye.

3.3.1.4 Pyrexia of Unknown Origin

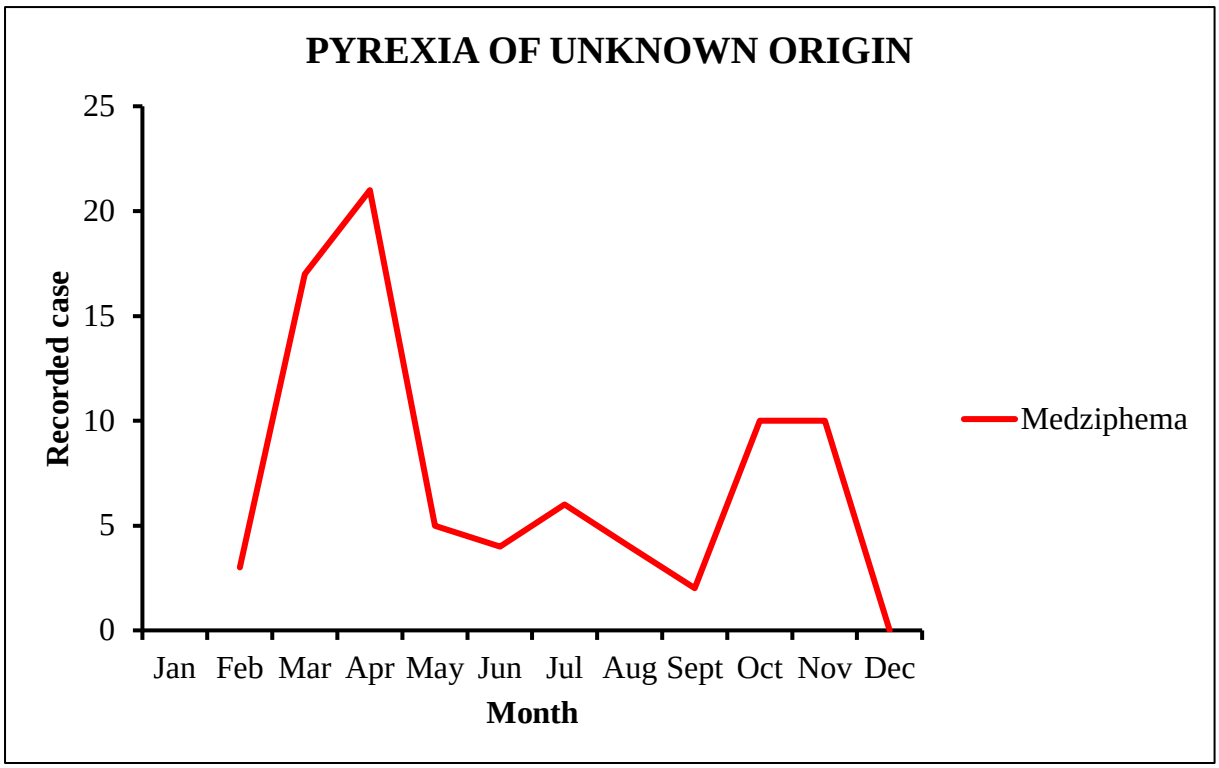
This disease is only recorded in the administrative circle of Medziphema. It is one of the common diseases in that area which in turn is important to the health sector. The disease itself does not have any known origin and it may be even a life-threatening disease. Looking at the geographical locations of Medziphema Circle, the area is bounded by Mountains on one side and does sometimes experience mountain weather conditions, on the other side it is bounded by plains. This geographical location leads the area to experience both a very hot summer and again very cold winter, which may allow some disease germs to thrive and harm man.

Figure 3.11: Distribution and Incidence of Uo in Dimapur district (sampled area)



Source: Primary Data

Figure 3.12: Monthly distribution of Uo in Dimapur district



Source: Primary Data

The months of March and April, October and November recorded a high in the number of cases. These are the months in the whole state of Nagaland experiencing seasonal changes from hot to cold and cold to hot. This change in weather conditions may result in high chances of more microbes becoming more active and may also result in new origin of microbes which may affect man.

3.3.2 Kiphire District

Kiphire district lies in the Eastern part of Nagaland and is also considered to be the 'Aspirational District' in the state. The district has a total geographical area of 1130 sq km. It has a total of 5 PHCs, 1 CHC and 1 DH health institution. In this study, 4 health centres were sampled covering 4 administrative circles in the district.

Table 3.4: List of diseases in Kiphire district (sampled area)

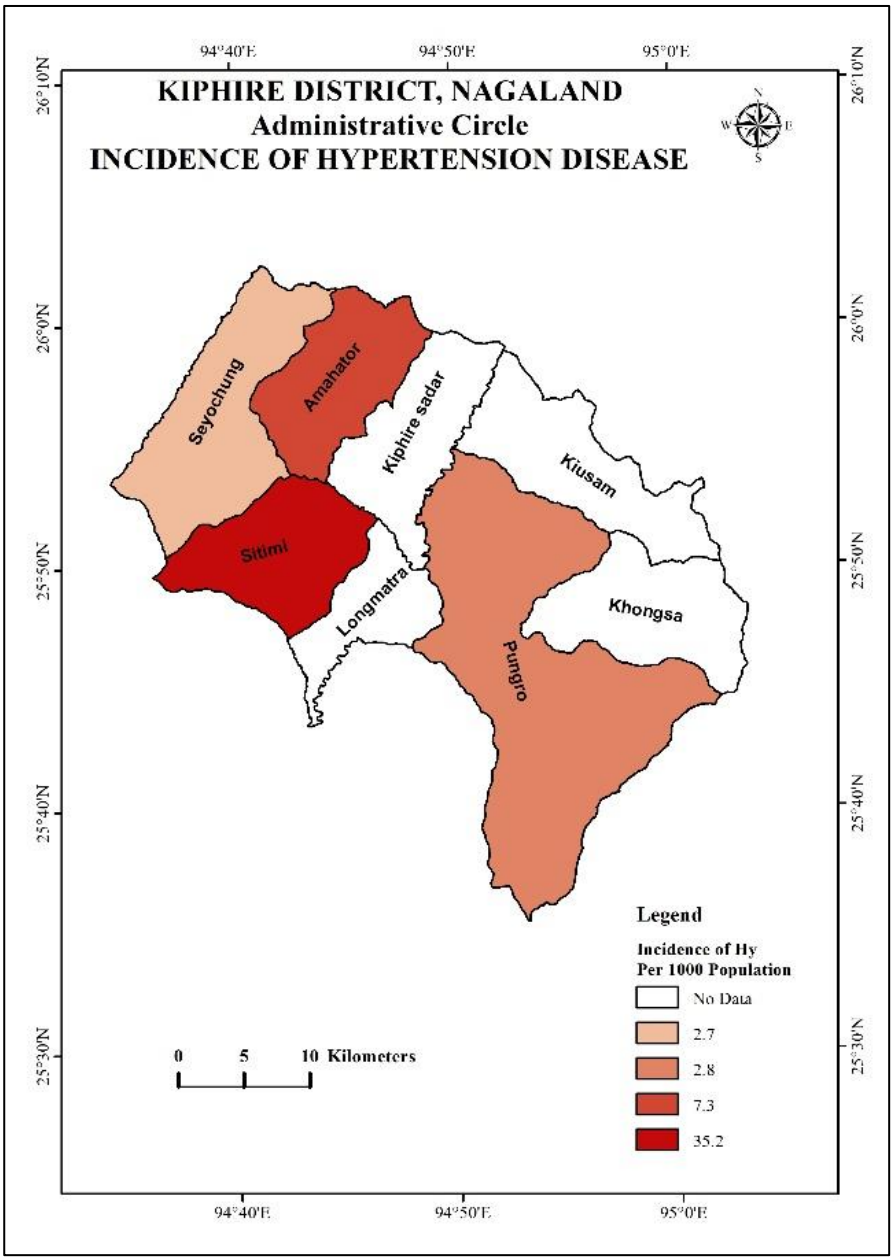
Sl. No.	Name of Disease	Total no. of Recorded cases	Incidence per 1000 population
1	Hypertension	549	7.39
2	Oral Cavity	501	6.75
3	Common Fever	320	4.31
4	Acute Respiratory	161	2.17
5	Acute Diarrhoeal	118	1.59
6	Pyrexia of unknown origin	62	0.83
7	Others	156	2.1
Overall Total		**1, 867**	

Source: Health and Family Welfare

3.3.2.1 Hypertension disease

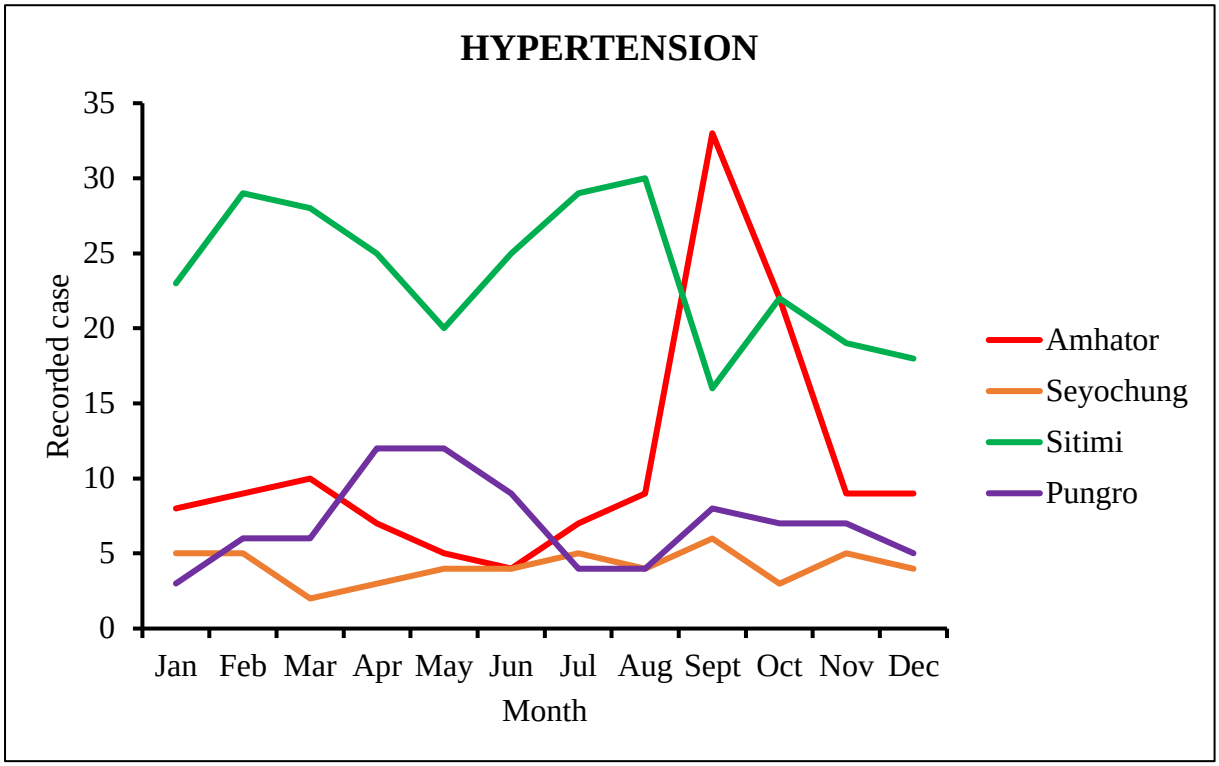
The most common diseases in the district is hypertension disease. A high and consistent number of cases is recorded in all the sampled health institutions or administrative circles. The highest incidence is recorded under Sitimi administrative circle followed by Amhmator, Pungro and Seyochung administrative circles.

Figure 3.13: Distribution and Incidence of Hy in Kiphire district (sampled area)



Source: Primary Data

Figure 3.14: Monthly distribution of Hy in Kiphire district



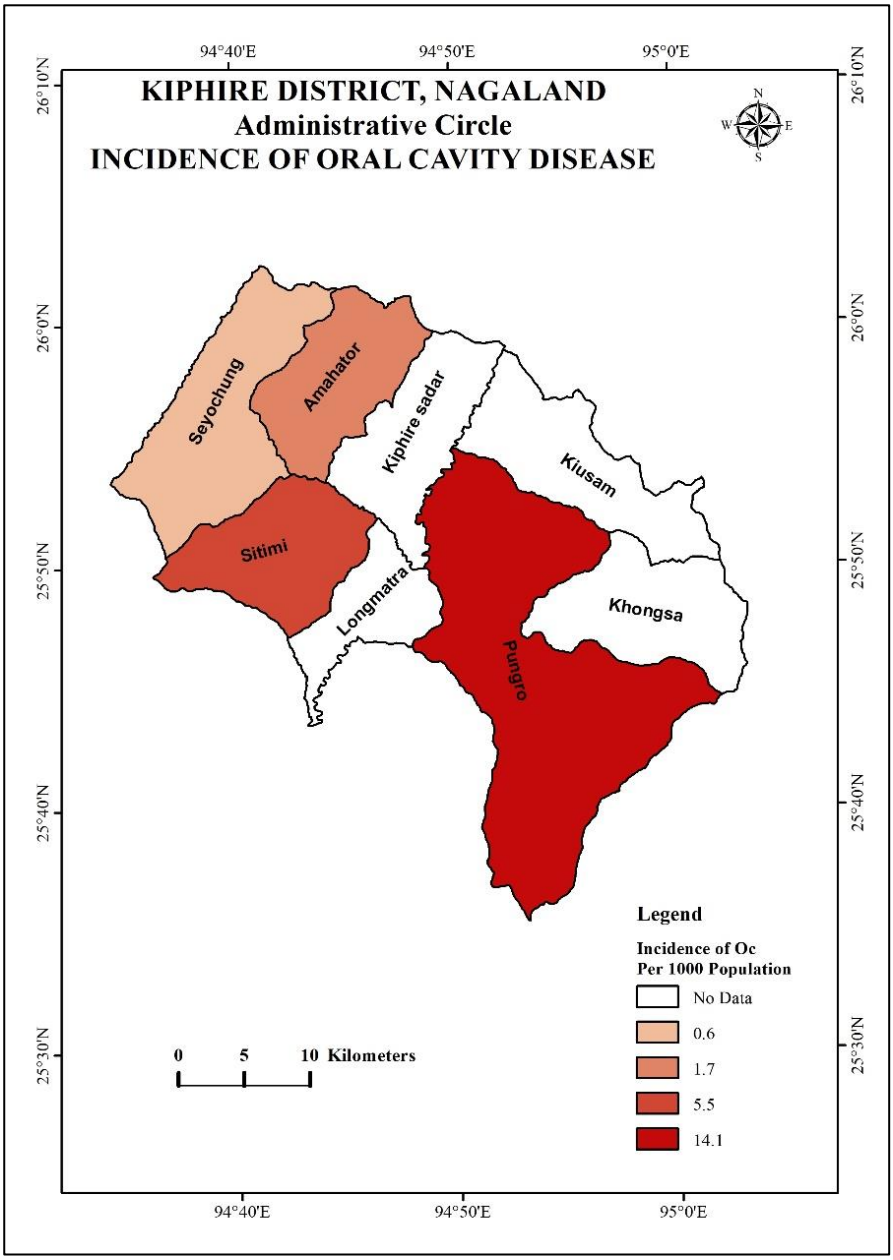
Source: Primary Data

Hy disease is the most common disease in the district. A high number of cases is recorded in the month of March and April, and also in the month of September and October. Amahator Circle has the highest recorded case in the month of September. Hy diseases are mostly due to changes in lifestyle and geographically due to topography and climatic conditions.

3.3.2.2 Oral Cavity disease

Oral cavity disease is the second-highest recorded case and also a common disease in the district. It is mostly due to personal hygiene. The highest incidence is under Pungro circle.

Figure 3.15: Distribution and Incidence of Oc in Kiphire district (sampled area)

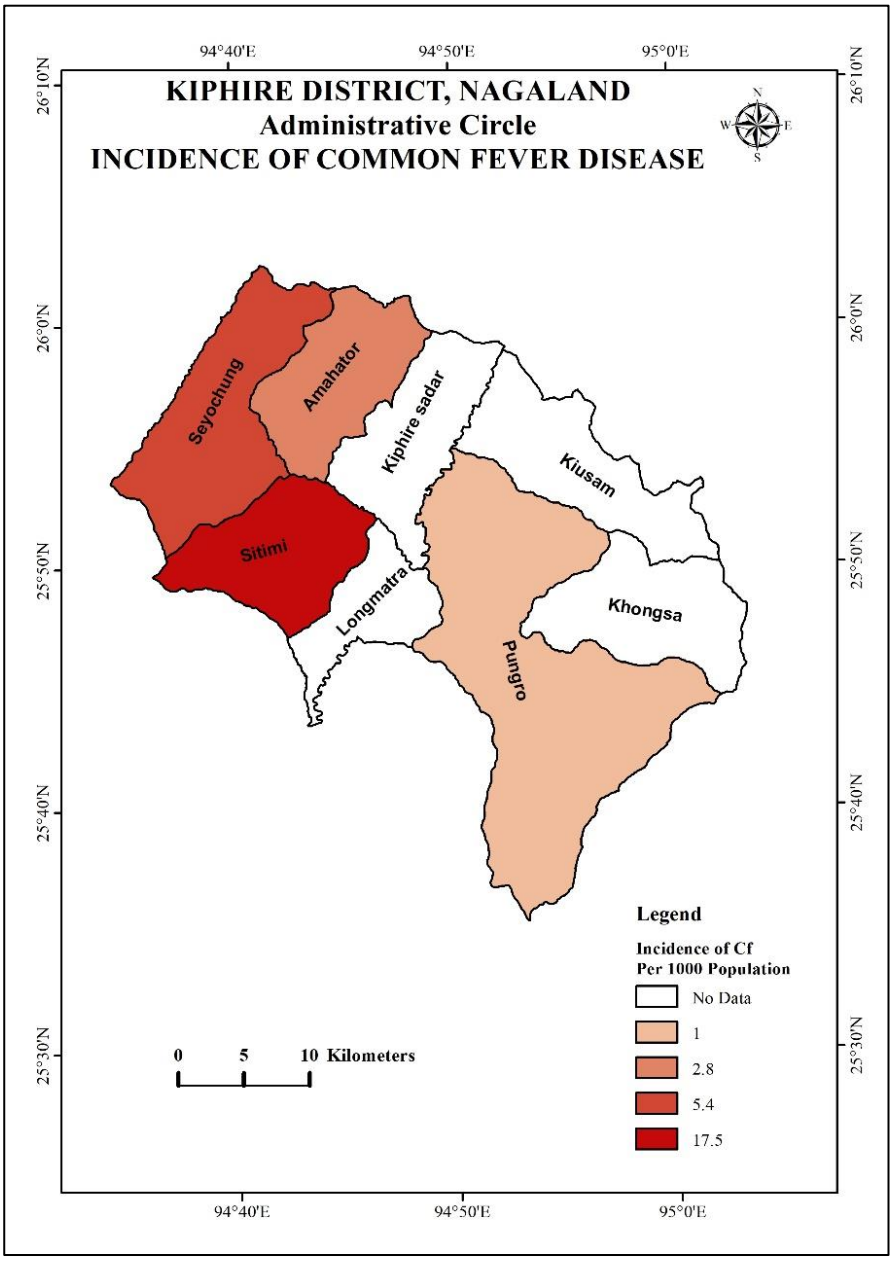


Source: Primary Data

3.3.2.3 Common fever disease

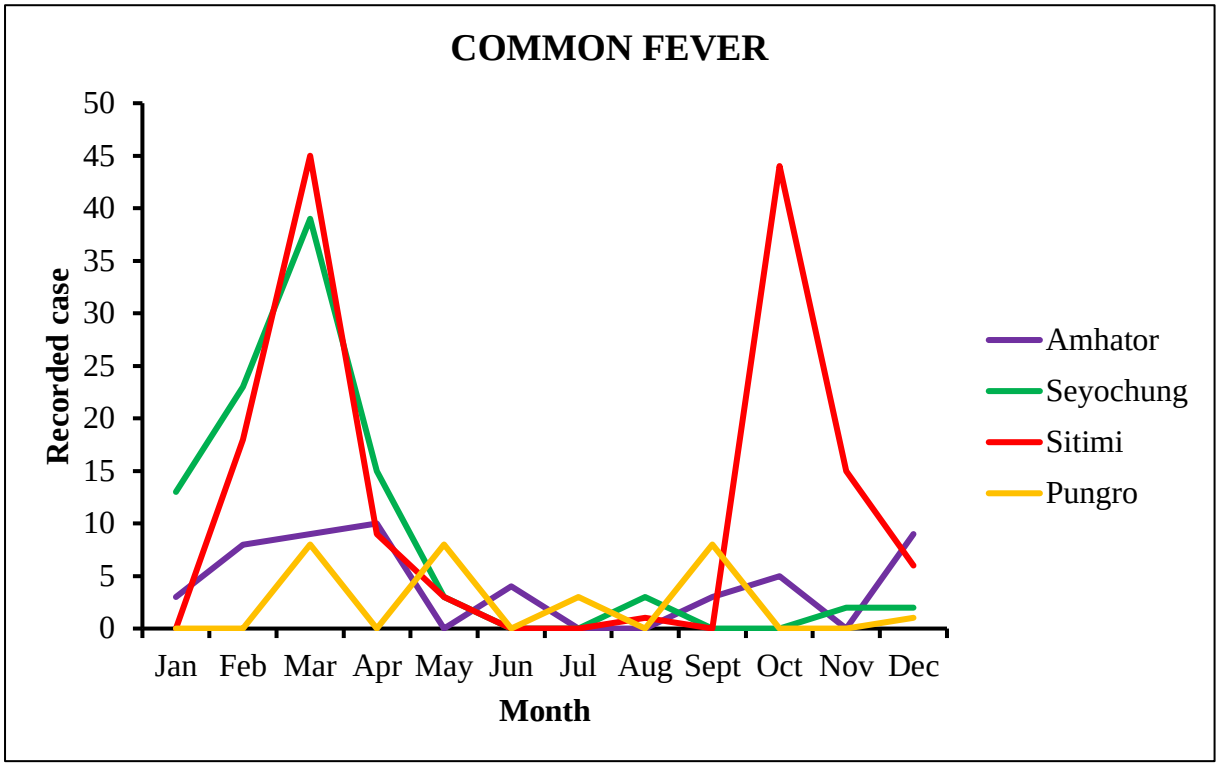
Under Sitimi circle, the highest incidence of Cf disease is recorded. The second is under Seyochung followed by Amhator and Pungro circle. Most of this circle lies at high altitude and experiences sudden changes in temperature which may result in a high number of fevers.

Figure 3.16: Distribution and Incidence of Cf in Kiphire district (sampled area)



Source: Primary Data

Figure 3.17: Monthly distribution of Cf in Kiphire district



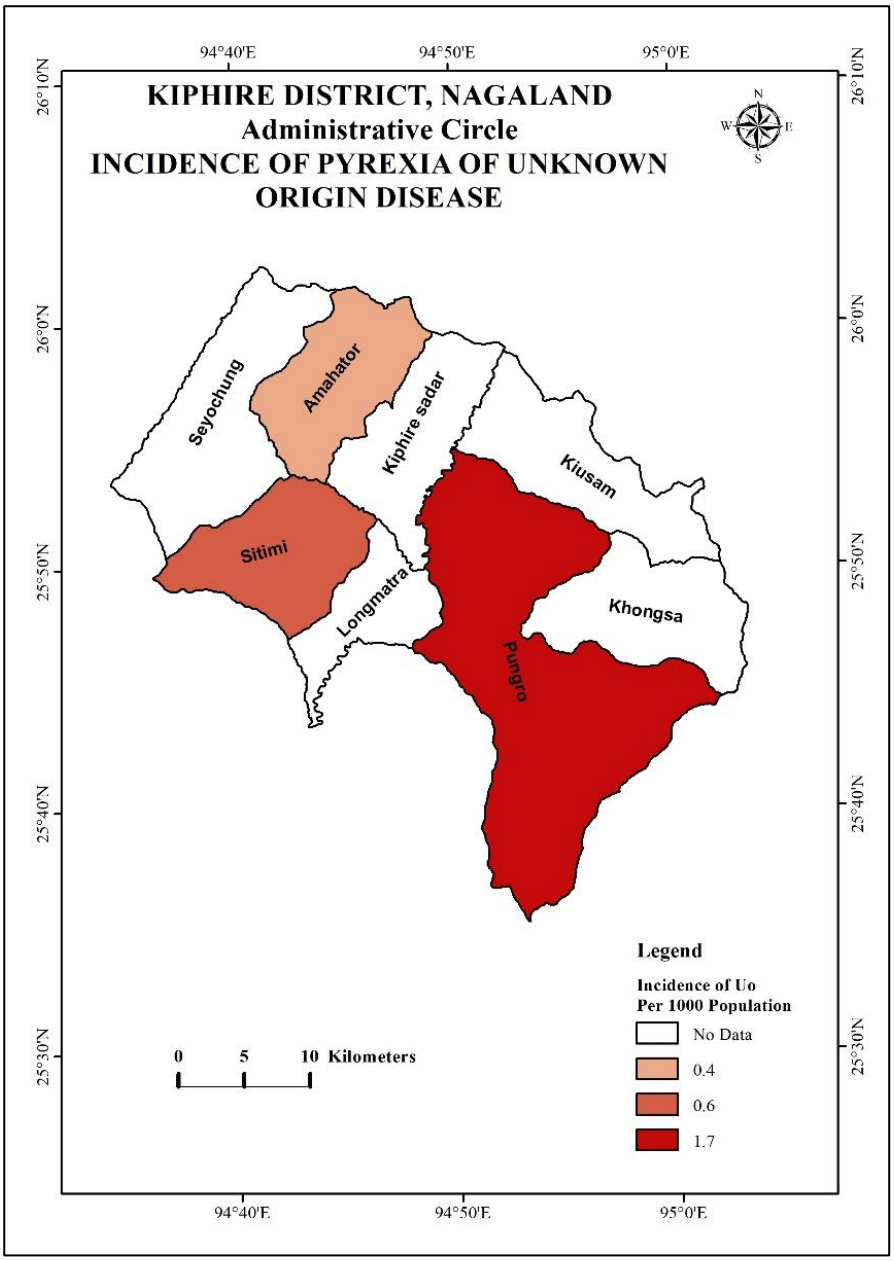
Source: Primary Data

The month of March and October records a high number of cases. These are the two months when the weather conditions start to change from cold to hot and hot to cold. From the months of February and September, the number of cases slightly increases and ends up in April and November.

3.3.2.4 Pyrexia of Unknown Origin

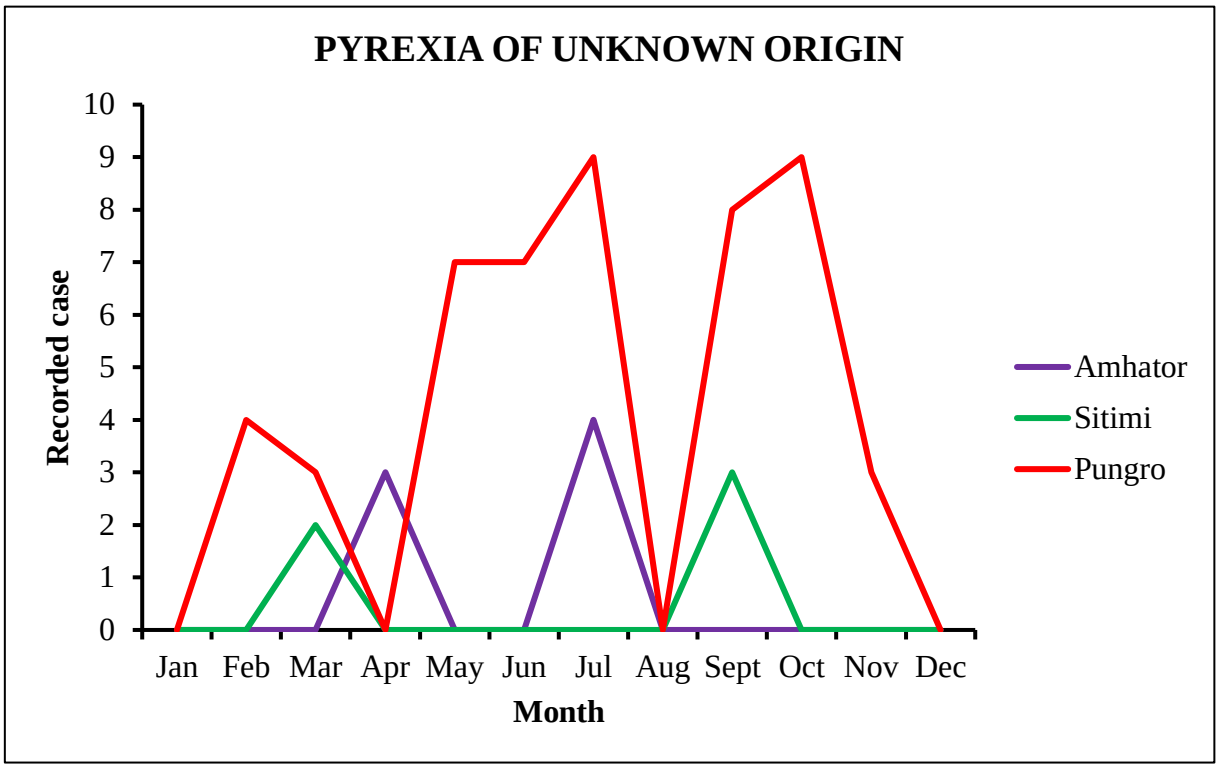
A high number of incidences of Uo case is found under Pungro circles. This disease needs to be further investigated as the causes and origin because may lead to unpredictable outbreaks of diseases.

Figure 3.18: Distribution and Incidence of Uo in Kiphire district (sampled area)



Source: Primary Data

Figure 3.19: Monthly distribution of Uo in Kiphire district



Source: Primary Data

Most of the cases of Uo diseases are recorded in summer seasons during the wet and hot seasons. This season must provide favourable weather conditions for the disease aetiology to grow rapidly and infect humans. Care and prevention are much needed during this season in geographically affected areas in order to stop its spread.

3.3.3 Kohima district

Kohima district has a geographical area of about 1463 sq. km and recently the Government of Nagaland has bifurcated the district into two i.e., Kohima district and Tseminyu district. This study was carried out before the divisions of Kohima district into two parts. Thus, all the data of Tseminyu district is included under Kohima district.

Kohima district has a total health institution of 17 PHCs, 3 CHCs and 1 DH with 9 administrative circles.

The most common diseases in the district are Ar, Ad, Oc, Hy etc. of which high incidence is recorded for Ar disease followed by Ad, Oc and Hy diseases.

Table 3.5: List of diseases in Kohima district (sampled area)

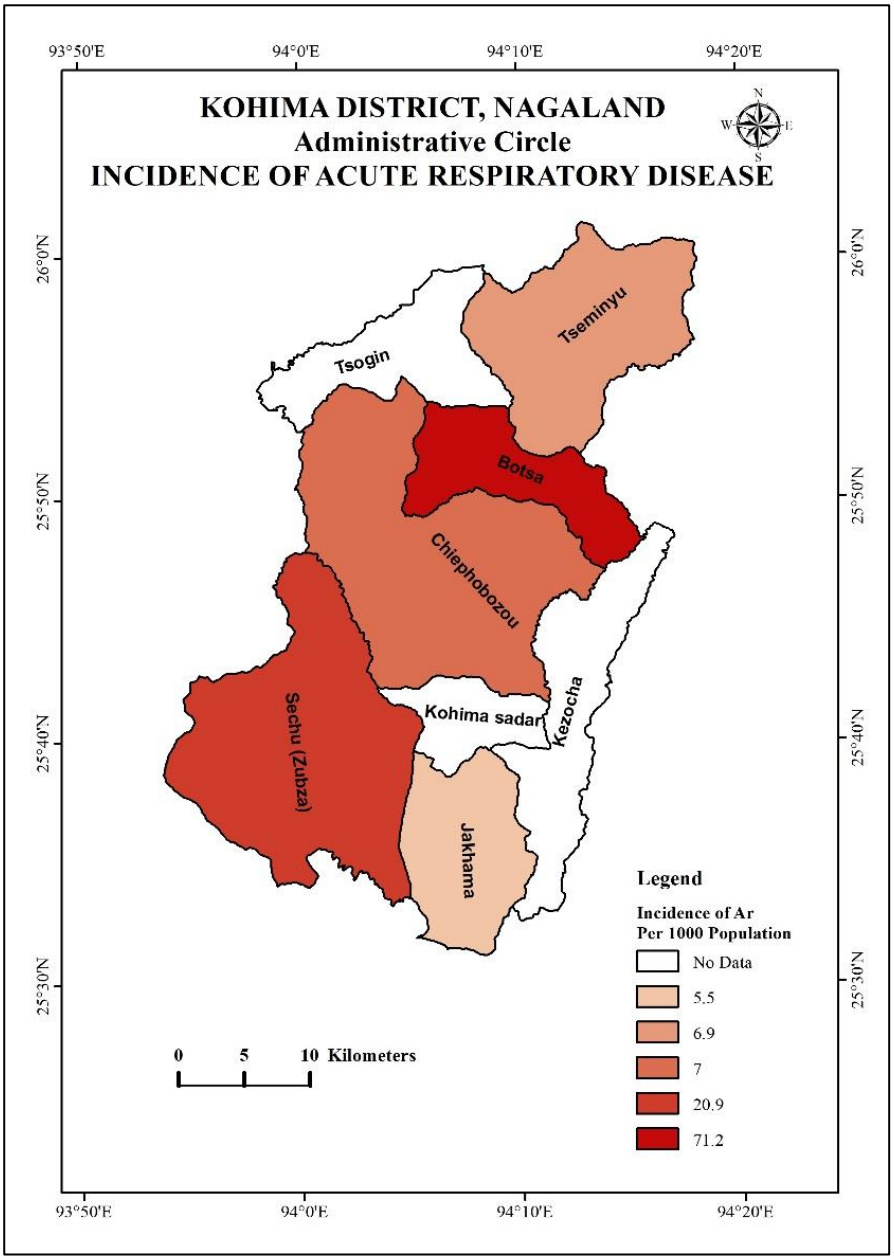
Sl. No.	**Name of diseases**	**Total No. of Recorded cases**	**Incidence per 1000 population**
1	Acute Respiratory	4622	11.95
2	Acute Diarrhoel	2071	5.36
3	Oral Cavity	1231	3.18
4	Hypertension	1194	3.09
5	Enteric Fever	789	2.04
6	Eye	699	1.81
7	Common Fever	466	1.2
8	Diabetes	113	0.29
9	HIV+	34	0.09
10	Others	156	0.4
Overall Total		**11, 375**	

Source: Health and Family Welfare

3.3.3.1 Acute Respiratory disease

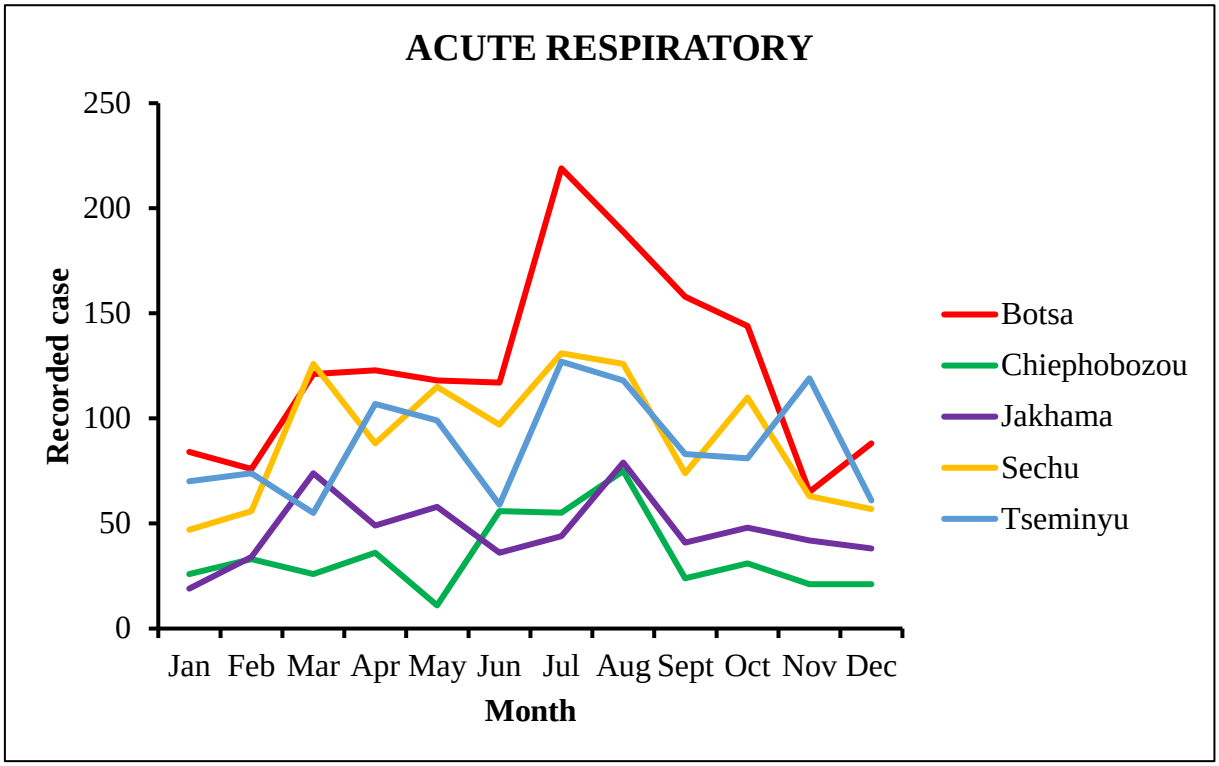
Ar disease is the most common disease in Kohima district. It may be due to cold and warm weather conditions that may be suitable for the growth of disease germs to thrive. The most affected circle is under Botsa circle, followed by Sechu (Zubza) circle, Chiephobozou circle, Tseminyu circle and Jakhama circle. Under Sechu (Zubza) circle high incidence of Ar diseases is due to the construction of the four-lane highway road connecting between Kohima and Dimapur which causes air pollution in the surrounding highway.

Figure 3.20: Distribution and Incidence of Ar in Kohima district (sampled area)



Source: Primary Data

Figure 3.21: Monthly distribution of Ar in Kohima district



Source: Primary Data

The highest recorded case in the district is observed in the months of June to September when the district experiences a warm and moist climate which results in disease germs thriving more. During these months the temperature is always around 24ºC which is warm for mountain climates.

Also, in the months of March and April, the number of cases starts to increase which indicates temperature increase after the cold long winter the disease becomes active and the weather conditions make it favorable to adapt it quickly infecting man.

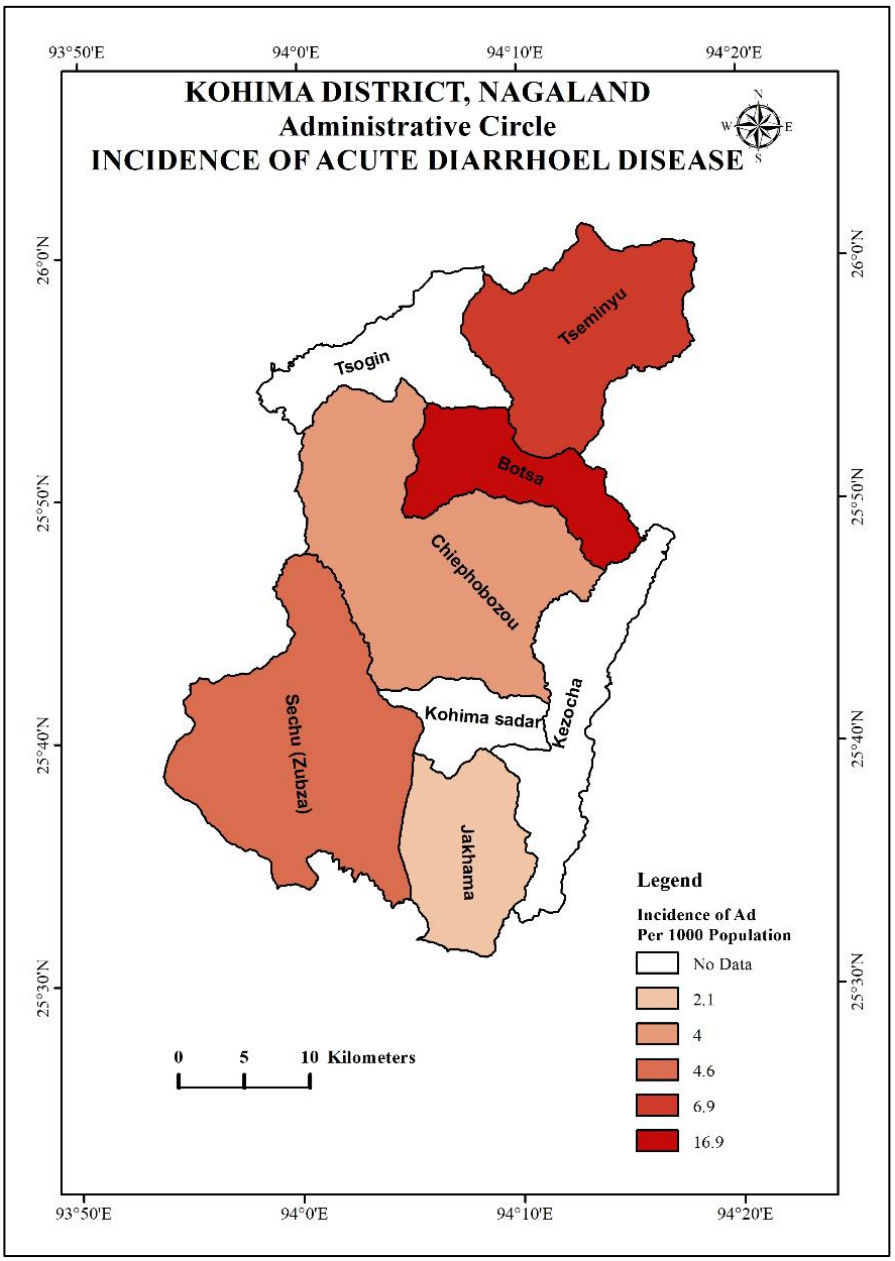
3.3.3.2 Acute Diarrhoel disease

Ad disease is the second most common disease in the district. The most incidence case is reported under Botsa Circle followed by Tseminyu Circle, Sechu Circle, Chiephobozou Circle and Jakhama Circle.

Based on the data collected from the Census office as per the 2011 census, Botsa circle is the highest circle under Khima district which does not have proper access to water for drinking purposes and most of the water source is mainly from ponds, lakes or natural streams.

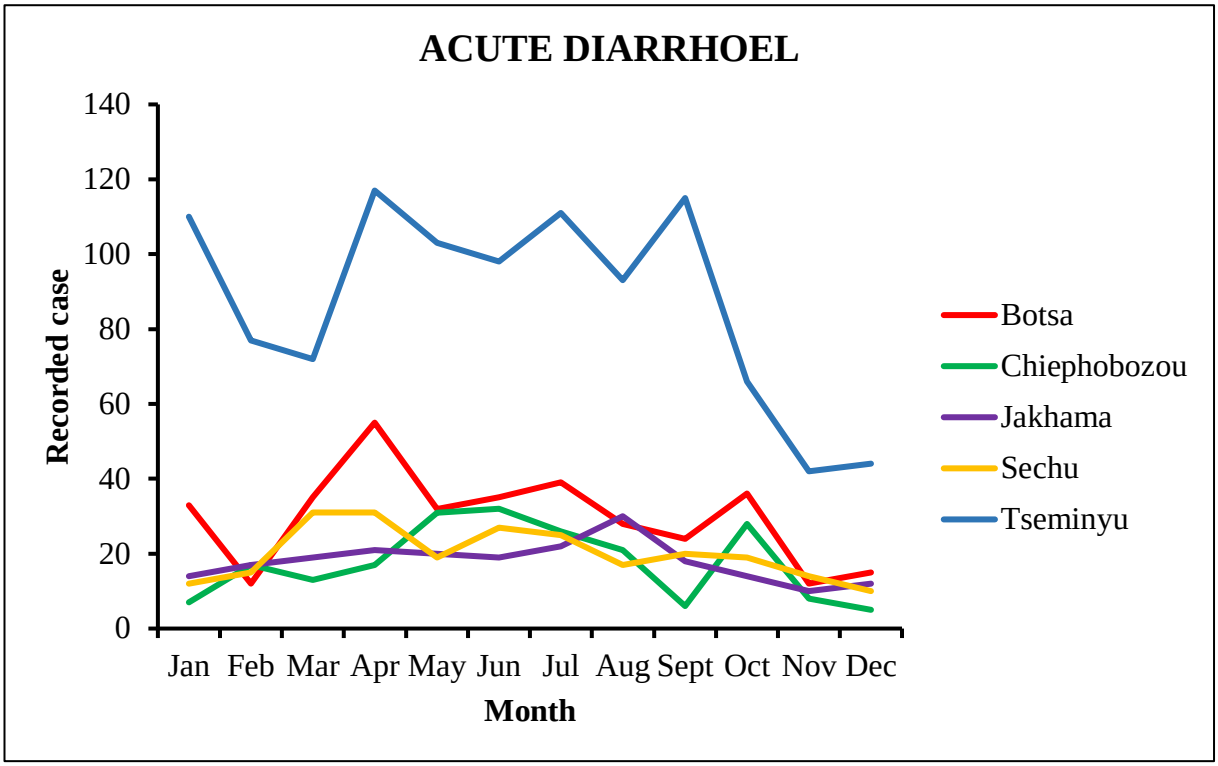
Another factor is this circle also has a high rate of open defecation of about 33.64 % (2011 census). These two factors result in a high incidence of Ad disease because Ad is mostly related to water borne disease. Under Tseminyu Circle also only 37.55 % of the villager's main water source is from tap water and the rest are mostly from ponds, lakes or natural streams.

Figure 3.22: Distribution and Incidence of Ad in Kohima district (sampled area)



Source: Primary Data

Figure 3.23: Monthly distribution of Ad in Kohima district



Source: Primary Data

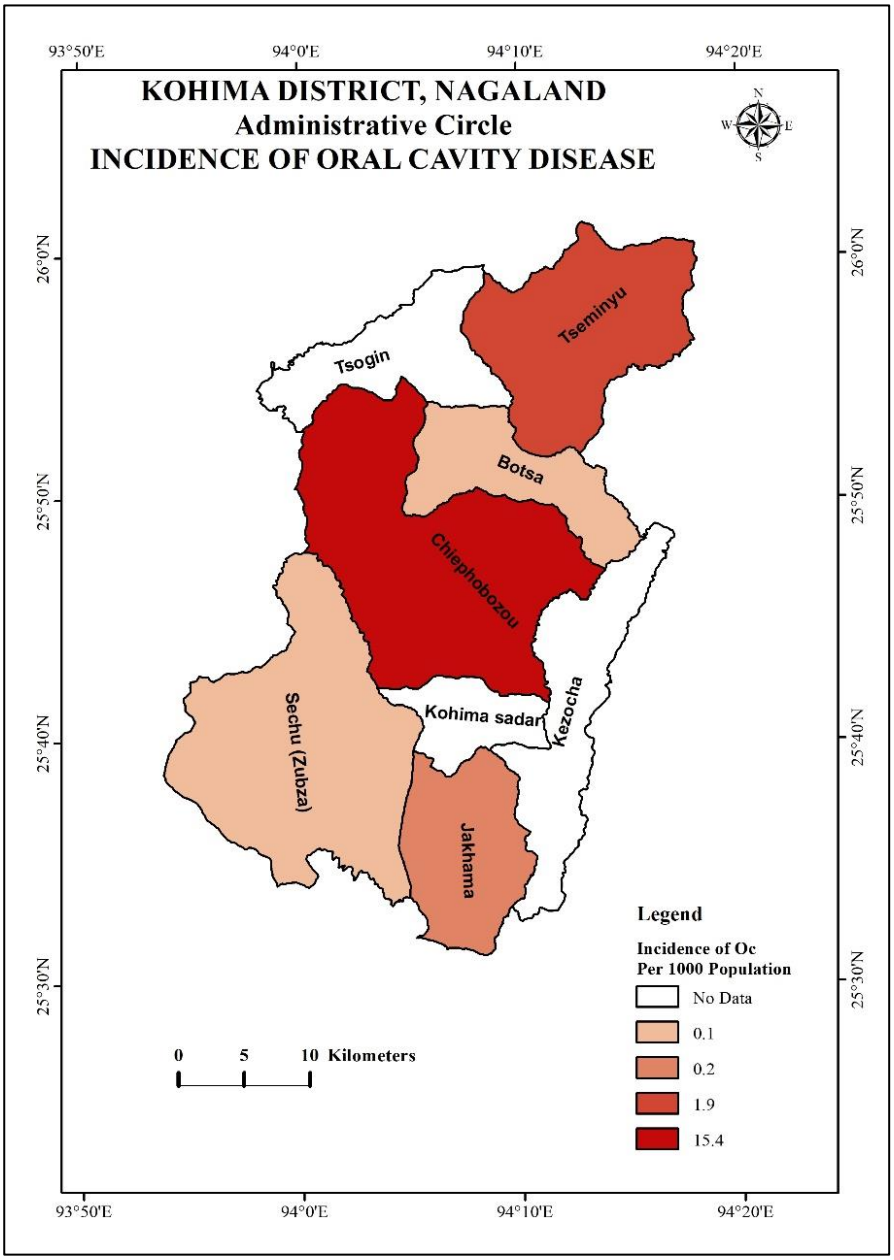
A high number of cases was reported from April to September months and gradually the number of cases started to decline. These months do experience high rainfall as well as high temperatures, which in turn pollute the unpolluted water. As most of the villagers depend on ponds or stream water, once it is consumed or used for any purpose it results in to increase number of Ad cases in the district.

3.3.3.3 Oral cavity disease

A high number of oral cavity-related cases are also reported in the district. The highest incidence is Chiephobozou Circle and second is Tseminyu Circle. For the rest of the sampled circle, the incidence case is at a minimum level. These two circles lie in the periphery of rural areas and both also have CHC health centres which have better health facilities. Under Kohima district, most of the people engaged in farming and most of these farmers do not give proper care to teeth which may also result in a high number of cases.

Chiephobozou health centres record of high number of cases is also due to the availability of health professionals which draws a huge number of people to this particular health centre to avail better health care.

Figure 3.24: Distribution and Incidence of Oc in Kohima district (sampled area)



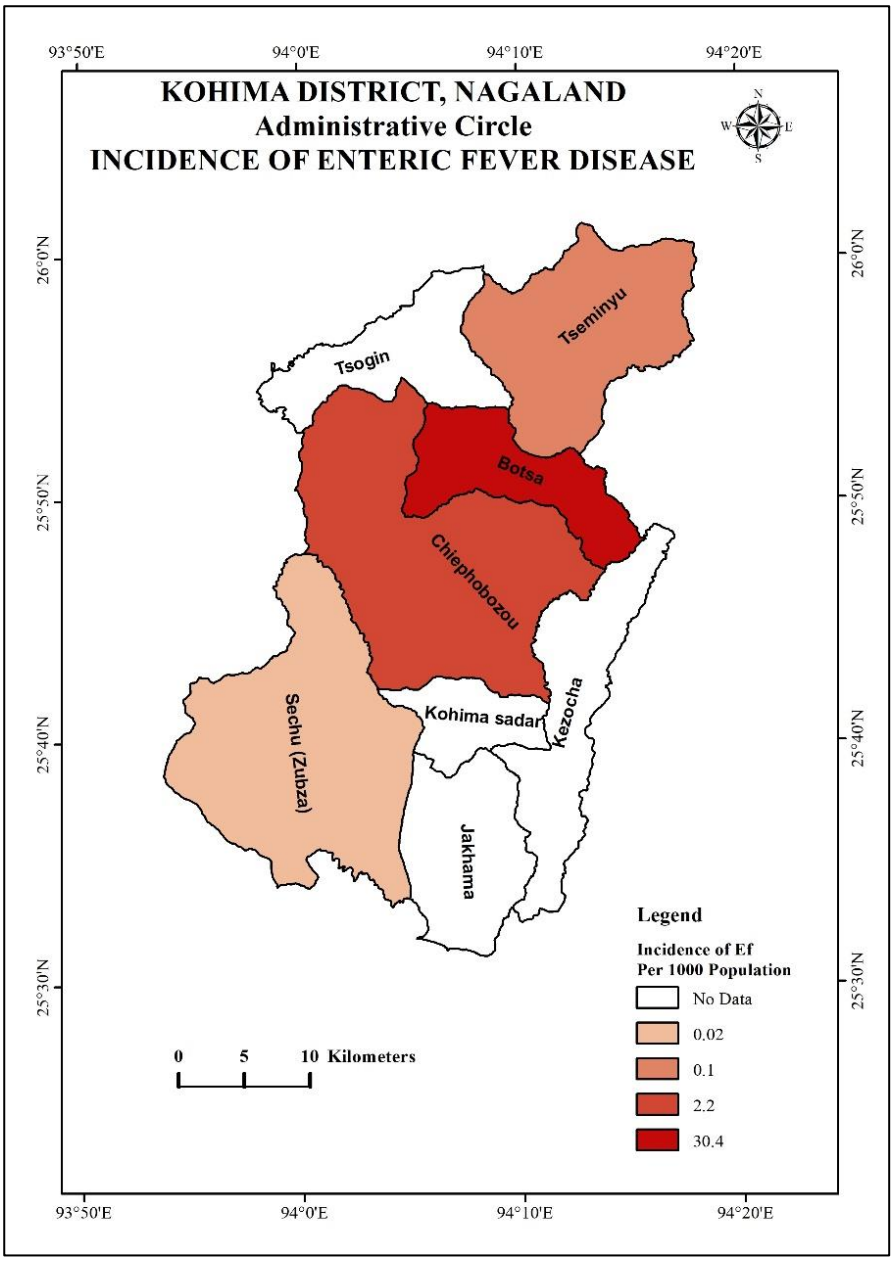
Source: Primary Data

3.3.3.4 Enteric fever disease

Enteric fever is a common fever in Kohima district and the most affected circles are Botsa and Tseminyu circles. Enteric fever can also be known as Typhoid fever and is mostly transmitted through contaminated water and food. Under these circles, most of the populations' main water source is mostly from ponds, streams etc. which may be the primary reasons behind the quick spreading and infection. Other cases are due to farmers getting drenched in the rain, which leads to easy infection.

Under Kohima district, Botsa Circle has a very high incidence rate which may be due to a particularly favorable climatic condition. Most of the villages under this circle (Botsa) experience high temperatures as well as moist climatic conditions which results in more thriving of the disease germs, leading to more infections.

Figure 3.25: Distribution and Incidence of Ef in Kohima district (sampled area)

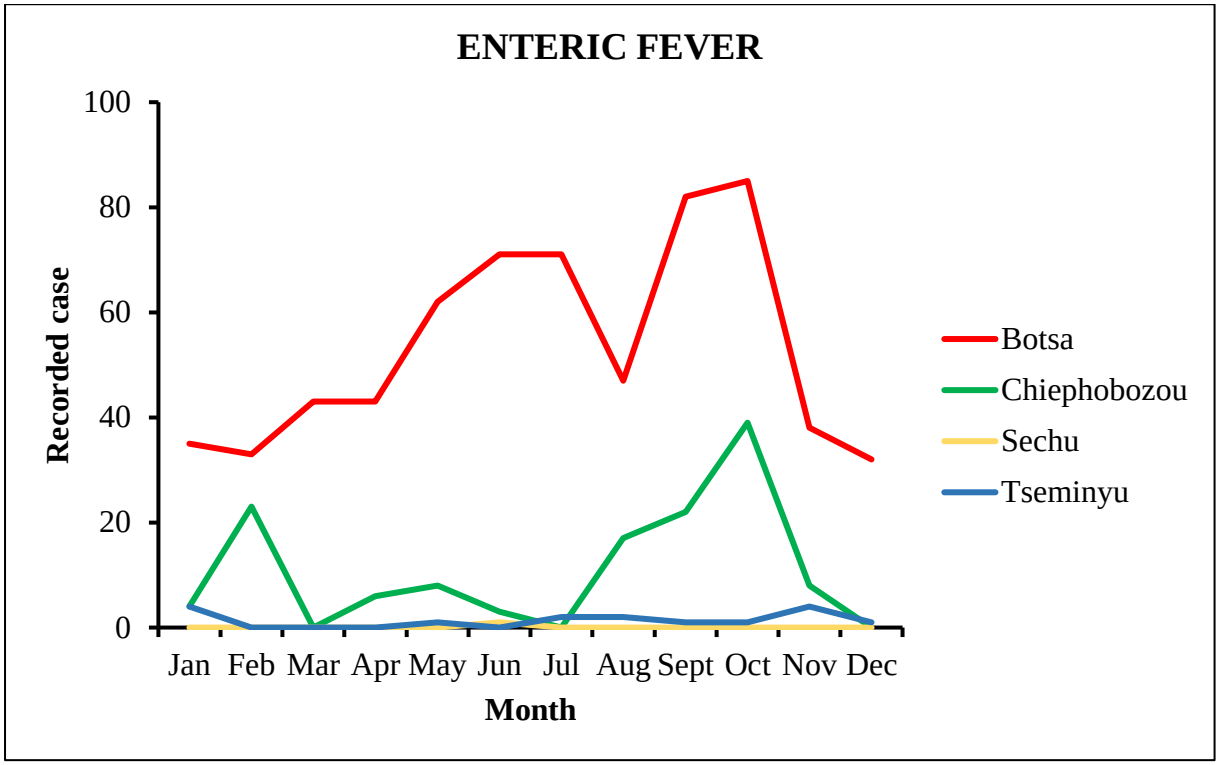


Source: Primary Data

The reported number of cases of Ef starts to increase from the month of March and continues to have a high number of cases up to the month of October. It indicates that the disease germs thrive well during warm and wet seasons, and also during these months most of

the people engage in agricultural activity, most of them go out to their fields and slog in the rain. Often unreported cases also further increase the disease spread.

Figure 3.26: Monthly distribution of Ef in Kohima district



Source: Primary Data

3.3.4 Longleng district

Longleng district is the smallest district in Nagaland, with a geographical area of 562 sq. km. This district is home to the Phom tribe of Nagaland and has 6 administrative circles.

There are 3 PHCs and 1 DH, but during this study period one PHC i.e., Tamlu PHC was upgraded to CHC. Under the Longleng district for sample data collection, 2 PHCs were selected but data was collected from a single PHC i.e Tamlu. The other PHC selected for sample collection was no successful due to unapproachable to health staff, covid-19 pandemic and other unavoidable circumstances. Thus, the data collected were from PHC Tamlu for Tamlu Administrative circle and District Hospital (DH), in which DH data is used as a common data for the rest of the other administrative circles in the district.

Table 3.6: List of diseases in Longleng district (sampled area)

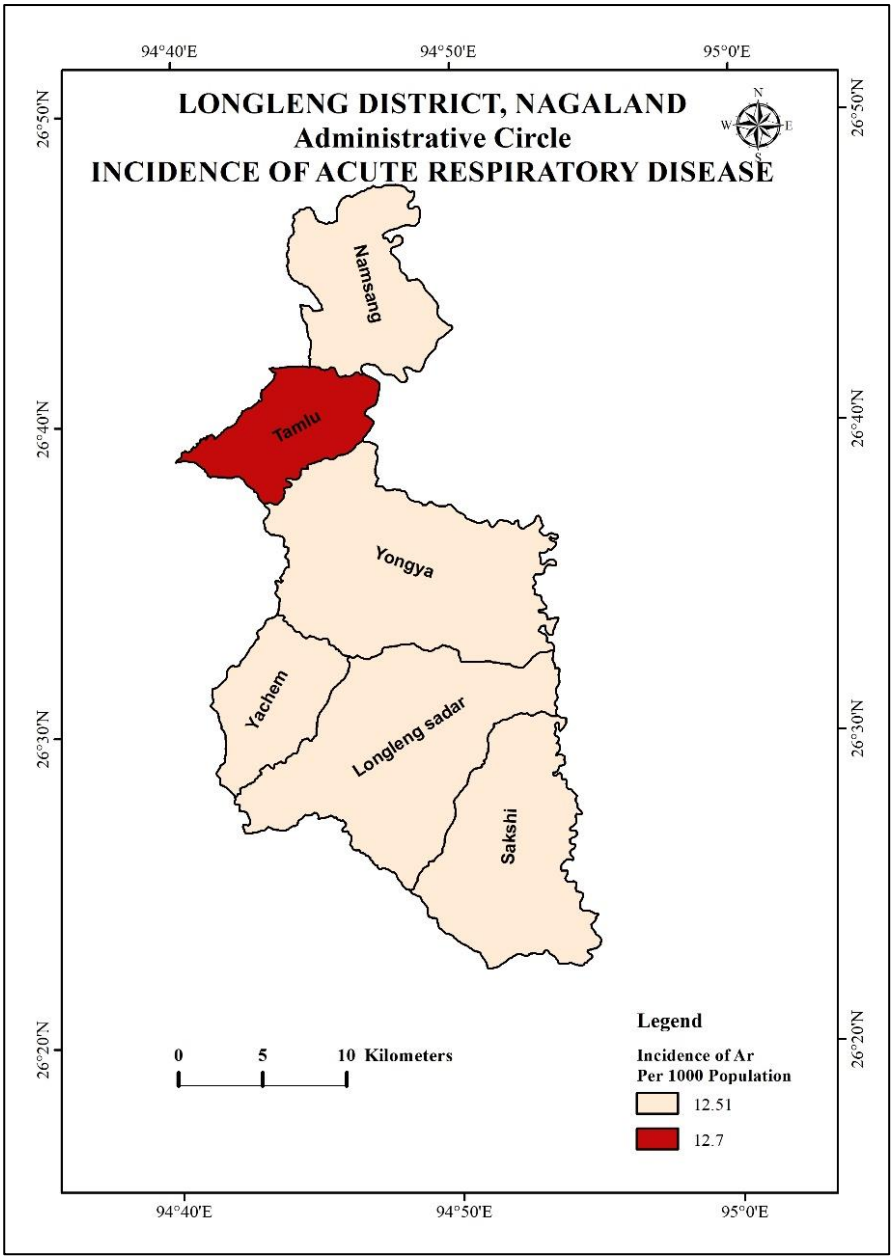
Sl. No.	Name of Disease	Total no. of Recorded cases	Incidence per 1000 population
1	Acute Respiratory	701	13.89
2	Enteric Fever	560	11.09
3	Hypertension	497	9.84
4	Acute Diarrhoel	345	6.83
5	Measles	292	5.78
6	Others	189	3.74
Overall Total		**2, 584**	

Source: Health and Family Welfare, Nagaland

3.3.4.1 Acute Respiratory disease

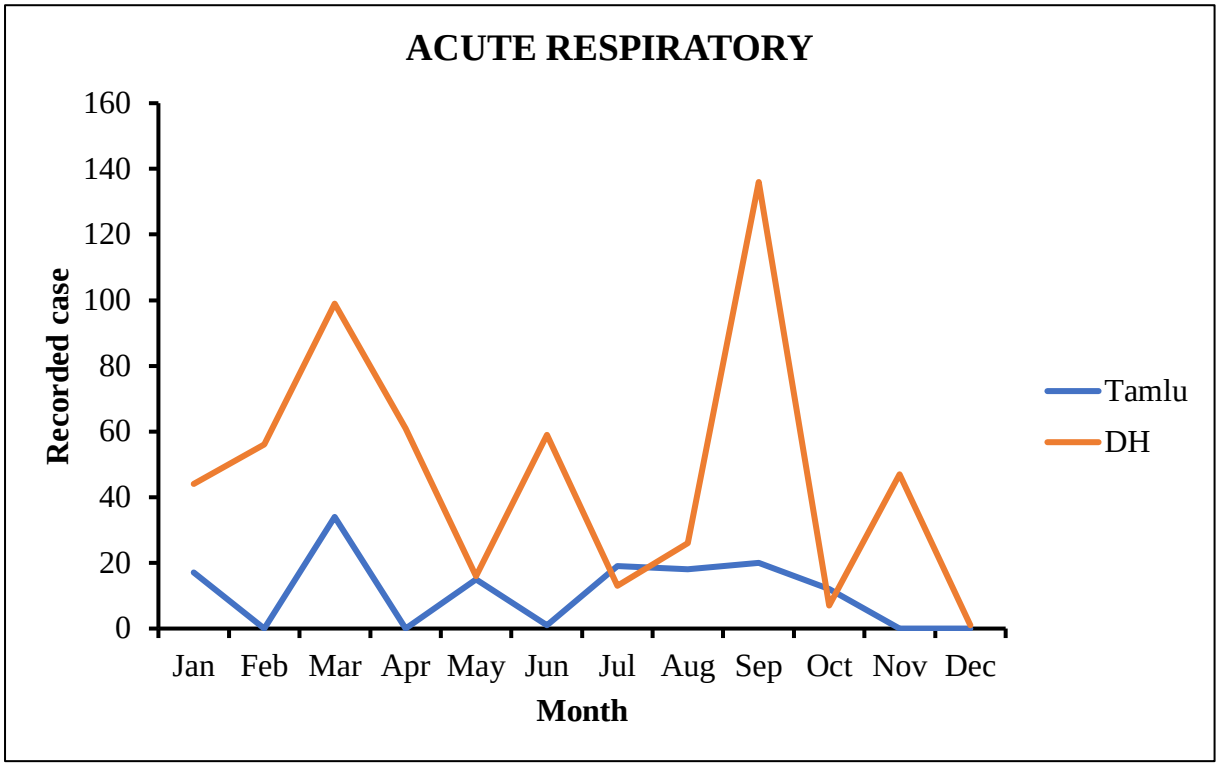
Under Longleng district, Ar disease is the most common disease. It also has a very high incidence in almost all the districts of Longleng. This may be due to sudden climatic or weather changes experienced in the district. The Northern part of the district is adjacent to the Assam plains which have warm weather conditions and in the interior or extreme Southern part of the district, a cold climate persists due to the mountainous landscape. This sudden geographical change can contribute to disease thrive.

Figure 3.27: Distribution and Incidence of Ar in Longleng district (sampled area)



Source: Primary Data

Figure 3.28: Monthly distribution of Ar in Longleng district



Source: Primary Data

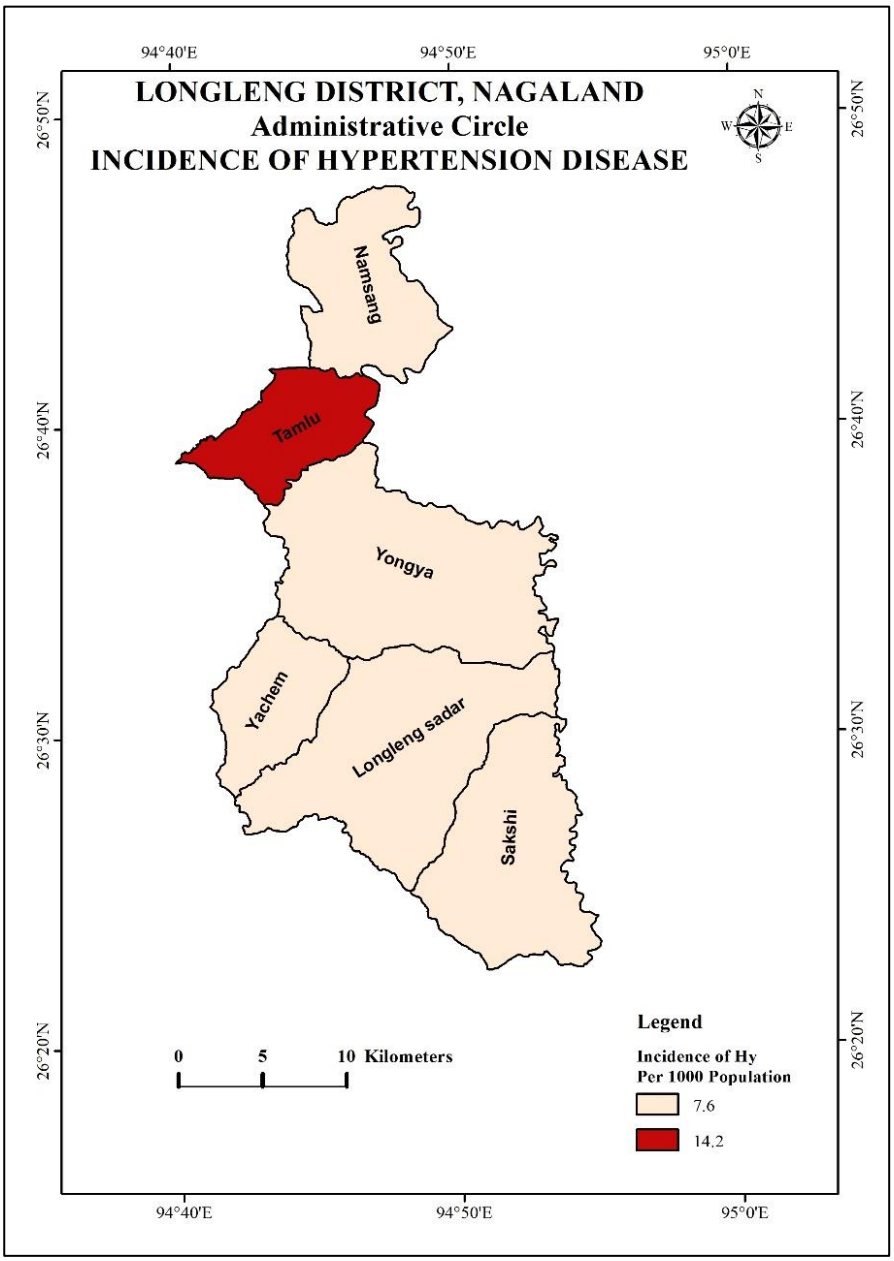
A high number of cases are recorded during the onset of pre-monsoon seasons i.e., in the month of March when the temperature starts to increase from the cold winter seasons. It also recorded a high case in monsoon seasons in the month of June and also in the month of September when the temperature starts to decline with the arrival of winter cold seasons.

The difference in temperatures from one season to another season has resulted in a greater number of cases. It indicates the human body is not able to cope to the change in temperature and that temperature plays a crucial role in the vibrant growth of disease germs.

3.3.4.2 Hypertension disease

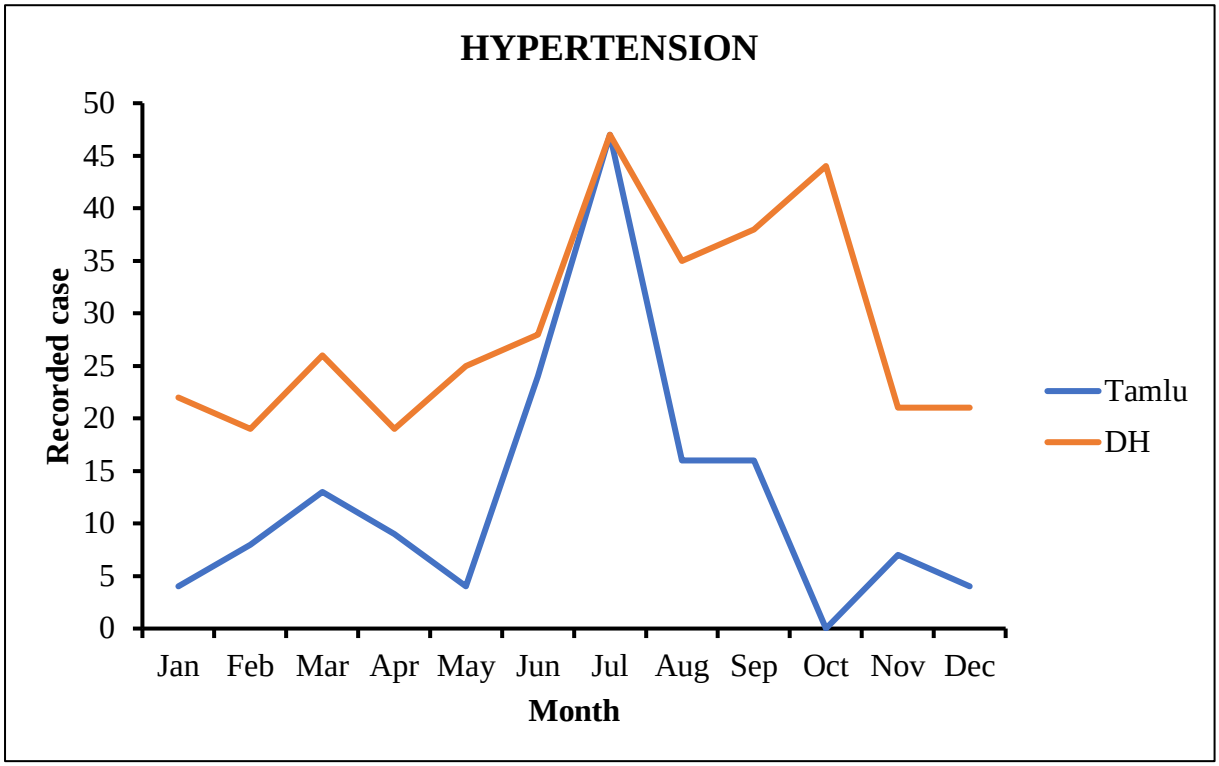
Hypertension is the second most common disease in the district. A high number of incidences is recorded under Tamlu circles. Having a conversation with medical staff under Tamlu circle, it was revealed that most of the cases in this circle is due to rapid change in lifestyle and also change in dietary habits.

Figure 3.29: Distribution and incidence of Hy in Longleng district (sampled area)



Source: Primary Data

Figure 3.30: Monthly distribution of Hy in Longleng district



Source: Primary Data

Hy disease is a major problem in the state of Nagaland. This disease is also one of the common diseases in the district of Longleng. Most high cases are recorded in the months of June and July. These two months are crucial for the whole of Nagaland because these months are important to the farmers to plough their fields. The concerned farmers having anxiety, social stress etc. which may increase his or her pressure. Another factor may be due to a major shift in lifestyles which could result in high number of cases.

3.3.4.3 Enteric fever disease

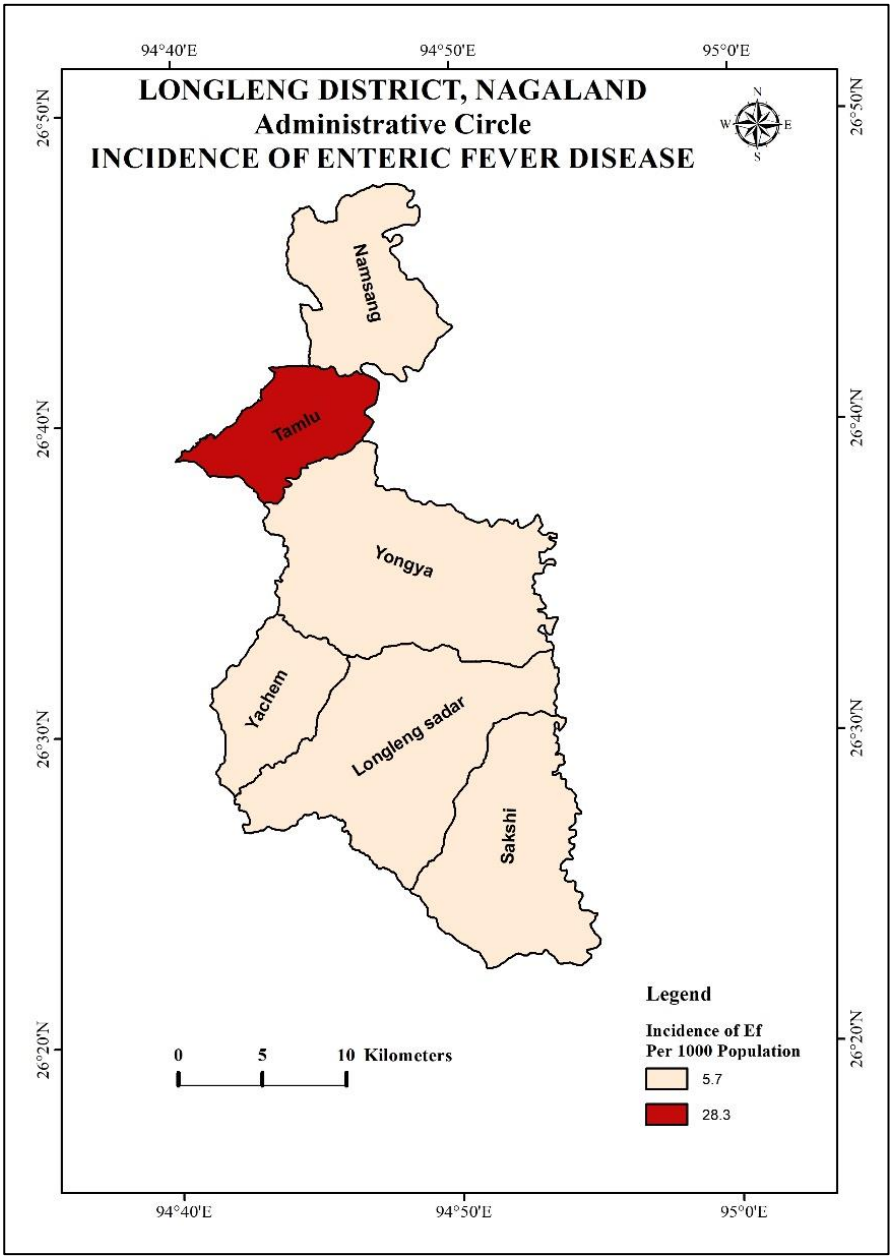
It is also a common disease in the district of Longleng. A higher incidence is reported in Tamlu circles than in the rest. This circle lies in the low-line areas of Longleng district that has a warm and humid climate during the monsoon seasons. The circle is also very close to the neighbouring state Assam which has warm climatic conditions.

Apart from the climatic conditions, as per the 2011 census, Longleng is the only district in Nagaland, in which most of the main source of water is from tanks or lakes. Tamlu Circle has 66.46 % water sourced from tanks or lakes. It indicates the districts or circles lake in basic

amenities and since most of the people depend on tanks or lakes, these natural water bodies may be contaminated and infect man's body.

To ascertain the facts provided by the census, extensive travel and study found out that most of the people depend on tanks, lakes etc. as the main source of water. Even the district Headquarter town does not have proper tap water connections and so most of their inhabitants depend on rainwater or even directly from rivers or streams.

Figure 3.31: Distribution and Incidence of Ef in Longleng district (sampled area)

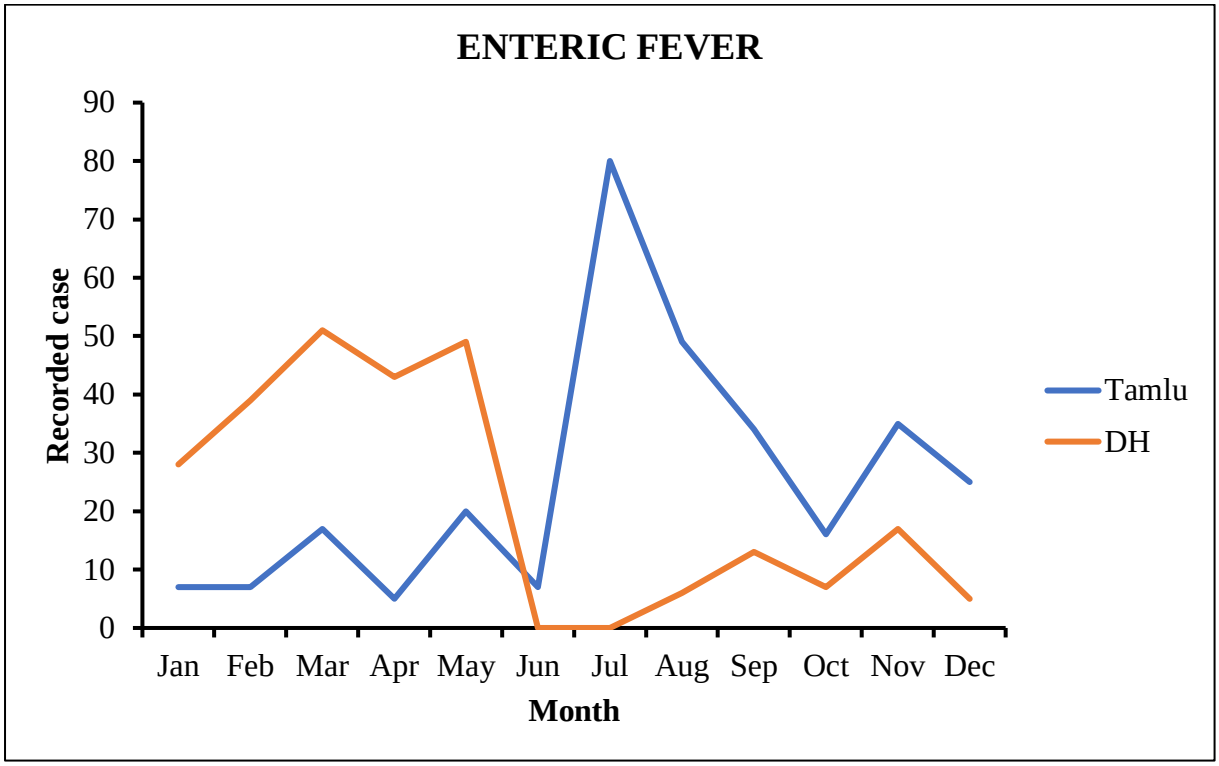


Source: Primary Data

Climatic conditions play a crucial role in the number of Ef cases. A high number of cases are reported during March month when the temperature in the state starts to change from cold winter to warm weather and also in the months of July – September when the temperature is warm and moist weather conditions leading to have high number of cases.

The onset of winter seasons, when the temperature changes from warm to cold also creates a favourable environment for increase of the disease Ef.

Figure 3.32: Monthly distribution of Ef in Longleng district



Source: Primary Data

3.3.5 Mokokchung district

The total geographical area of Mokokchung district is 1615 sq. km. The district has 17 PHCs, 4 CHCs, 1 TB hospital and 1 DH. It has 10 administrative circles. In this study 10 health institutions were sampled covering 7 administrative circles.

The most common or prominent diseases in the district are Hypertension, Acute Respiratory, Diabetes, Acute Diarrhoel etc. Some least common diseases are heart, mental illness, Asthma etc.

Table 3.7: List of diseases in Mokokchung district (sampled area)

Sl. No.	Name of Diseases	Total No. of Recorded Cases	Incidence per 1000 population
1	Hypertension	2365	6.86
2	Acute Respiratory	2183	6.34
3	Diabetes	1178	3.41
4	Acute Diarrhoel	1169	3.39
5	Enteric Fever	648	1.88
6	Oral Cavity	577	1.67
7	Eye	212	0.62
8	Others	141	0.41
Overall total		**8, 473**	

Source: Health and Family Welfare

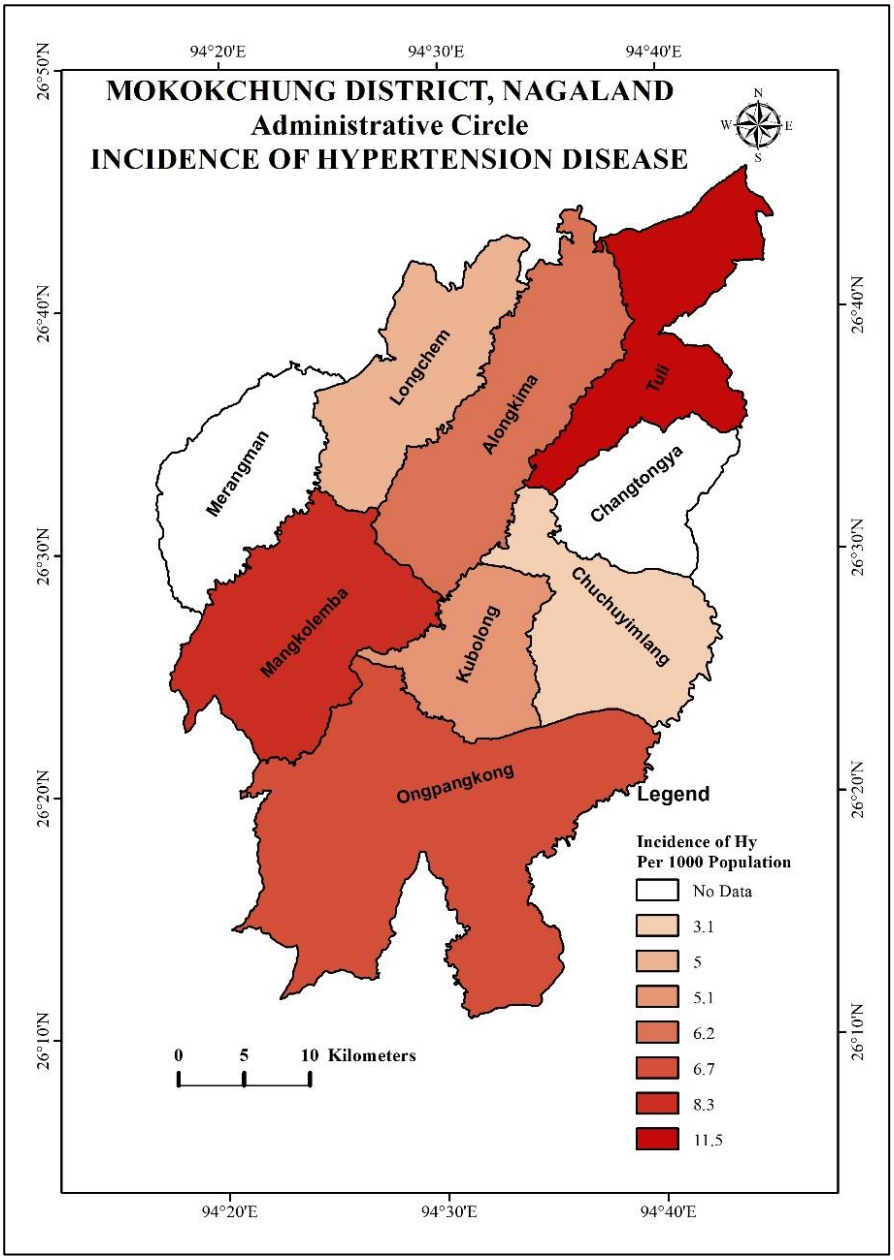
3.3.5.1 Hypertension disease

A non-communicable disease, hypertension is a major common disease in the district of Mokokchung. A high incidence case is found under the Tuli circle and the lowest incidence case is found in the Chuchuyimlang circle.

In a comparative study between population and incidence of Hy disease, Ongpangkong circle is the most populous circle under Mokokchung district and also recorded the highest number of Hy disease but the Ongpankong circle does not show high incidence of Hy disease whereas in Tuli circle, the number of recorded Hy disease is much lower to Ongpankong circle, but since it has lower population, the incidence of Hy disease is more than Ongpangkong circle and moreover it is also the highest Hy incidence circle in the district.

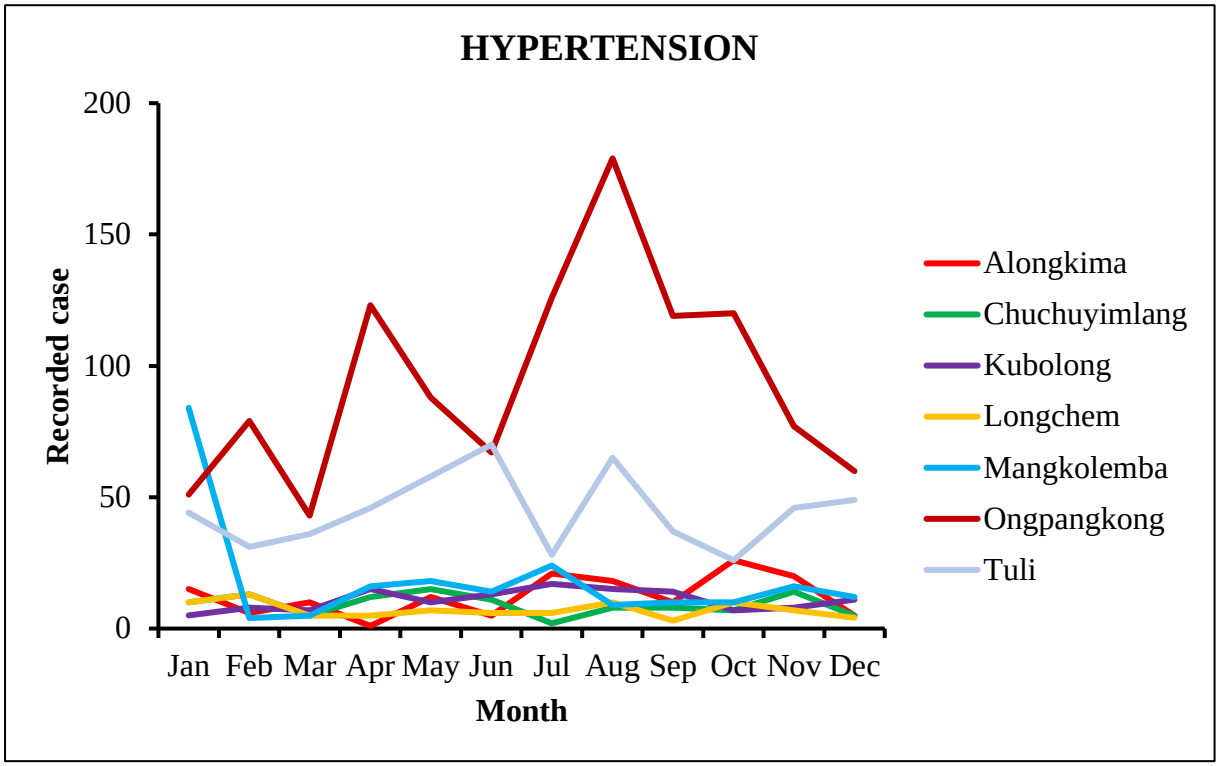
To ascertain the main causes of Hy disease, questionaries were handed out to medical staff and the result was primarily related to poor socio-economic stress, unhealthy lifestyle etc.

Figure 3.33: Distribution and Incidence of Hy in Mokokchung district (sampled area)



Source: Primary Data

Figure 3.34: Monthly distribution of Hy in Mokokchung district



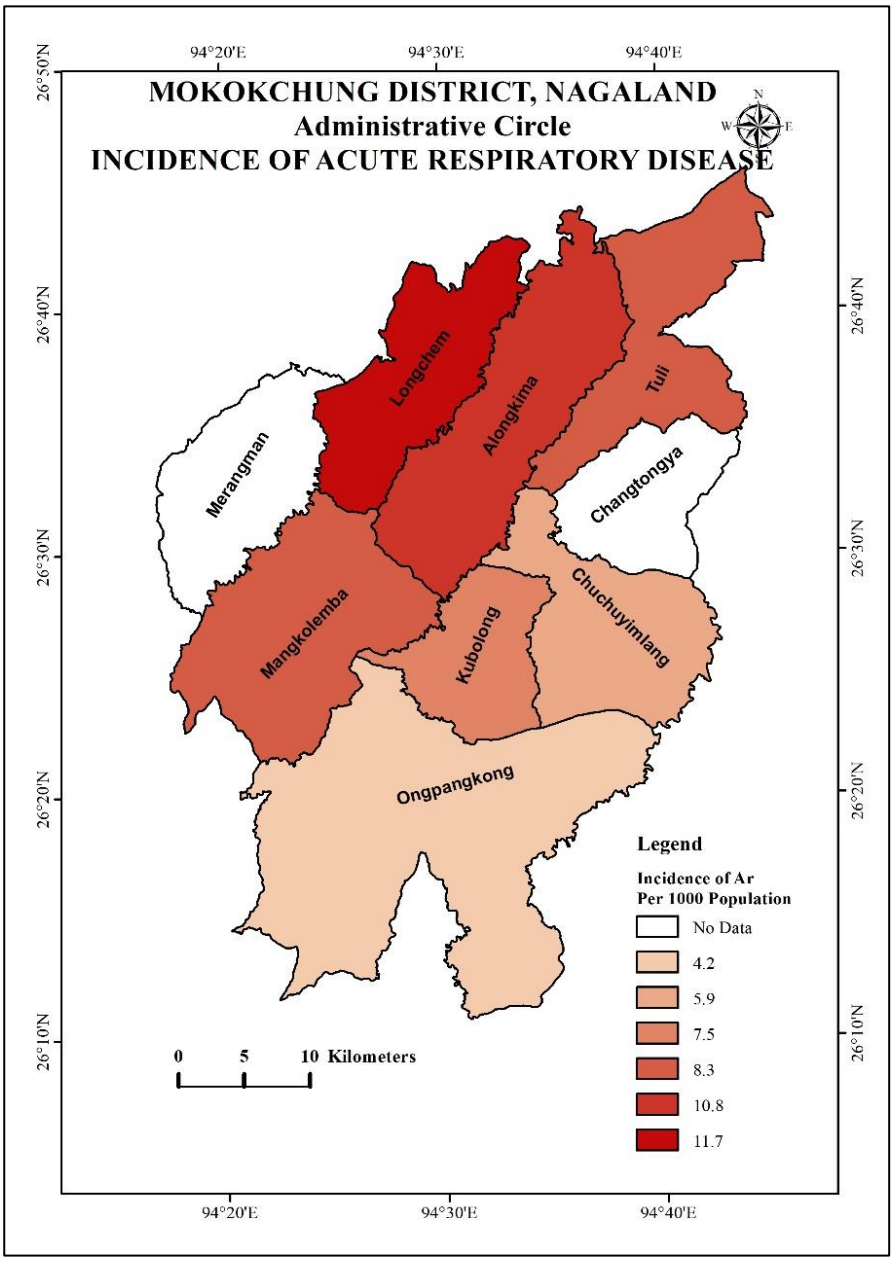
Source: Primary Data

As per the figure no. 3.34 given above, a high number of cases are recorded from the months of April and May and also from July to October. These are the months in the district that experience a sudden change of temperature. This change can affect other weather elements like atmospheric pressure. A well-balanced atmospheric pressure is crucial for regulating normal blood pressure. Thus, the sudden change of weather conditions or environment may increase the Hy incidence in the district.

3.3.5.2 Acute Respiratory disease

The second most common disease in the district is Ar disease. High incidence case is recorded under Longchem with 11.7 per thousand populations, Alongkima with 10.8, Tuli with 8.3 etc.

Figure 3.35: Distribution and Incidence of Ar in Mokokchung district (sampled area)



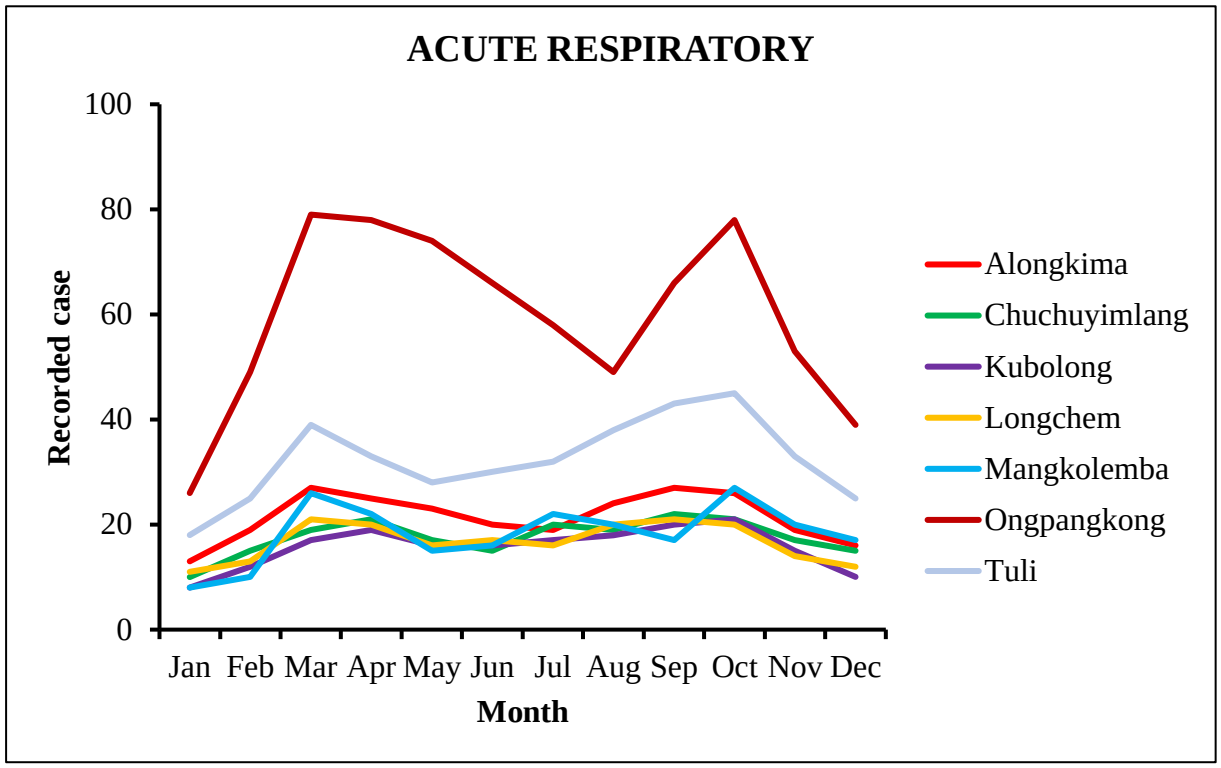
Source: Primary Data

As per the figure no. 3.35, the lower altitude areas are having a higher incidence of Ar diseases. The temperature factor play a crucial role in the occurrence and intensity of Ar disease.

Ar diseases are mostly prominent during the onset of warm and moist summer and also during the retreating seasons when the temperature starts to decline with the onset of cold and dry winter. This change in temperature, humidity etc. which completely changes the weather

or climate phenomenon in the state results in more cases of diseases especially climatic influence diseases like Ar, Ef, Cf etc. Even in Mokokchung district, a high number of cases are recorded in the months of March, April, September and October. These are crucial months for an outbreak of any disease.

Figure 3.36: Monthly distribution of Ar in Mokokchung district



Source: Primary Data

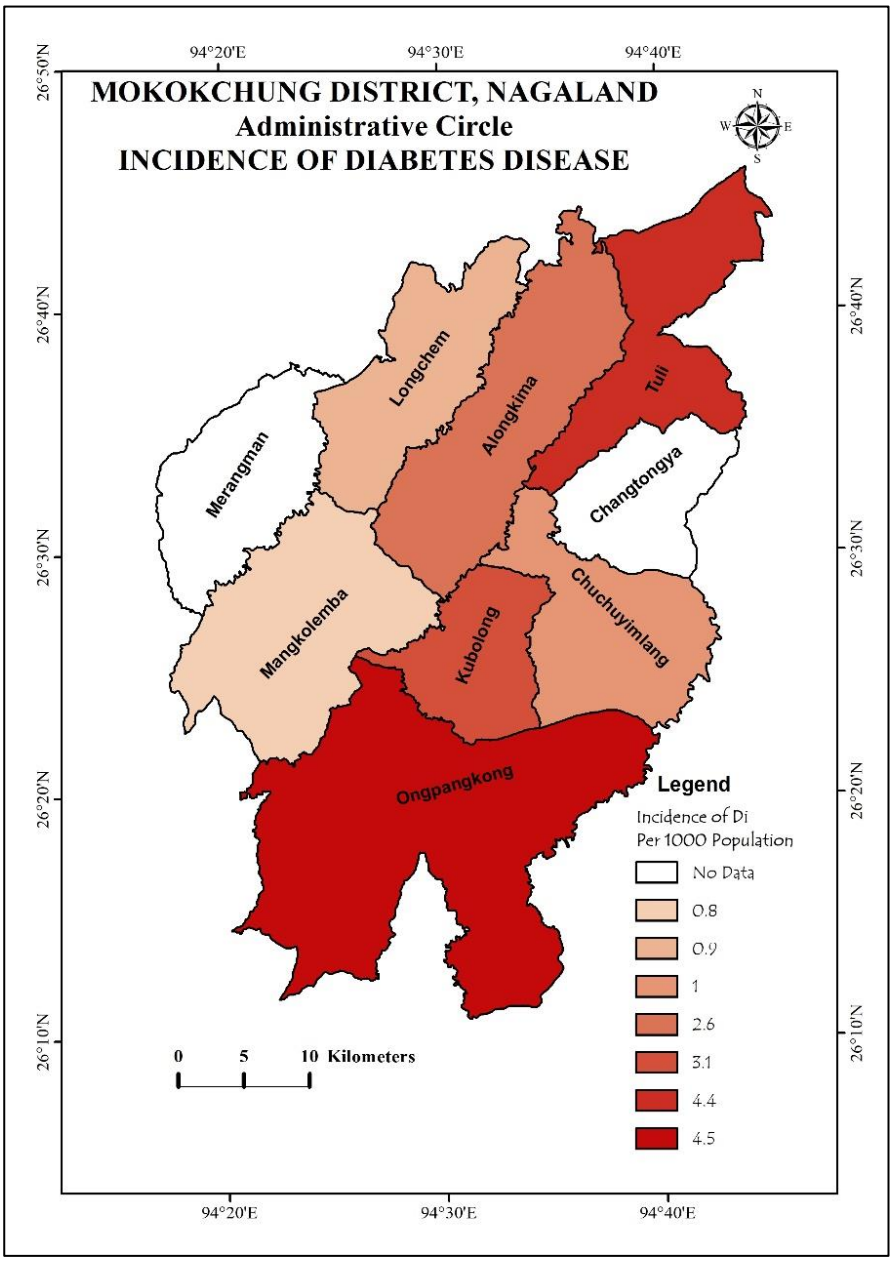
3.3.5.3 Diabetes disease

Di disease is a common disease in the district of Mokokchung. Out of the 11 districts sampled (at present 16), Mokokchung has a high number of cases of Di disease. High incidence is recorded under Ongpankong circle with 4.5 and followed by Tuli 4.4 per 1000 population.

Di disease is a non-communicable disease and recently it has also become a common disease in the state of Nagaland. This kind of disease is mostly associated with a change in lifestyle and unhealthy dietary habits. Other factors may be due to social problems, physical inactivity, being overweight etc. Most of the Di cases in the Mokokchung district are reported in urban areas like Mokokchung town and Tuli town. It is also key evidence that people in

urban areas engaged more in secondary or more higher in economic activity rather than primary economic activity.

Figure 3.37: Distribution and Incidence of Di in Mokokchung district (sampled area)

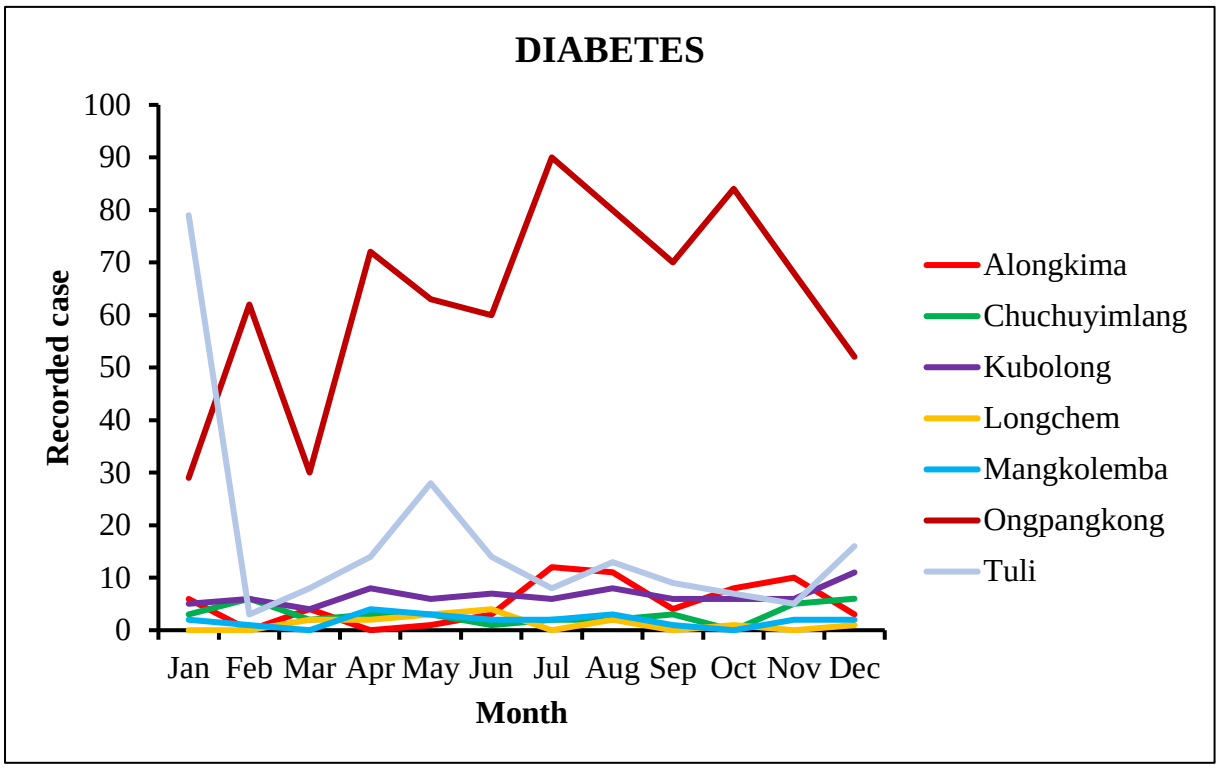


Source: Primary Data

The distribution and incidence of Di disease may not be purely related to the climatic conditions but it is mostly related to individual personal lifestyles. Therefore, the number of recorded cases also differs from one month to another and does not reflect much of the change in weather or climatic conditions. Another reason why there is an irregular number of cases can

be attributed to free medical camps in the village where the villagers were unaware of the disease and the Di cases were detected during this camp.

Figure 3.38: Monthly distribution of Di in Mokokchung district



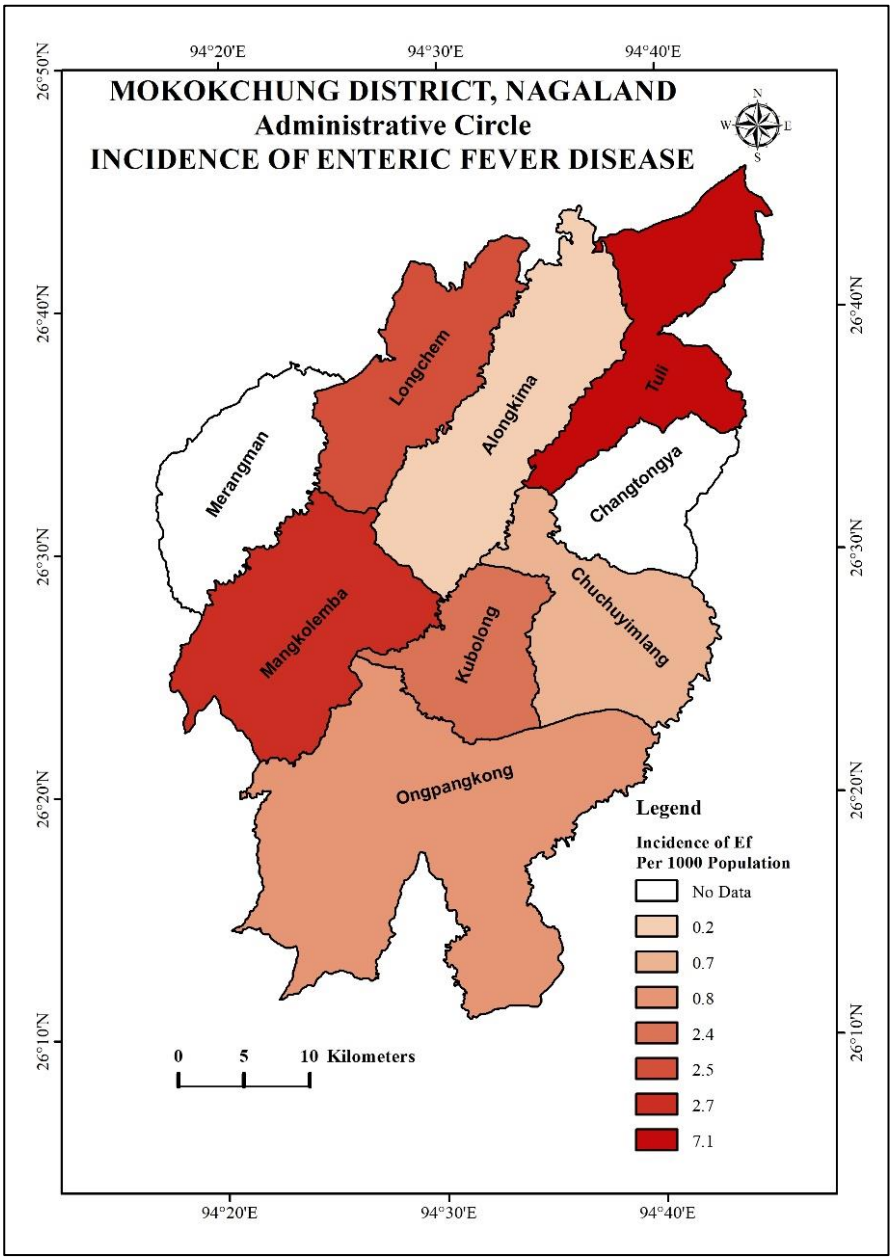
Source: Primary Data

3.3.5.4 Enteric fever disease

Ef disease is also another common disease in the district. The highest incidence of Ef is recorded under Tuli circle at 7. 1, Mangkoklemba at 2.7, Longchem at 2.5, Kubulong at 2.4, Ongpangkong at 0.8, Chuchuyimlang at 0.7 and Alongkima at 0.7 per thousand population.

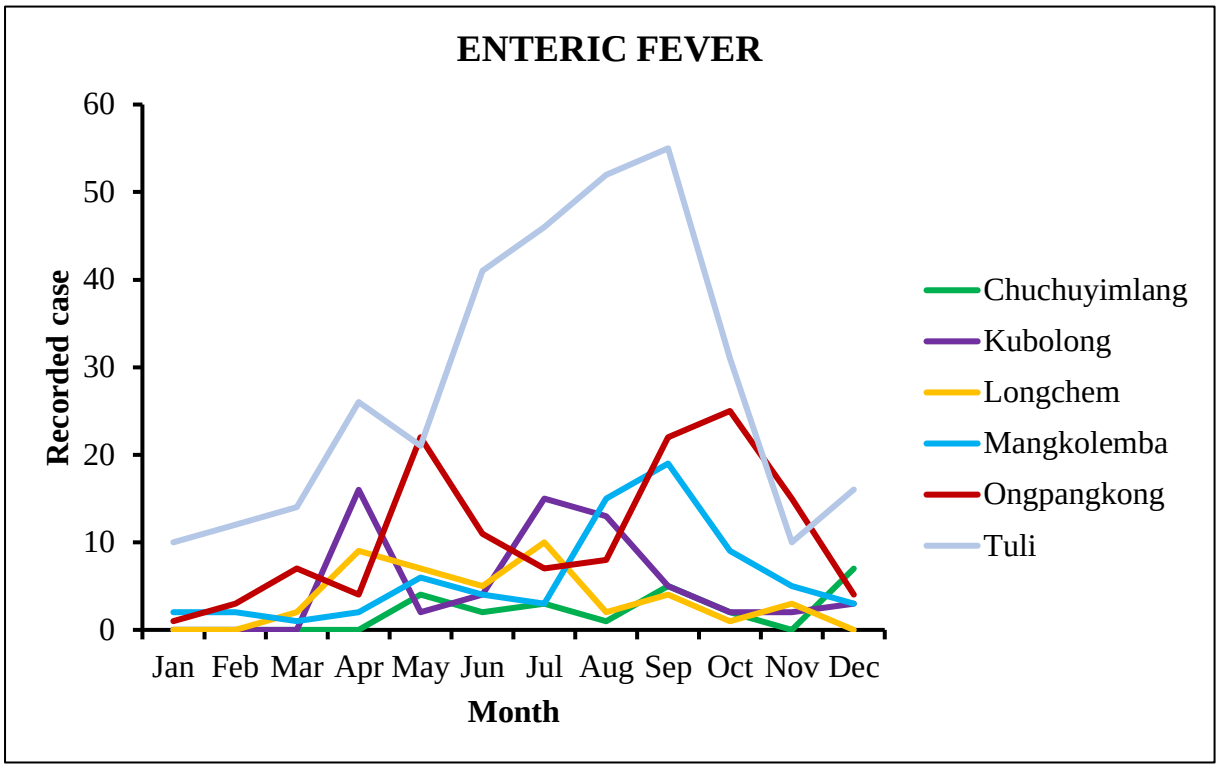
Based on the incidence or recorded case, it is found that most of the high-incidence cases are in the circles adjoining the state of Assam. Thus, these circles have lower altitude which also corresponds to high temperatures and moist weather conditions during the monsoon seasons which makes it favourable for the disease germs to thrive. Another factor is also due to a high number of unreported cases leading to more transmission of disease germs more rapidly, which sometimes leads to outbreaks in a particular locality or even in administrative circles.

Figure 3.39: Distribution and Incidence of Ef in Mokokchung district (sampled area)



Source: Primary Data

Figure 3.40: Monthly distribution of Ef in Mokokchung district



Source: Primary Data

The recorded cases of Ef disease steadily start to increase from the month of March and go up to September or October. The most infected months in the district of Mokokchung are from June to September, where these 4 months have warm and moist climatic conditions throughout the state and even in Mokokchung district. Particularly, in the Mokokchung district the highest incidence case is found in circles adjoining to Assam plains where the temperature is higher than in hilly regions like Kubolong or Ongpankong circles. Thus, the recorded cases also declined from lower altitude to high altitude areas.

3.3.6 Mon district

Mon district lies in the extreme South Eastern part of Nagaland with a total geographical area of 1786 sq. km. The district most home to the Konyak tribe of Nagaland. As per the 2011 census, the district is considered to have the lowest literacy rate in the state of Nagaland with about 56.99%, which is way below the average of the state of Nagaland which stood at 79.55%. In the health institutions sector, the district has 72SCs, 14PHCs, 3 CHCs and 1 DH.

The highest recorded cases are Ar, followed by Ad, Hy, Ef etc. In Mon district, Whooping cough disease still persist, which is not been reported in other districts of Nagaland. Disease recorded data under Mon district is poor due to negligence, poor health infrastructure in some circles and also unavailability of medical staff in the far-flung areas of the district. The most affected are the rural populations or villages which could not access health institutions for quality health care.

Table 3.8: List of diseases in Mon district (sampled area)

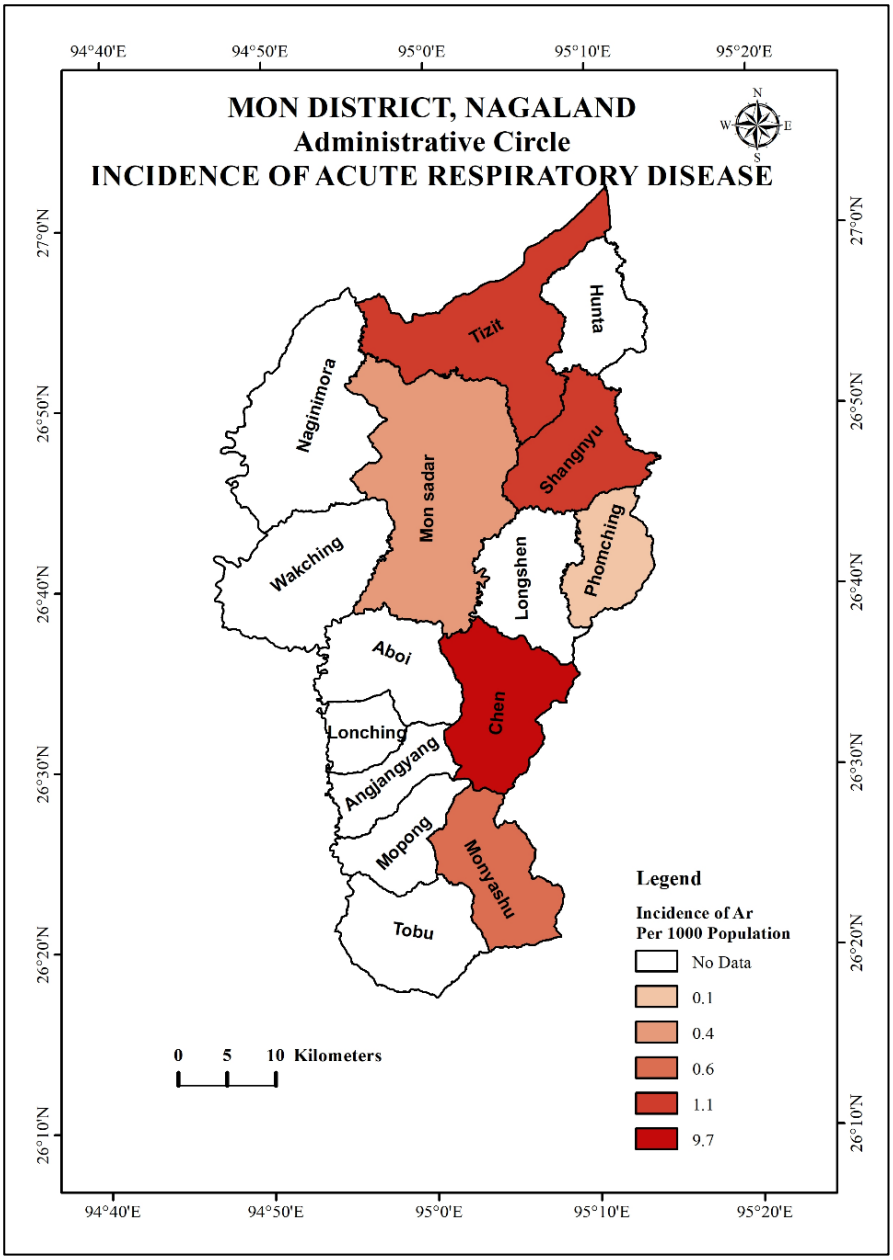
Sl. No.	**Name of Disease**	**Total no. of Recorded cases**	**Incidence per 1000 population**
1	Acute Respiratory	490	1.72
2	Acute Diarrhoel	265	0.93
3	Hypertension	259	0.91
4	Enteric Fever	242	0.85
5	Whooping Cough	110	0.39
6	Diphtheria	27	0.09
7	Others	118	0.41
Overall Total		**1, 511**	

Source: Health and Family Welfare

3.3.6.1Acute Respiratory disease

Acute respiratory disease a common disease in the state of Nagaland is also the most common disease in the Mon district. The highest incidence is found under Chen circles with 9.7, second is Tizit and Shangyu with 1.1 per thousand population. High incidence is found in circles that have higher temperatures and also in circles that have low basic amenities. Chen circles have a high incidence and one of the main reasons is due to the constant presence of medical staff in the health centre which has proper and regular records on health in the circle.

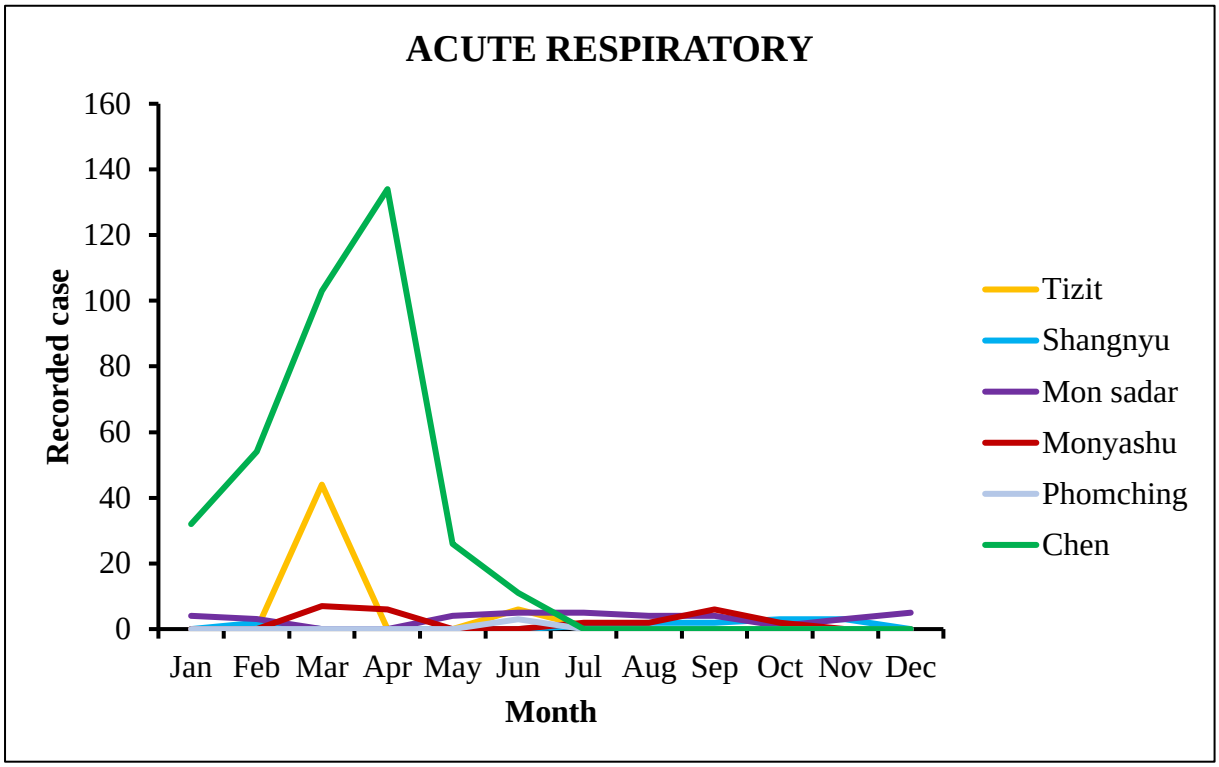
Figure 3.41: Distribution and Incidence of Ar in Mon district (sampled area)



Source: Primary Data

The highest Ar disease is recorded during the onset of pre-monsoon seasons when the temperature starts to steadily increase from very cold winter. The onset of the monsoon season changes the environment and most importantly the climatic conditions in the district. The highest recorded case is observed in the month of March.

Figure 3.42: Monthly distribution of Ar in Mon district



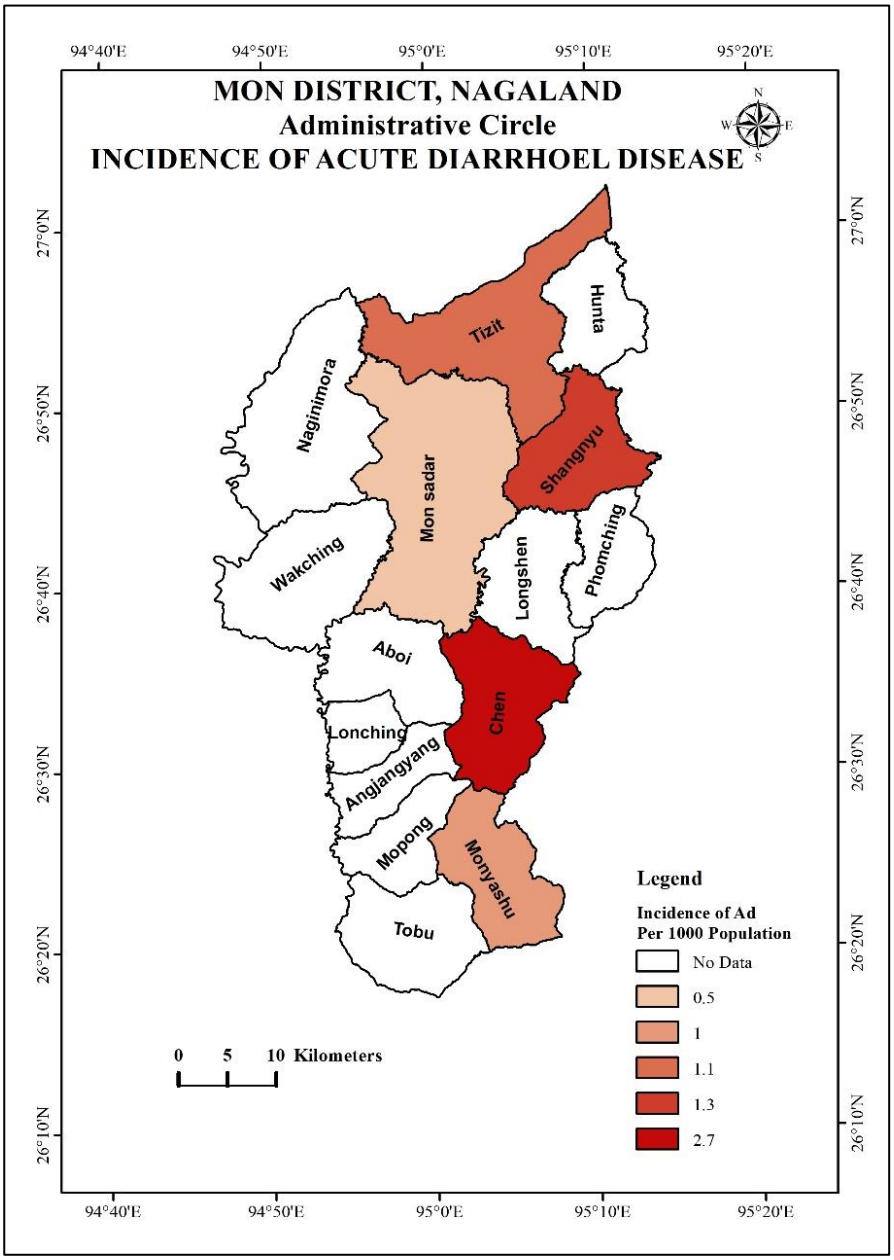
Source: Primary Data

3.3.6.2 Acute Diarrhoel disease

The second common disease in the district is Ad disease. This disease is mostly related to clean surroundings, proper sanitation, cleanliness etc. of every individual and community. Based on 2011 census data, most of the circles under Mon district has their main source of water from rivers, streams, wells etc. and sanitation is poor in the district. Lack of these basic amenities contribute to the thriving of disease germs especially Ad disease because Ad disease is transmitted through contaminated water, food etc.

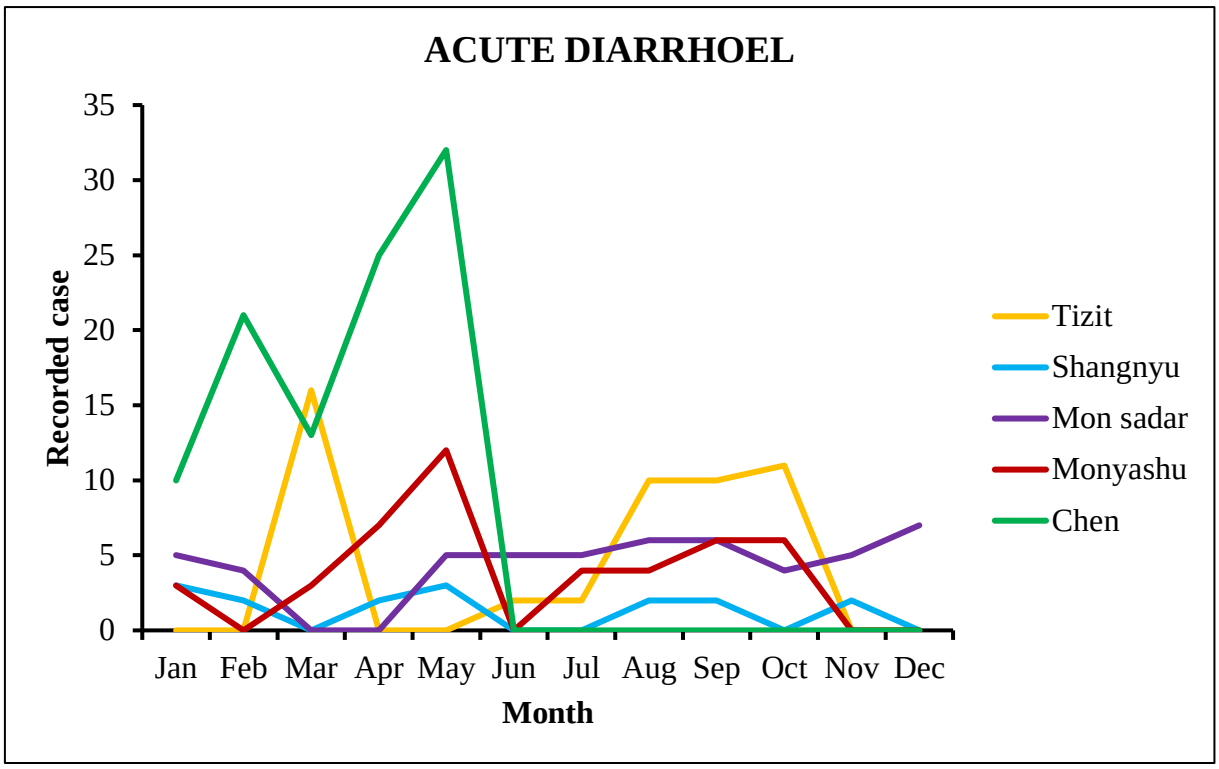
The highest incidence is found under Chen circle followed by Shangyu, Tizit, Monyashu and Mon sadar with 2.7, 1.3, 1.1, 1 and 0.5 per thousand population respectively.

Figure 3.43: Distribution and Incidence of Ad in Mon district (sampled area)



Source: Primary Data

Figure 3.44: Monthly distribution of Ad in Mon district



Source: Primary Data

A high number of Ad cases is recorded with the onset of monsoon season in the district. During this month i.e., March to April the temperature changes and there is some marginal amount of rainfall. Most people depend on water for daily use from rivers, streams etc. It is their main water source which may get polluted due to rainfall, since the rains begin in the month of March and April after a long spell of cold and dry winter months. It contributes to the accumulation of dust particles and unwanted substances in the atmosphere which comes down along with the rain and pollutes the surface water. Thus, consumption of this water may cause several diseases too.

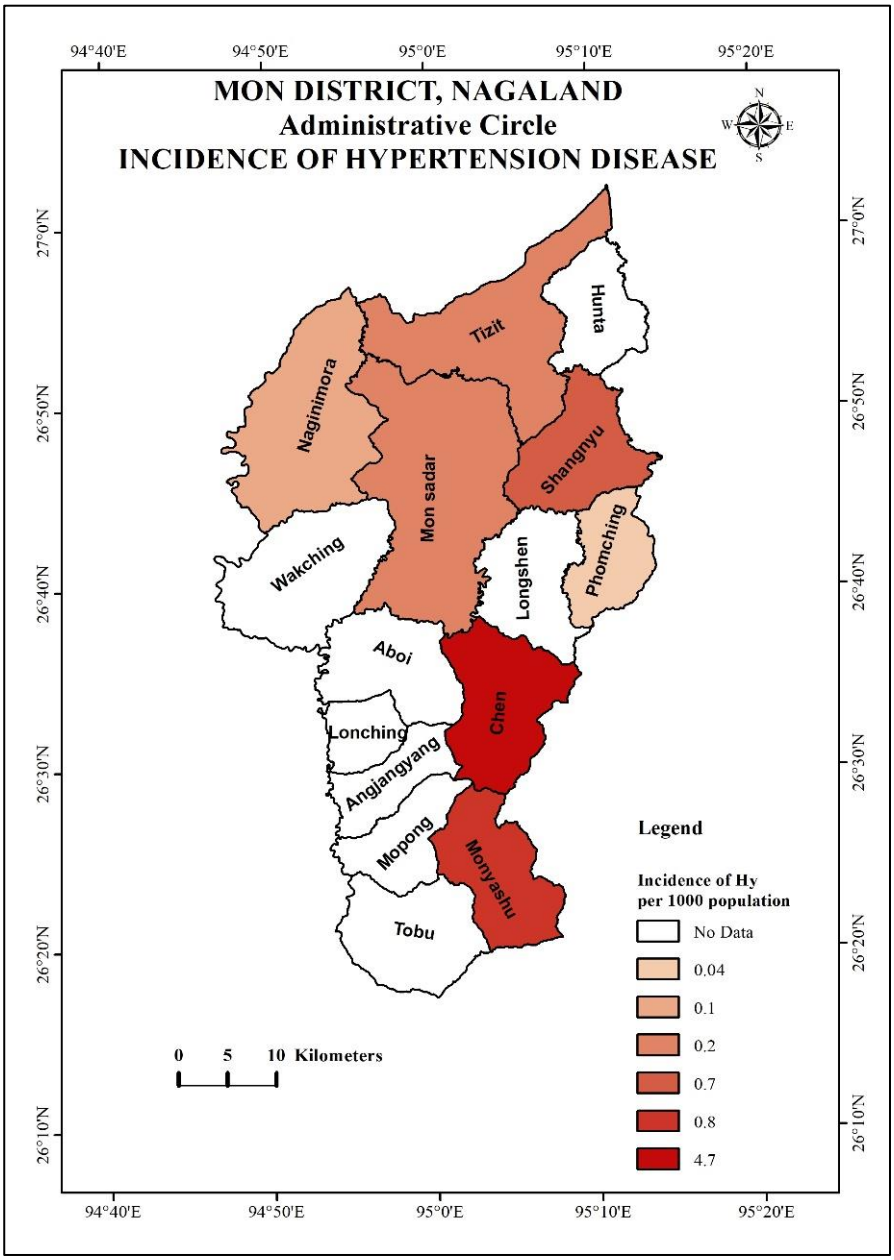
The highest recorded case is under Chen Circle in the month of May and Tizit circle too recorded high number of cases in the month of March.

3.3.6.3 Hypertension disease

The most common disease in the state of Nagaland, Mon district too does not have exceptions but it is the third most recorded case in the district.

The highest incidence of Hy disease from Chen administrative circle at 4.7, followed by Monyaskshu at 0.8, Shangyu at 0.7, Tizit and Mon sadar at 0.2, Naginimora at 0.1 and the lowest Phomching at 0.04.

Figure 3.45: Distribution and Incidence of Hy in Mon district (sampled area)



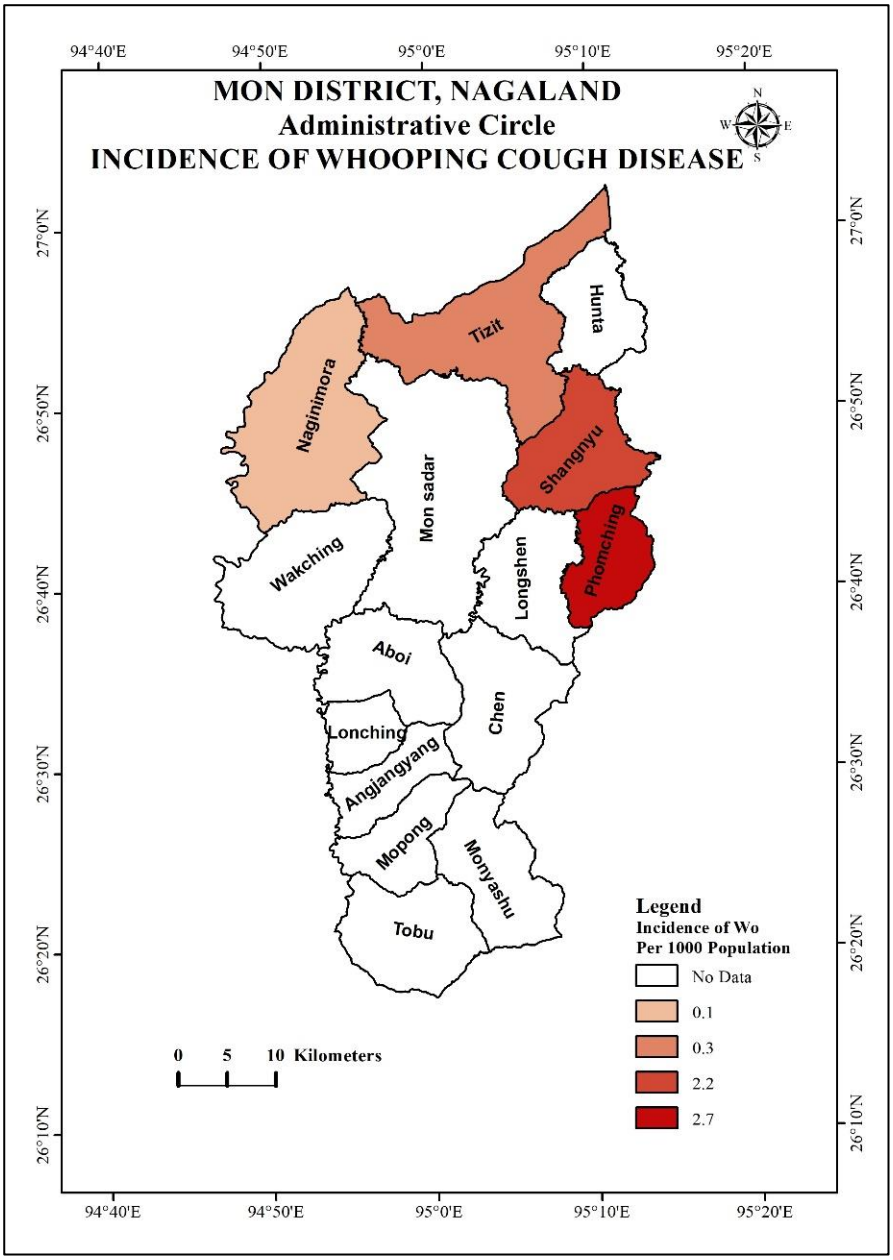
Source: Primary Data

3.3.6.4 Whooping Cough disease

Whooping cough also known as pertussis, is an extremely contagious disease caused by the bacterium Bordetella pertussis. It can be spread easily from person to person through the air from droplets produced by coughing and sneezing.

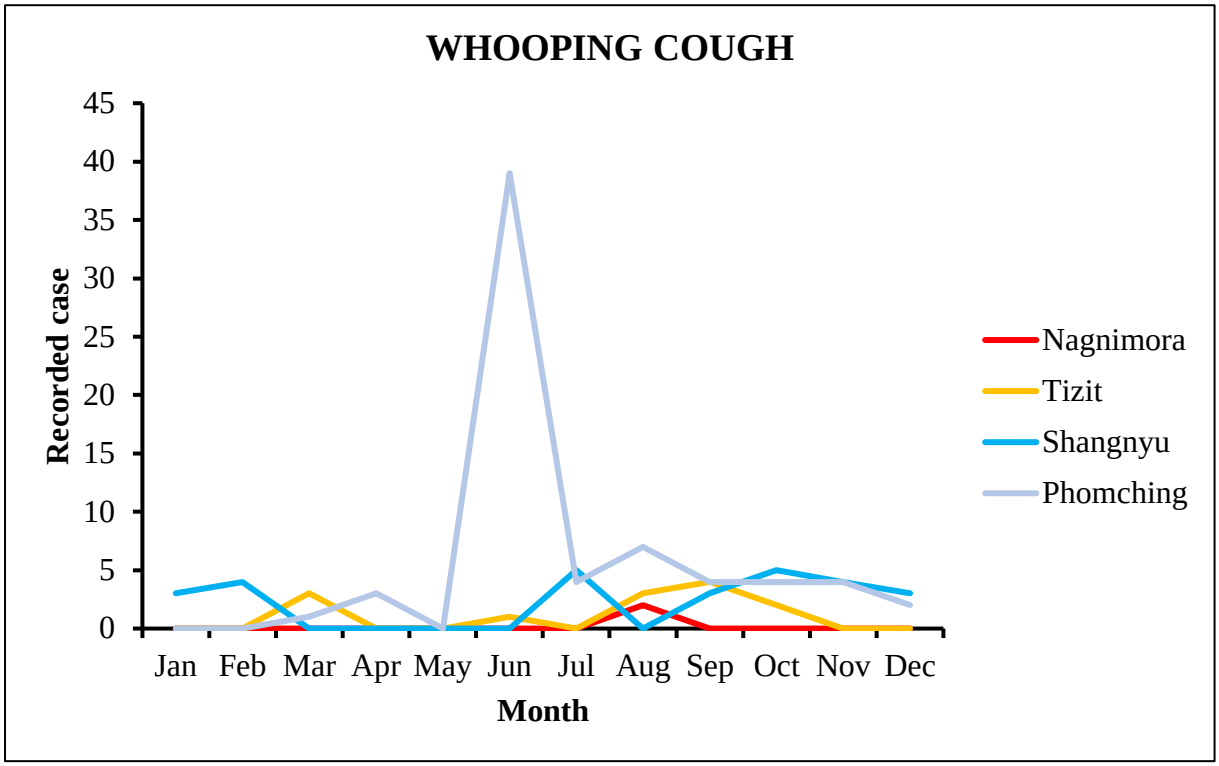
From a medical perspective, it can be prevented through vaccination, from a geographical perspective it can be prevented through a collective afford by organising awareness programmes and most importantly individual hygienic conditions. Warm temperatures influence the increased number of Wo. Thus, in this study, the highly affected areas are in the warm region and very poor hygienic conditions. Dietary habits can also be another reason in increasing the number of Wo diseases.

Figure 3.46: Distribution and Incidence of Wo in Mon district (sampled area)



Source: Primary Data

Figure 3.47: Monthly distribution of Wo in Mon district



Source: Computed by Author

The number of Wo cases increases rapidly during the summer seasons when the temperature is high with sufficient moisture in the air. During the months of May to July, the district experiences summer seasons and the disease germs must be favourable to warm temperatures. The maximum seasonal incidences of confirmed and clinical pertussis cases were reported in the summer, with winter seasons having low incidences (Ghorbani et al., 2016).

3.3.7 Peren district

Peren district has a total geographical area of 1651 sq. km. and is also the only district in Nagaland that has a National Park known as Intangki National Park. The district is home to the Zeliang tribe of Nagaland. In the health sector, it has 29 SCs, 8 PHCs, 2 CHCs and 1 DH.

The most common diseases in the district are Hypertension, Acute Respiratory, Eye, Diabetes, Enteric fever etc. and HIV+ disease is also found dominant in one particular circle of the district.

Table 3.9: List of diseases in Peren district (sampled area)

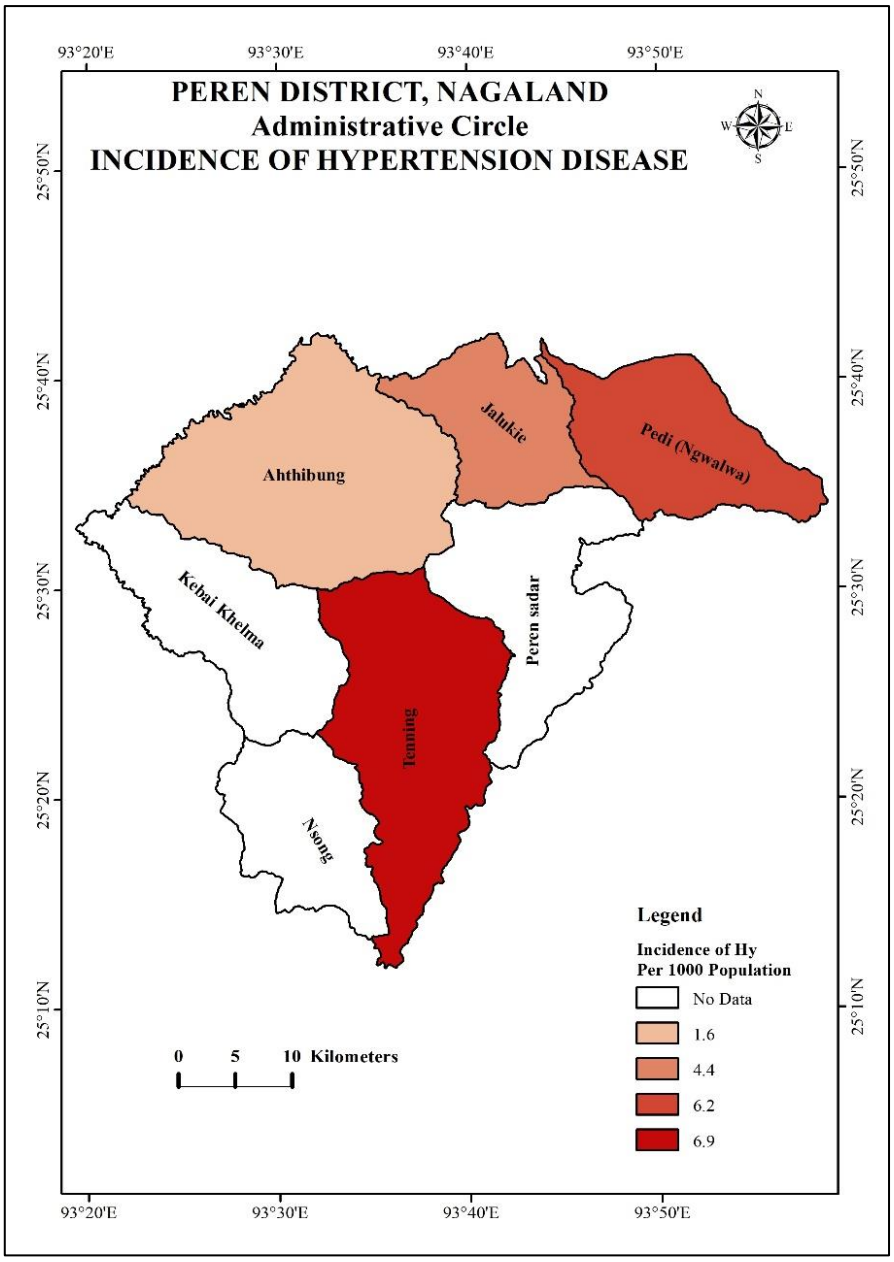
Sl. No.	Name of Diseases	Total no. of Recorded cases	Incidence per 1000 population
1	Hypertension	753	5.02
2	Acute Respiratory	662	4.42
3	Eye	580	3.86
4	Diabetes	420	2.8
5	Enteric Fever	361	2.4
6	Oral Cavity	300	2
7	Acute Diarrhoel	294	1.96
8	Common Fever	120	0.8
9	HIV Positive	107	0.71
10	Others	90	0.6
Overall Total		**3, 687**	

Source: Health and Family Welfare

3.3.7.1 Hypertension disease

Hypertension is the most common disease in the district and the highest incidence is under Tenning Circle with 6.9, followed by Pedi (Ngwalwa), Jalukie and Ahthigbung with 6.2, 4.4 and 1.6 per thousand respectively. To ascertain the reasons behind why there is a high incidence of Hy disease, questionnaires were passed to medical staff, and the result is due to rapid change in lifestyle and improper care of health. In geographical aspects, it may be due to the rapid change in temperature and also being a hilly region the ascend and descend on the hills may also result to Hy related cases.

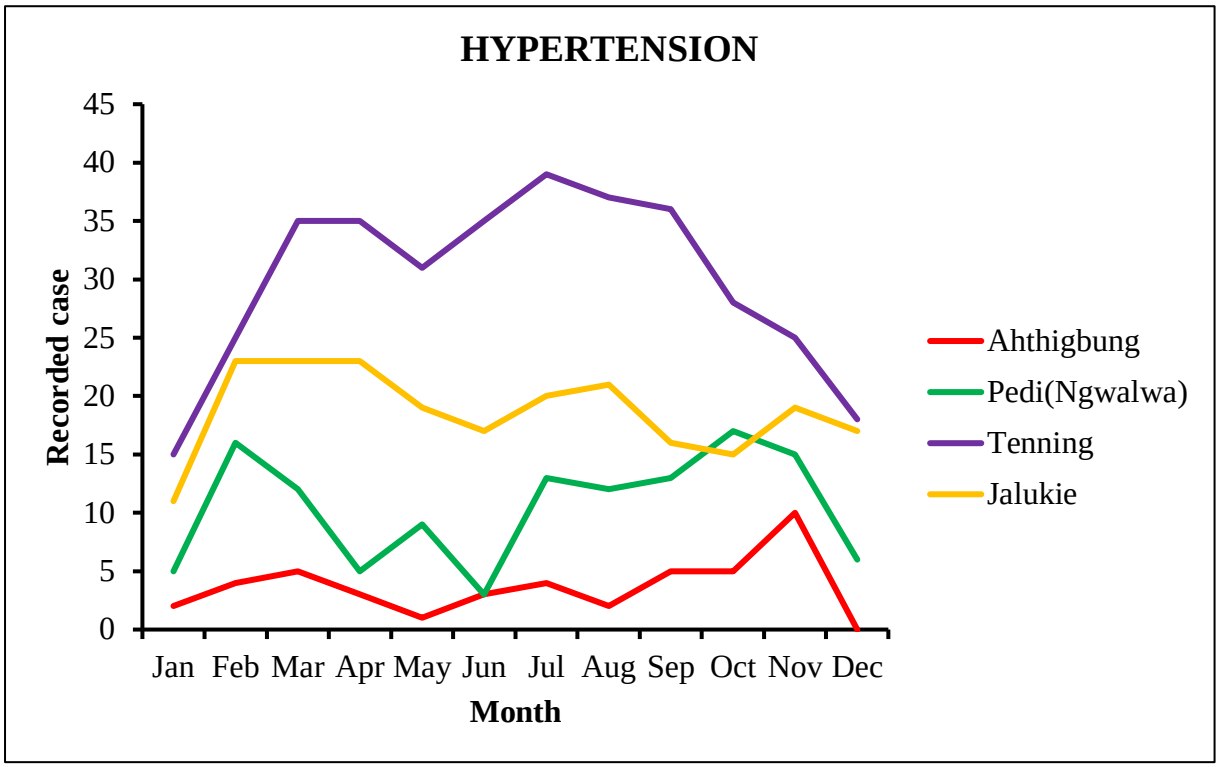
Figure 3.48: Distribution and Incidence of Hy in Peren district (sampled area)



Source: Primary Data

Based on the monthly recorded cases of Hy disease in the district, a high number of cases is recorded during the warm season i.e., from March to October in almost all the health centres that have been sampled. This indicates that warm climatic conditions influence the Hy disease as our body temperature cannot regulate the surrounding warm air. Another reason may be the people mostly being laborious farmers, working in their agriculture fields in warm conditions may result in a high number of Hy cases.

Figure 3.49: Monthly distribution of Hy in Peren district



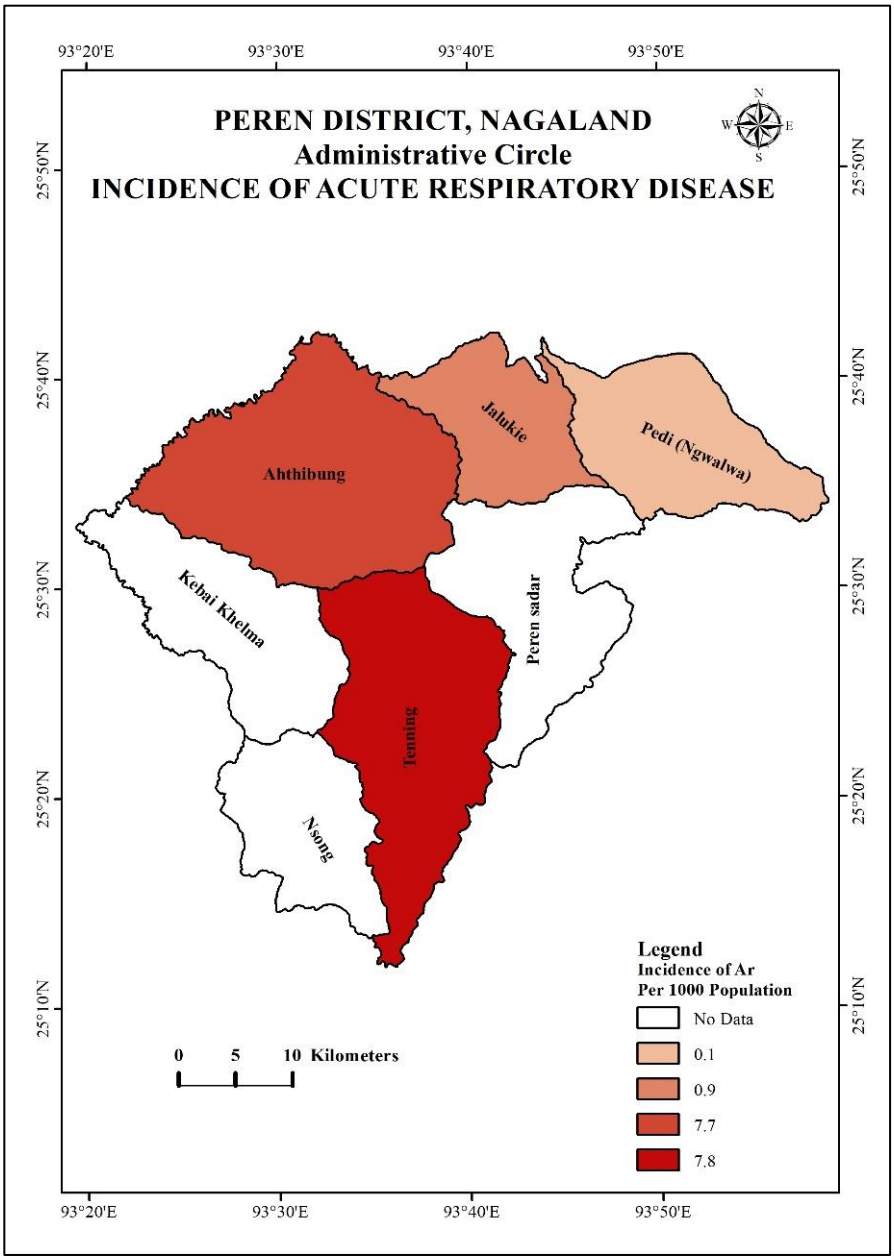
Source: Primary Data

3.3.7.2 Acute Respiratory disease

A communicable disease Ar is the second most common disease in the district. Ar diseases are very much related to the influence of temperature and environmental conditions. Being mostly covered by forest or vegetation the influence of it may also play a crucial role in a high incidence of Ar disease. As per the questionnaires that have been provided to the medical staff, large forest cover may lead to unforeseen number of diseases as known or unknown germs adapt easily to the natural vegetation harming man's health.

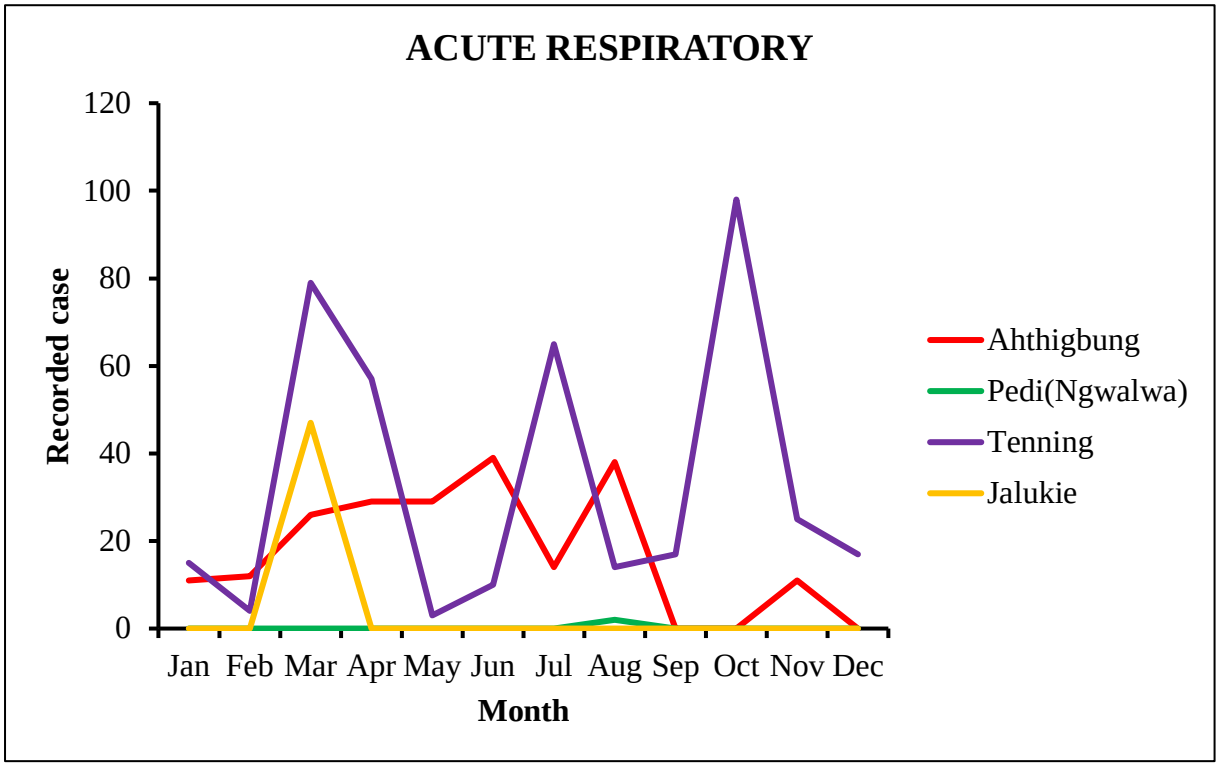
The highest incidence is under Tening administrative circle, followed by Ahthibung, Jalukie and Pedi (Ngwala). As per the distribution of Ar in Peren district, Ar disease is more prominent in the colder climate or higher altitude areas than the warmer regions or lower altitude areas.

Figure 3.50: Distribution and Incidence of Ar in Peren district (sampled area)



Source: Primary Data

Figure 3.51: Monthly distribution of Ar in Peren district



Source: Primary Data

A regular number of cases is recorded in Tenning circle. On the distribution of Ar disease in Peren, it has higher incidence in higher altitude areas and in temperature perspective, high altitude is colder than lower altitude areas. In contrast to temperature and altitude, high number of Ar disease cases are recorded in Tenning which have higher altitude than the other sampled circle but by observing the monthly distribution figure no. 3.51, a number of high Ar cases even in Tenning circle is also recorded, when the circle is experiencing high temperature in the month of March and April and July to September months. Thus, it can be concluded Ar disease requires warm and moist temperature to thrive.

In Tenning circle, reason behind high number of cases is also due to regular presence of medical doctor in the assigned health centre where the regular health care system is performed well and also maintaining consistency of data management.

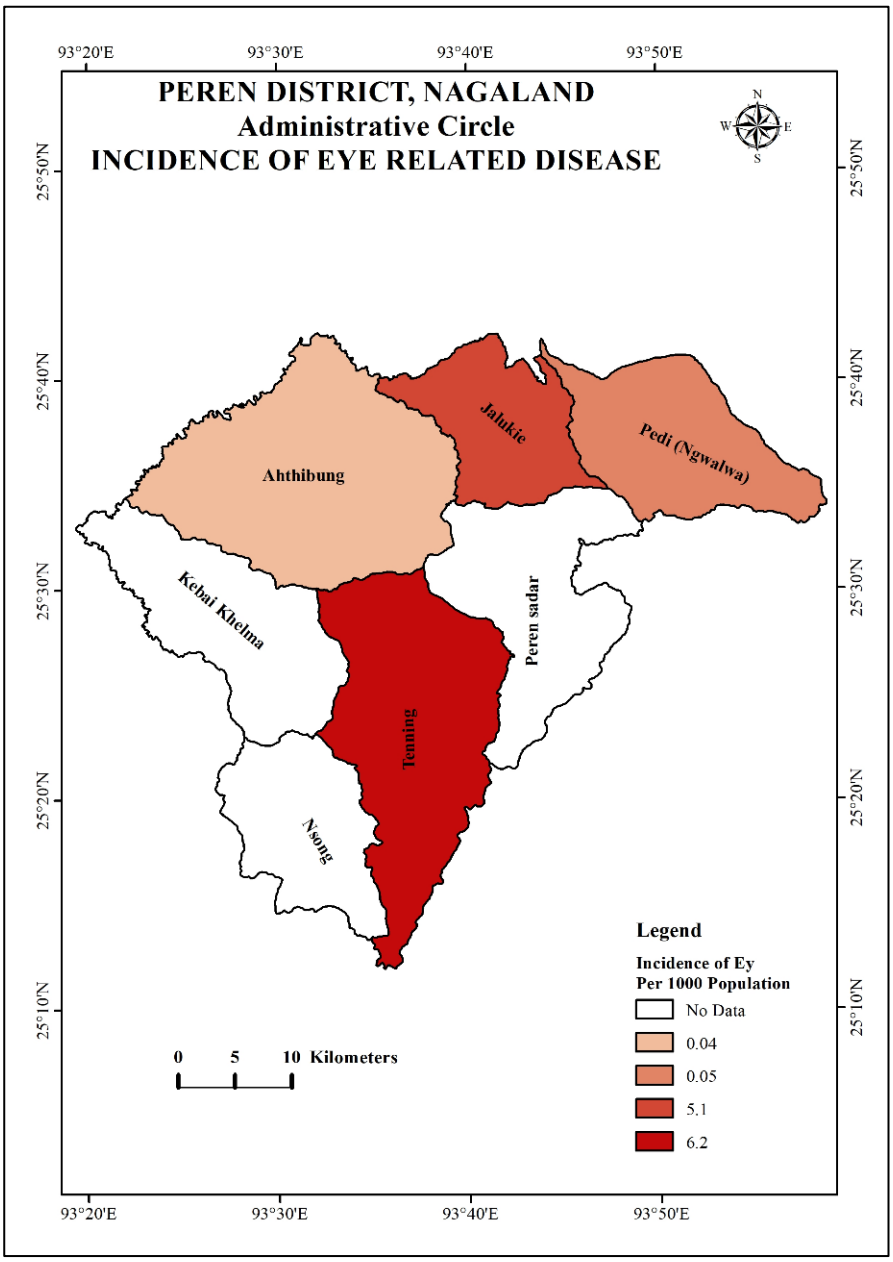
3.3.7.3 Eye related disease

Eye is also a common disease in the district of Peren. The highest incidence of the eye is recorded from Tenning, Jalukie, Pedi (Ngwalwa) and Ahthigbung with 6.2, 5.1, 0.05 and 0.04 per thousand respectively.

Evaluation of the causes of disease in the district, personal interactions and questionnaires were passed to the medical staff and general public. It was found that most of the cases were due to improper care of the eyes, and being farmer most of them cannot afford and hence do not wear any protective gear, resulting in dust, tree branches or even crops etc hurting their eye.

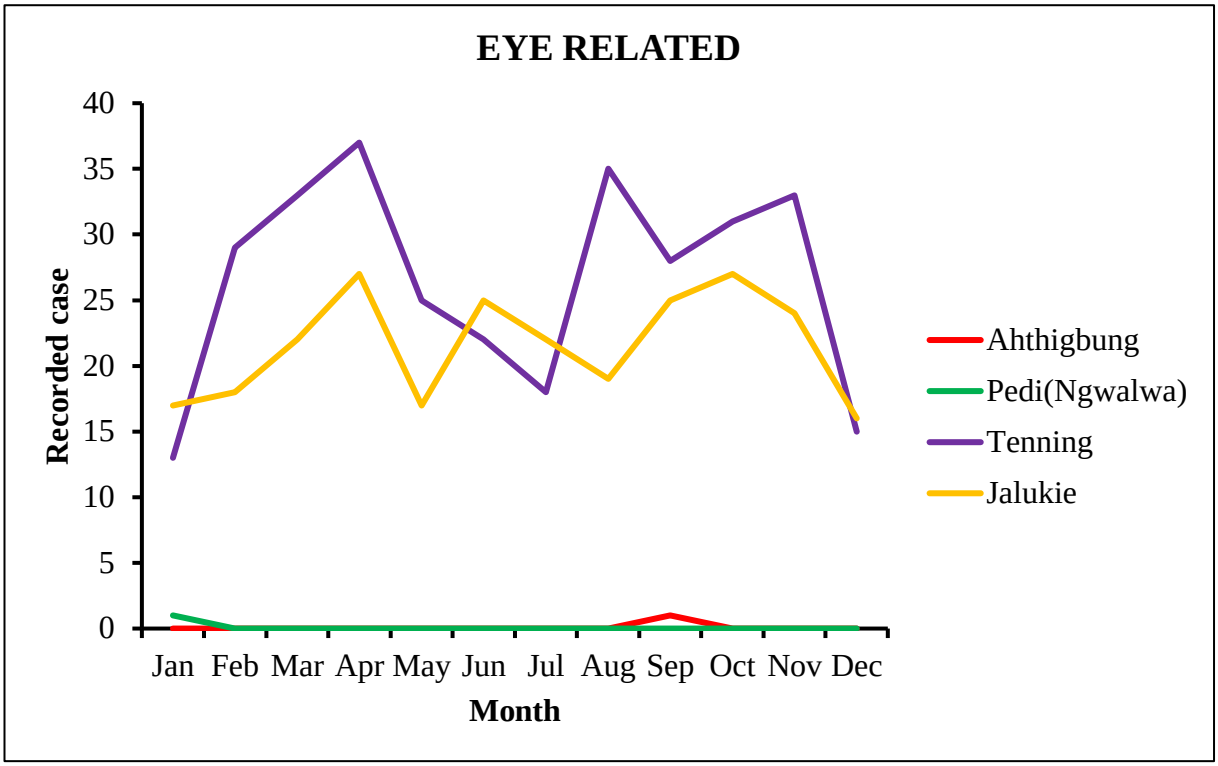
Another reason behind this is, that the district being situated in a hilly region there are some cases of cataracts.

Figure 3.52: Distribution and Incidence of Ey in Peren district (sampled area)



Source: Primary Data

Figure 3.53: Monthly distribution of Ey in Peren district



Source: Primary Data

A high number of cases is recorded during the month of March and April. During these two months the climatic conditions change which results in changes of seasons like the arrival of monsoon. This result in high windy conditions during which the winds can pick up dust particles and also because of change in climatic conditions germs may start to thrive. Again, in the month of August to October or sometimes up to November high number of cases is also recorded. During these months, the temperature conditions is favourable for disease germs to multiply and become effective due to warm and moist air conditions. Another is because being a farmer, these are the crucial months when the farmers harvest their crops resulting in hurting their eyes from crops and minute hay particles.

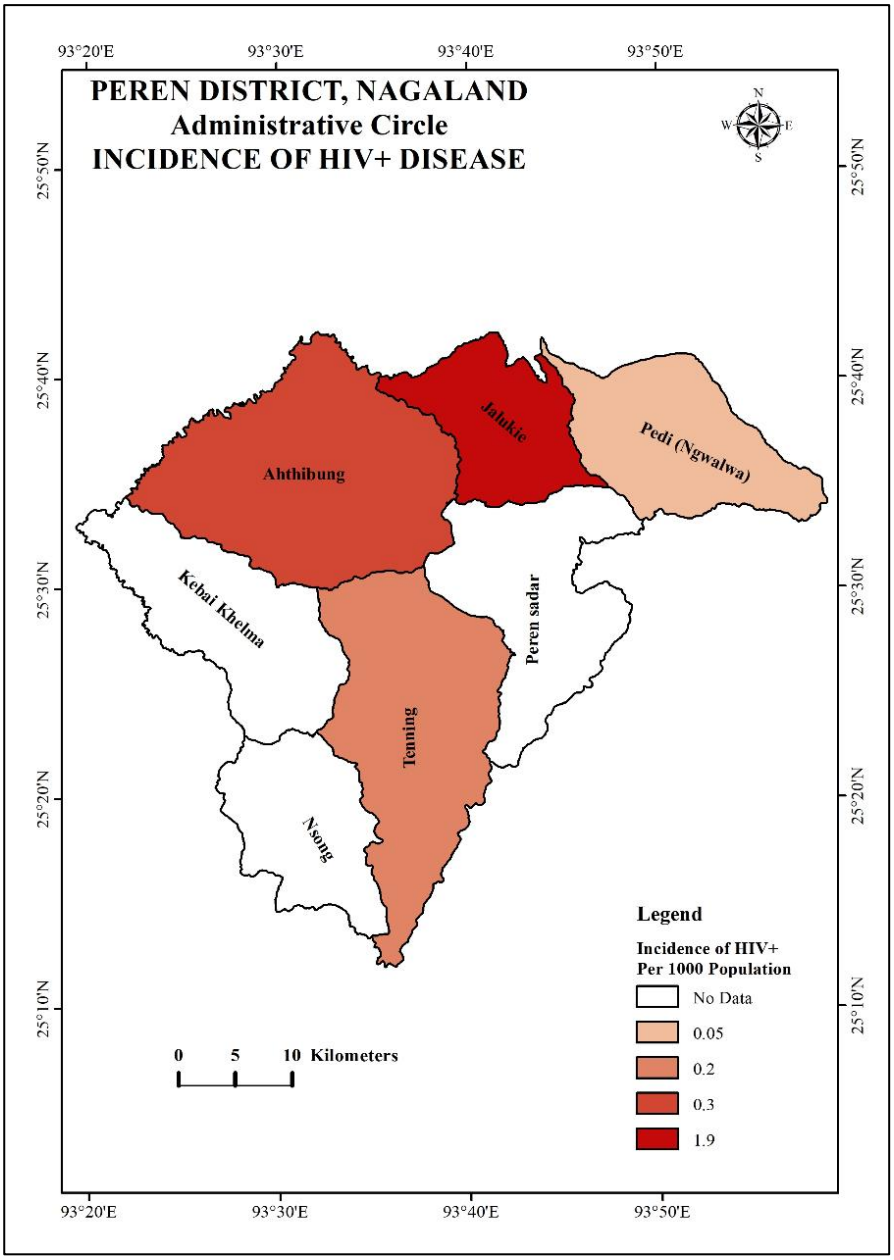
3.3.7.4 HIV+ disease

Improper sexual intercourse, infected injection from needles, improper transfusion of blood etc. are some of the sources of transmitting the HIV+ disease. Peren district also has a high number of incidences of the case in one circle i.e., Jalukie circle. Upon investigation it is mostly from unprotected sexual intercourse and drug users are the main route of transmission. Peren district is bounded by the state Manipur in the South and East, Assam on the West and Dimapur and Kohima district on the North. It has a long boundary line with the state of Manipur

and does not have a boundary wall, which makes it easy accessibility from one state to another. The Northeastern states of India lie in the Golden Triangle where it can have easily access to drugs. This is also one of the reasons why a high HIV+ case is found in Peren district and other district of Nagaland.

The highest incidence is under Jalukie circle with 1.9 and the lowest is Pedi (Ngwalwa) with 0.05 per thousand population.

Figure 3.54: Distribution and Incidence of HIV+ in Peren district (sampled area)



Source: Primary Data

3.3.8 Phek district

Phek district is home to the Chakhesang and Pochury tribes of Nagaland. It has a total geographical area of 2026 sq. km. with its headquarter at Phek. The district has the highest number of PHC health institutions in Nagaland with an overall total health institution of 52 SCs, 23 PHCs, 3 CHCs and 1 DH.

Some of the prominent common diseases in the Phek district are Acute Respiratory, Hypertension, Oral cavity, Scrub typhus etc.

Table 3.10: List of diseases in Phek district (sampled area)

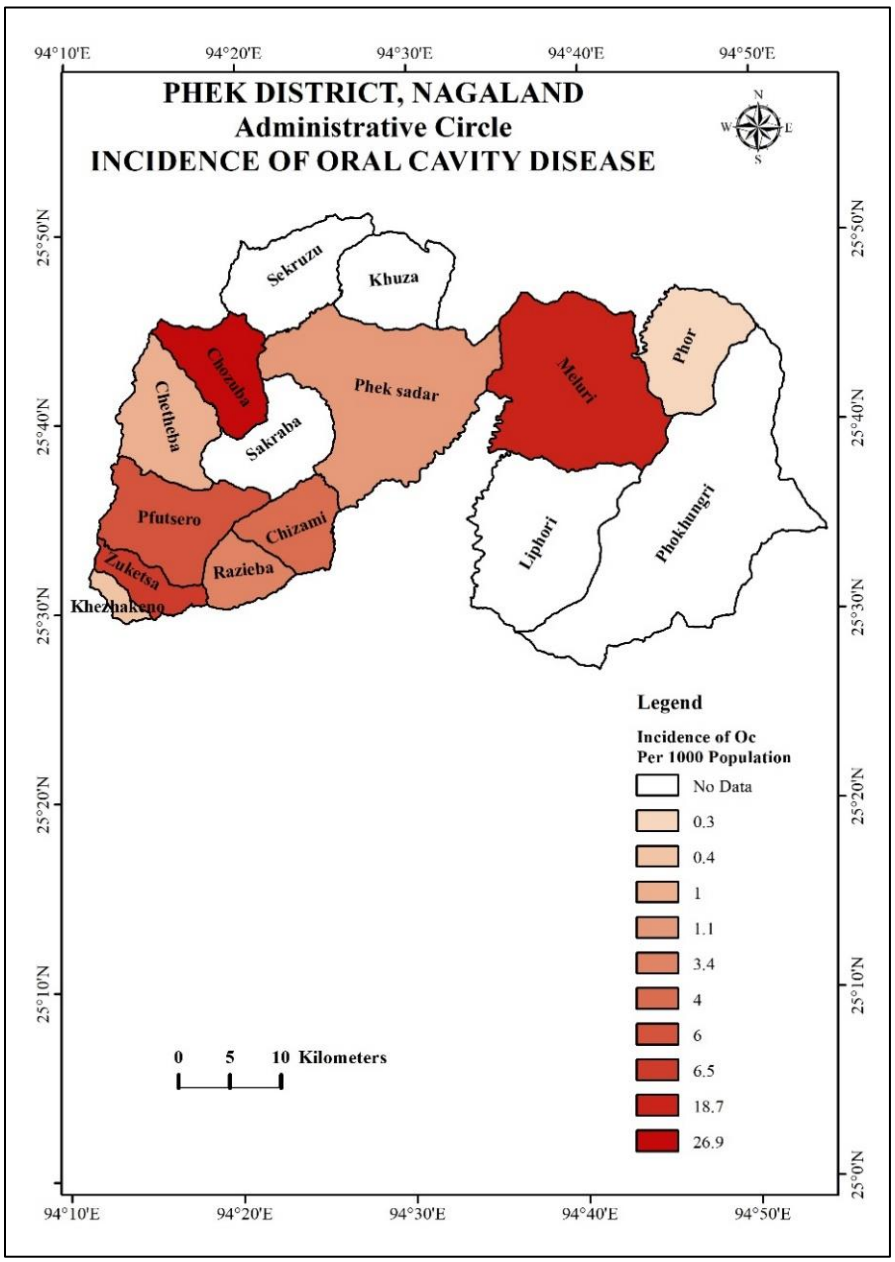
Sl. No.	**Name of Diseases**	**Total no. of Recorded cases**	**Incidence per 1000 population**
1	Oral Cavity	1915	7.3
2	Acute Respiratory	1780	6.8
3	Hypertension	1491	5.7
4	Enteric Fever	765	2.9
5	Acute Diarrhoeal	647	2.5
6	Common fever	266	1
7	Eye	236	0.9
8	Diabetes	99	0.4
9	HIV+ve	68	0.3
10	Scrub Typhus	65	0.2
11	Others	135	0.5
Overall Total		**7, 467**	

Source: Health and Family Welfare

3.3.8.1 Oral cavity related

The oral cavity is a common disease in Phek district, with the highest incidence recorded under Chozuba Circle at 26.9, Meluri circle at 18.7 and third under Zuketsa at 6.5 and Pfutsero circle at 6 per thousand population. The least is recorded under Phor at 0.3 per thousand population. The top circles that have high incidence cases of Oc related diseases may be due to better health facilities and also the presence of medical practitioners in the concerned field which draws a good number of people from neighbouring circles or villages to visit the health institutions for better health care. Another reason is most of the people in the district chew tobacco products and improper care of their Oral health leads to a high number of incidences.

Figure 3.55: Distribution and Incidence of Oc in Phek district (sampled area)



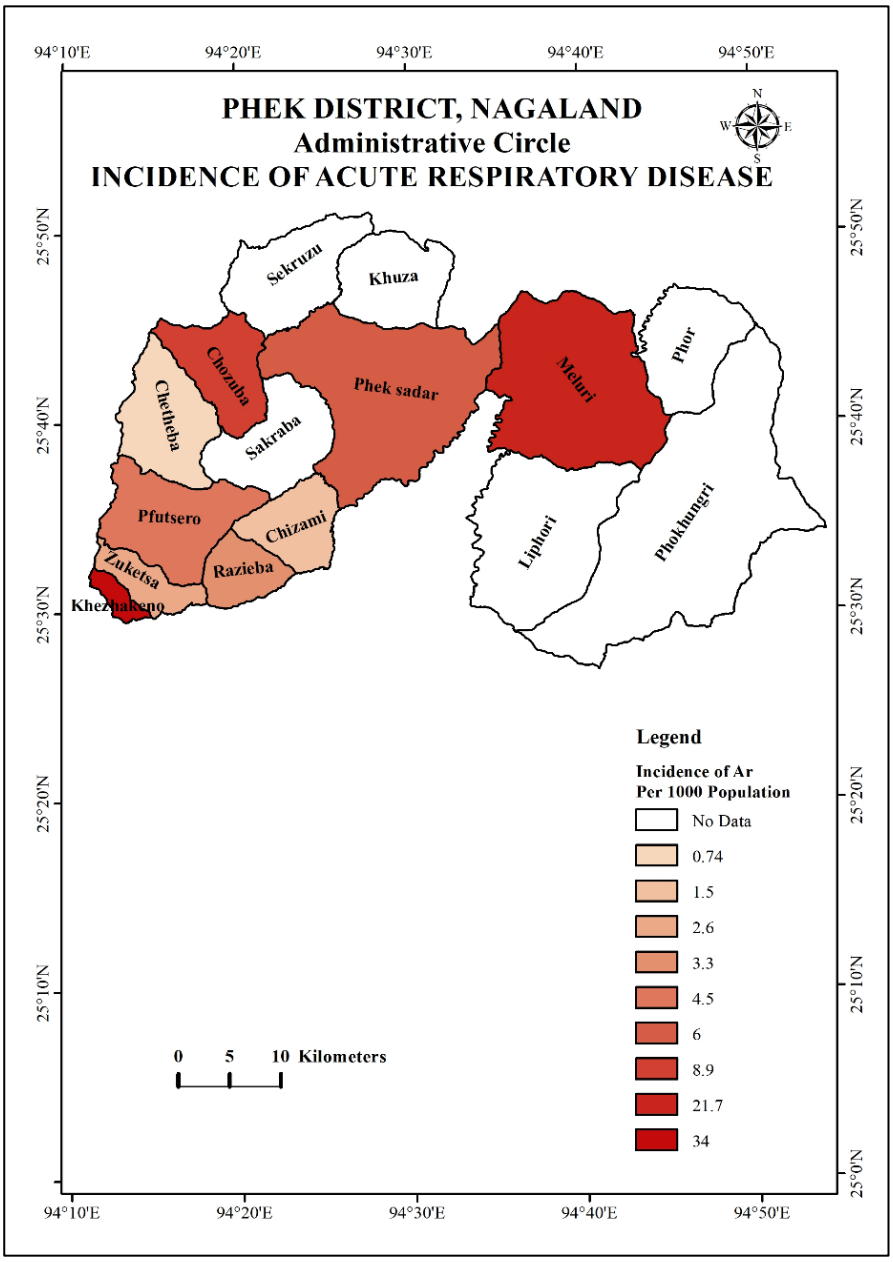
Source: Primary Data

3.3.8.2 Acute Respiratory disease

Ar diseases are communicable and also mostly influenced by climatic factors especially sudden changes in temperatures. The highest incidence case is Khezhakeno at 34, Meluri circle at 21.7 followed by Chozuba at 8.9, Pfutsero at 4.5 per thousand population. The disease thrives best in areas where it has a warm and moist climate during the monsoon seasons. Analysing the top three circles under Phek district, this circle i.e., Khezhakeno, Meluri and Chozuba have low altitudes resulting more warmer than the rest of the other circles. For example, the

temperature in Meluri and Chozuba sometimes reaches even to 35ºC max. in the summer season.

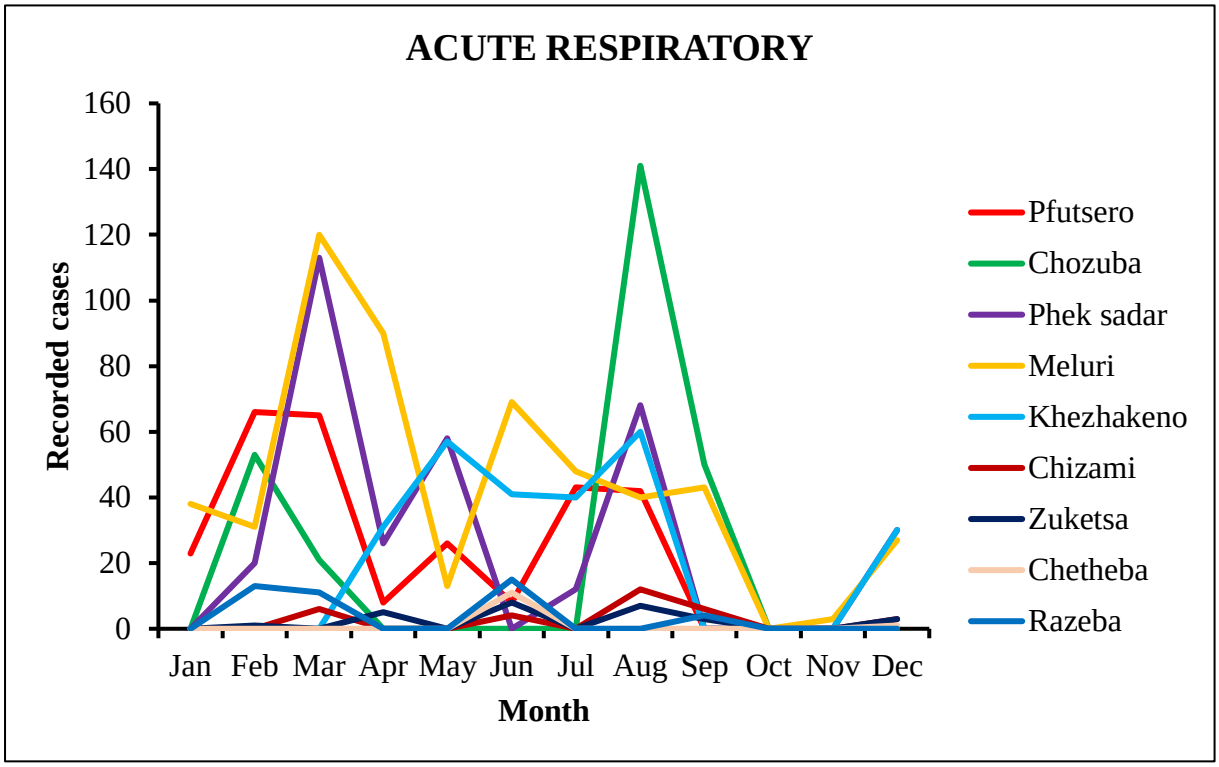
Figure 3.56: Distribution and Incidence of Ar in Phek district (sampled area)



Source: Primary Data

The highest recorded number of cases of Ar disease is in the months of March and April and again in the months of July to September. Usually after the long and cold winter season and with the onset of the warm and moist monsoon season in the district, the number of cases starts to increase rapidly. With the change in temperature, the human body is not able to balance with the surrounding environment and also allows disease germs to become more active in damp climatic conditions.

Figure 3.57: Monthly distribution of Ar in Phek district



Source: Primary Data

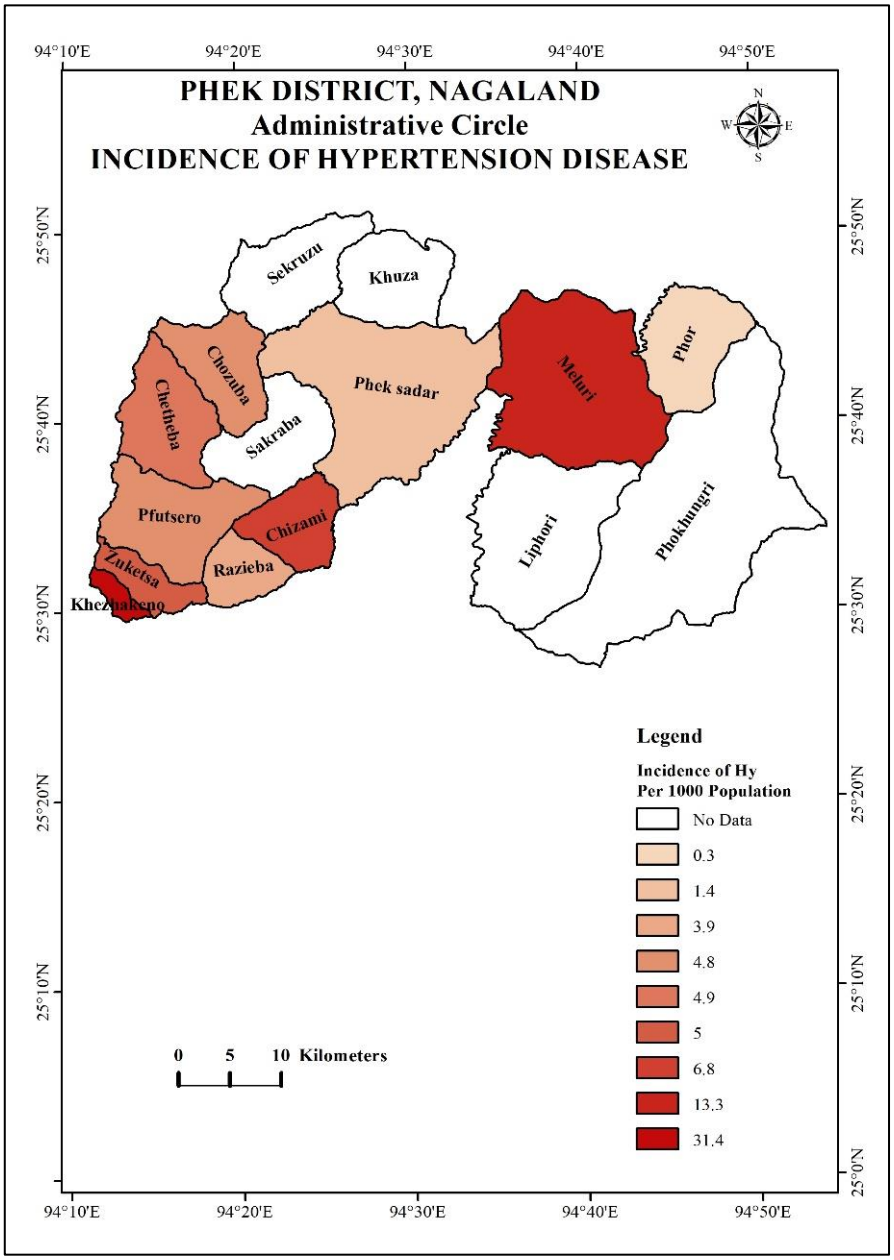
3.3.8.3 Hypertension disease

Upon interactions with medical staff and also with some patients it was found out that unchecked lifestyle, improper dietary habits, social and economic tension, lack of physical activity etc. are some of the factors attributed to a high number of Hy diseases in the district.

Khezhakeno circle has the highest recorded incidence of Hy at 31.4, Meluri circle at 13.3, Chezami 6.8 and Zuketsa at 5 per thousand population.

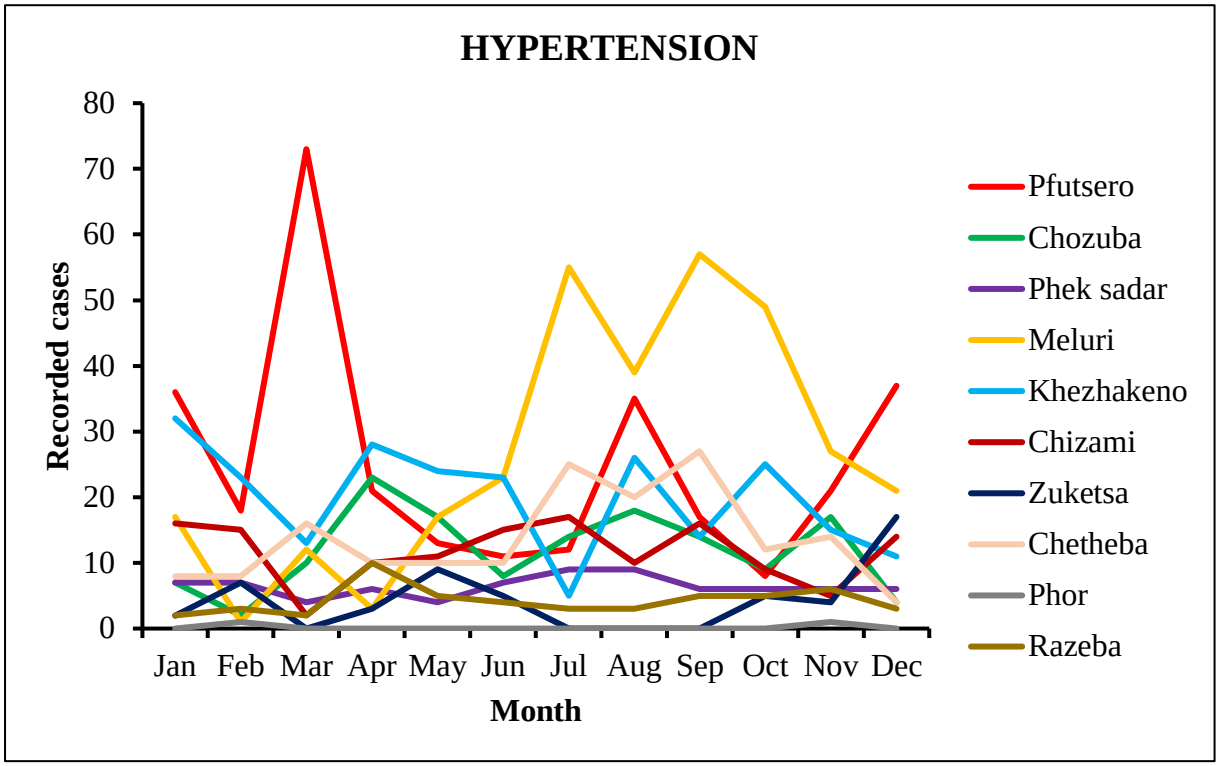
A high incidence case of Hy is found both in rural and urban areas in the district. In rural areas, it may be due to socioeconomic problems and mostly being farmers, work-related stress or physical exhaustion can increase the number of cases. In Urban areas, it is mainly due to a lack of physical activity and changes in lifestyle.

Figure 3.58: Distribution and Incidence of Hy in Phek district (sampled area)



Source: Primary Data

Figure 3.59: Monthly distribution of Hy in Phek district



Source: Primary Data

As per the figure no. 3.59, a high number of cases is recorded in the months of March and April, and again in the months of July to October. During these months the climatic conditions do greatly vary due to the onset of monsoon and winter seasons in the district. This change in temperature may result in our body temperature not being able to adjust to the surrounding environment properly.

The people in the district are mostly farmers. Being a hilly state, their agriculture field depends on good monsoon and also required hard physical labour. This leads to excessive physical work, sleepless night to oversee that irrigation is properly reached to their agriculture field in times of bad monsoonal period, protect their field from natural calamities etc can cause stress and anxiety which can cause high incidence of Hy.

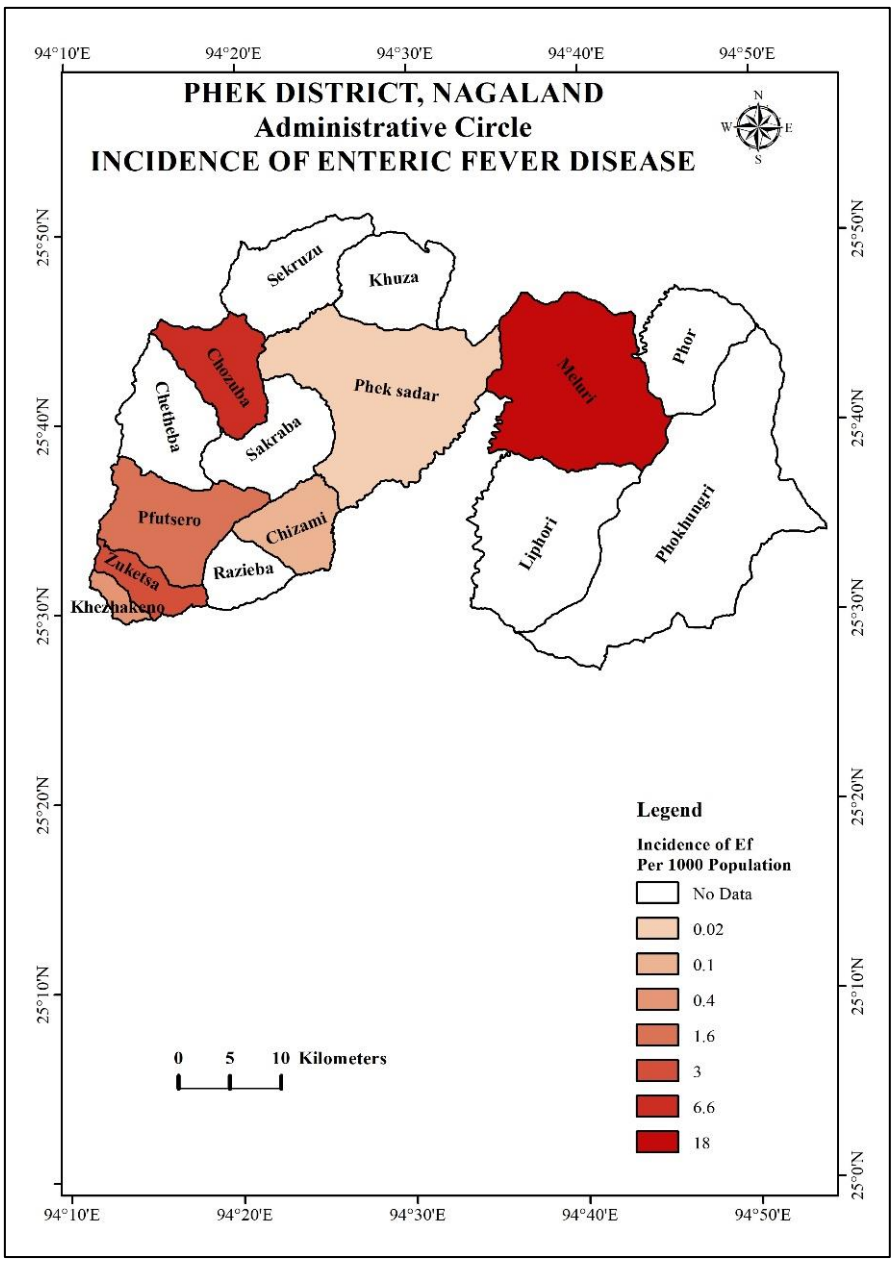
3.3.8.4 Enteric fever disease

Enteric fever is the fourth-highest recorded number of diseases in the district. It is prevalent in almost all the areas of the district. As per the 2011 census data, almost all of the villages or the administrative circle's main source of water is tap water, but this tap water is not purified. The tap water sometimes were polluted from the main source of origin because it is

not properly built to filter the water and thus pollutants like heavy rainfall leading to origin of numerous turbidity streams, animal excreta, decay of flora etc. can cause water pollution. Apart from tap water, in some areas or villages, people are still dependent on natural streams, tanks, lakes etc. as their main water source for daily used which can increase the origin and spread of Ef disease.

The highest incidence is under Meluri circle at 18, followed by Chozuba circle at 6.6, Zuketsa at 3 per thousand population. Of all the circles in the Phek district Meluri circle is the least with only about 36.77 % of the circle's main source of water being tap water. This allows the majority of the people to depend on other sources. Another key reason is also due to the low literacy rate, prevention measures were not disseminated to the people, which results in an increased number of cases.

Figure 3.60: Distribution and Incidence of Ef in Phek district (sampled area)

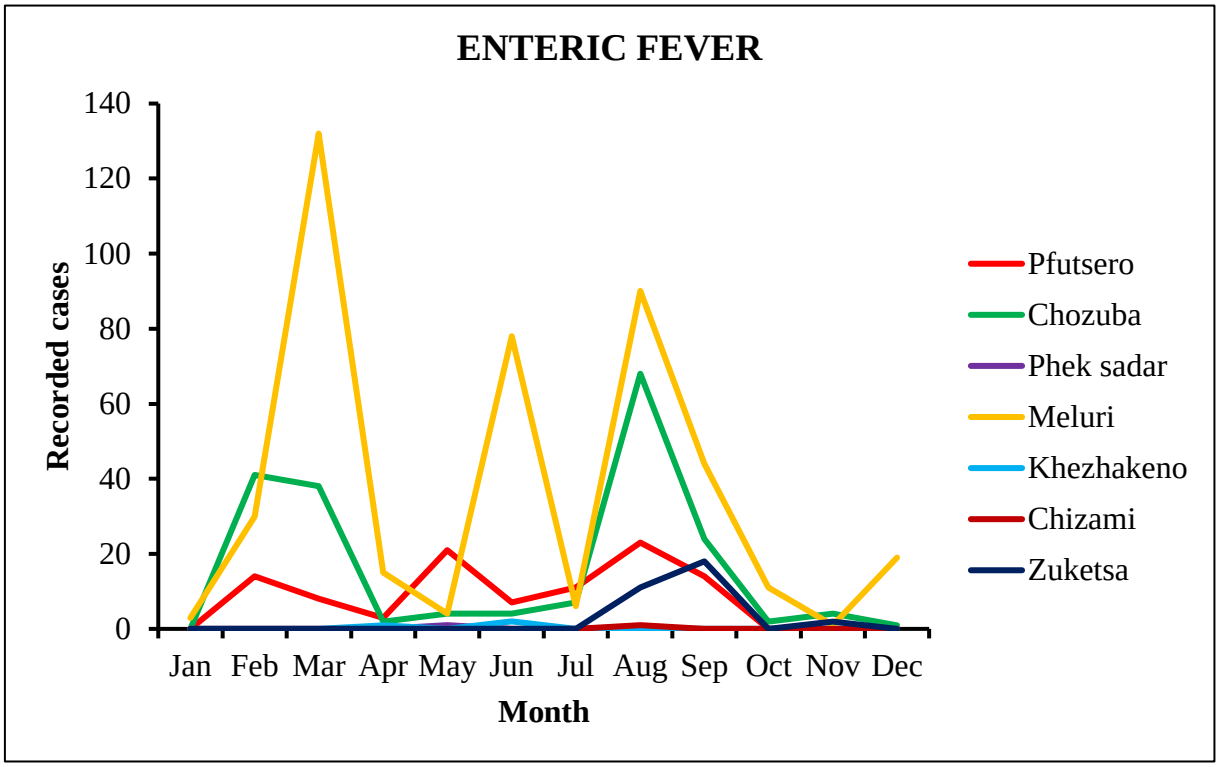


Source: Primary Data

Enteric fever disease is also same as other diseases, a high number of cases is recorded at the onset of the monsoon and winter seasons, high case is recorded in warm and moist climates, especially in the summer season. The disease sometimes even becomes threatening to life. People in the district lack knowledge of prevention and most of the cases also go unreported which allows the disease to be rapidly transmitted from an infected person to an unaffected person.

The highest incidence or recorded case circles like Meluri and Chozuba circle experiences high temperature with enough moisture content in the air that trigger the disease germs to grow rapidly and infect man.

Figure 3.61: Monthly distribution of Ef in Phek district



Source: Primary Data

3.3.9 Tuensang district

Tuensang district is home to the Khaimuniugan, Sangtam, Tikhir and Yimchunger tribes of Nagland. Before the bifurcation of Tuensang district into three districts namely Tuensang, Noklak and Shamator, it is considered to be the largest district in Nagaland in terms of area with a geographical area of 2536 sq. km. The study was carried out for both the newly created districts under Tuensang district since there was no separate Chief Medical Office in Noklak and Shamator and all administrative activities of health were carried out under Tuensang Chief Medical Office.

In health sector-wise, the district has 69 SCs, 14 PHCs, 3 CHCs and 1 DH. The district is bifurcated into 16 administrative circles for easy accessibility to administrative work, security and to bring equal development to the district.

The most common diseases in the district are Oral Cavity, Acute Respiratory, Enteric fever, HIV+, Hypertension etc.

Table 3.11: List of diseases in Tuensang district (sampled area)

Sl. No.	**Name of Diseases**	**Total no. of Recorded cases**	**Incidence per 1000 Population**
1	Oral Cavity	980	3.35
2	Enteric fever	939	3.21
3	Hypertension	552	1.89
4	Acute Respiratory	423	1.45
5	Diabetes	271	0.93
6	HIV+ve	211	0.73
7	Acute Diahhroel	87	0.3
8	Common Fever	56	0.19
9	Eye related	45	0.15
10	Others	70	0.24
Overall Total		**3, 634**	

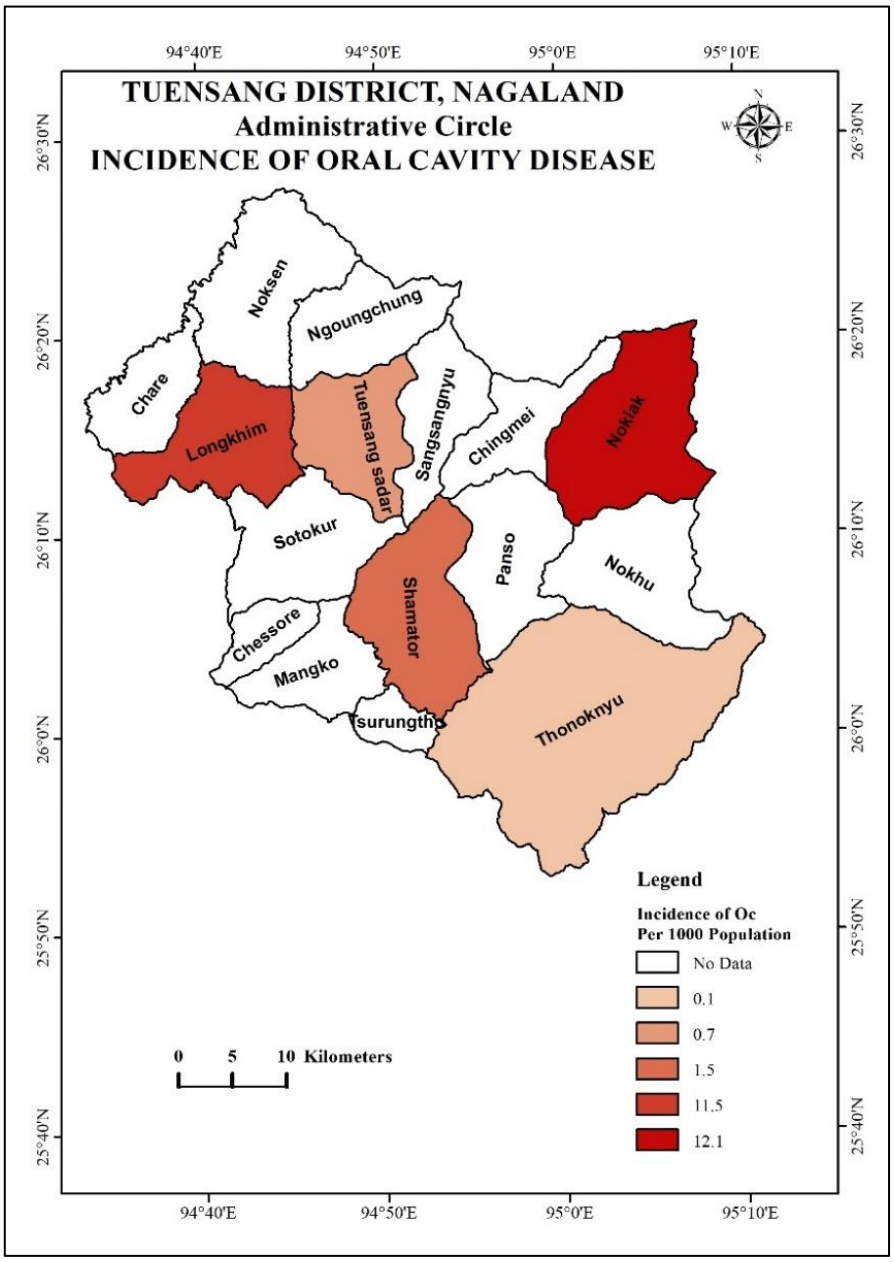
Source: Health and Family Welfare

3.3.9.1 Oral Cavity disease

The most common disease recorded in Tuensang district is Oc disease. Upon interaction with medical staff and patients it was found that most of the cases are related to improper care of their teeth, no hygiene on teeth, chewing of tobacco products, improper prevention of teeth decay awareness from parents etc are various factors that contributed to high number of cases in the district.

The highest incidence is found under Noklak administrative circle at 12.1, followed by the Longkhim circle at 11.5 with the lowest at the Thonoknyu circle at 0.1 per thousand population. A higher incidence is found under Noklak and Longkhim administrative circles than the rest of sampled circle is due to the presence of better health facilities and the presence of medical professionals which attracted people from other circles or villages to visit the health centre for better health care. Upon investigation, it is found out that a dentist posted under Longkhim circle is more regular than other medical professionals, which contributes to a more registered number of Oc related disease patients in the health centre.

Figure 3.62: Distribution and Incidence of Oc in Tuensang district (sampled area)



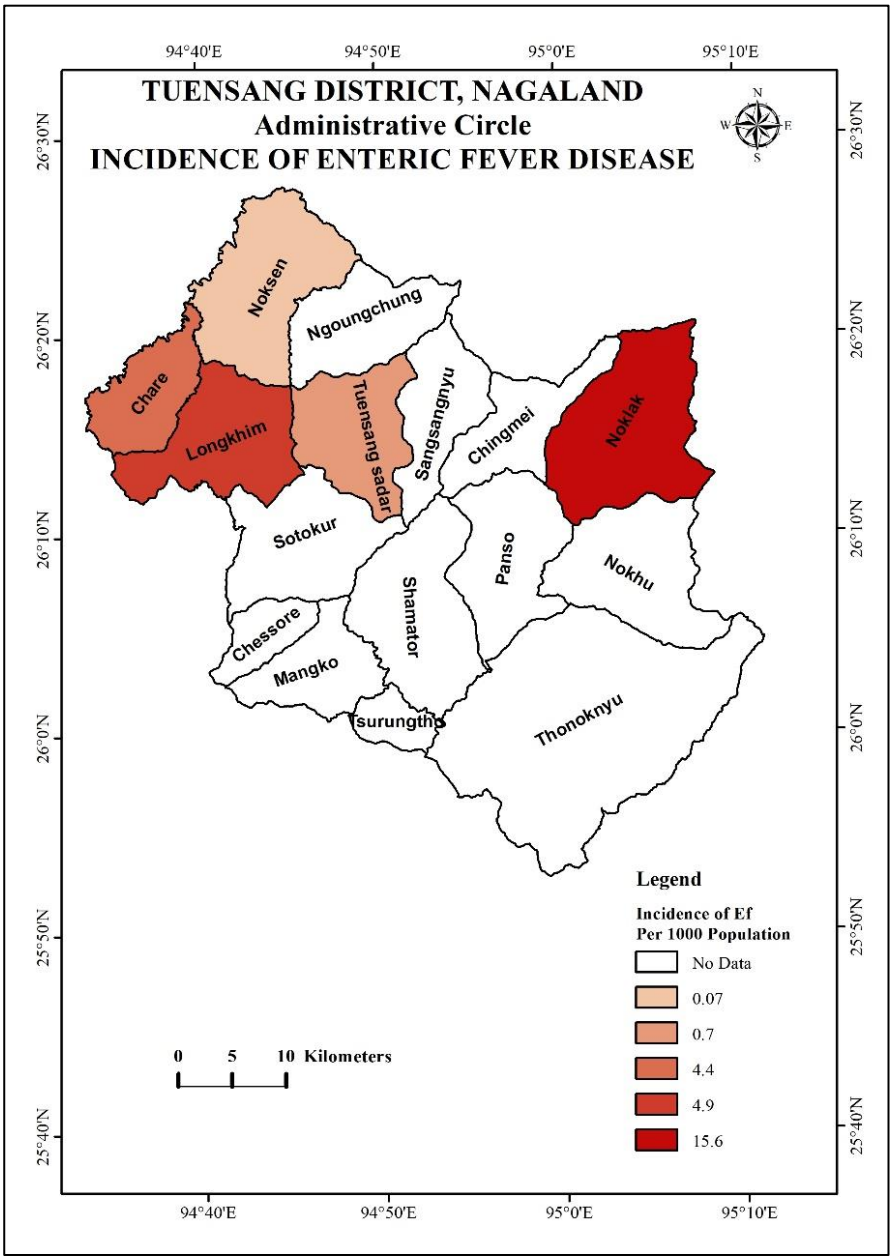
Source: Primary Data

3.3.9.2 Enteric fever disease

Enteric fever also known as Typhoid is a common disease in the district. This disease is mostly related to climatic conditions, the surrounding environment, hygienic living conditions, preventive measures etc. are required to contain the Ef disease outbreak. Ef disease is also related to forest cover because forest provides good habitats for the disease germs to rapidly develop and infect man. Upon investigation, there is a constant outbreak of Ef disease in the district. This outbreak is mostly due to unreported cases of Ef disease affected person and also in some circle it is due to lack of proper health institutions that allow the disease germs to transmit quickly to the unaffected population.

The highest incidence is recorded under Noklak circle with 15.6, followed by Longkim at 4.9, Chare at 4.4, Tuensang sadar at 0.7 and Noksen at 0.07 per thousand populations.

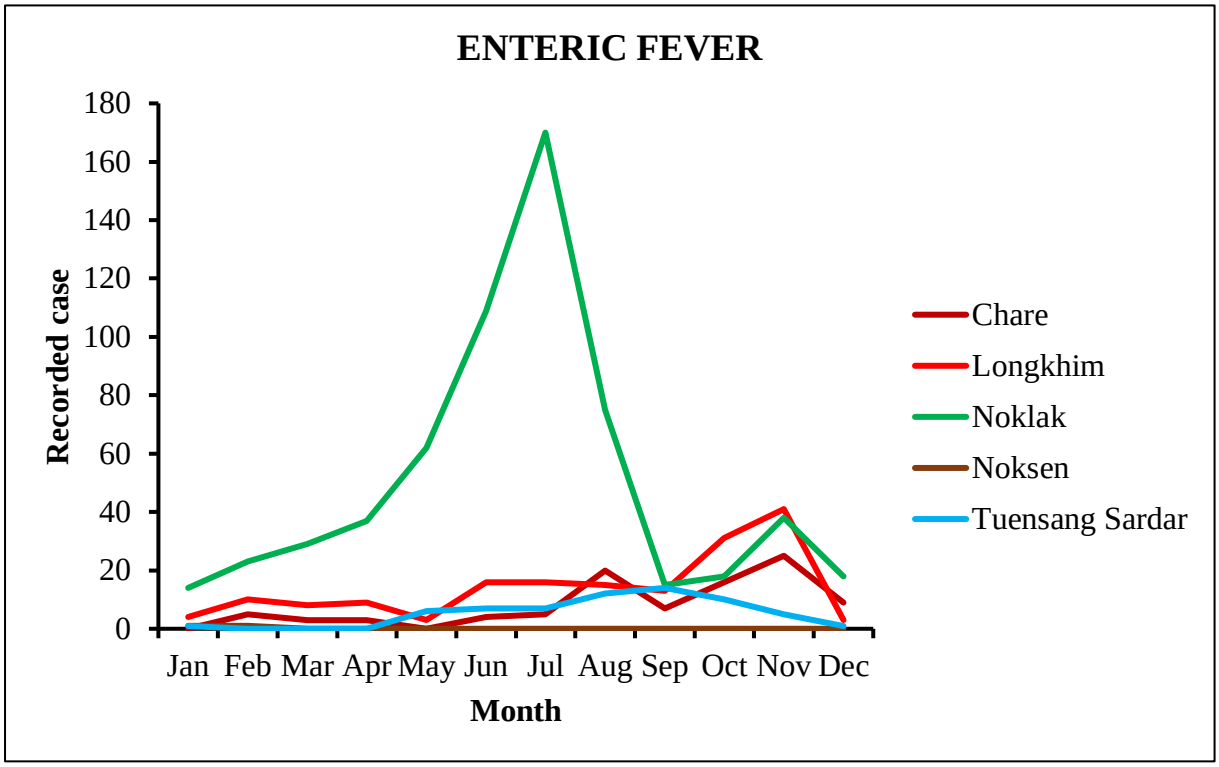
Figure 3.63: Distribution and Incidence of Ef in Tuensang district (sampled area)



Source: Primary Data

Ef disease in Tuesang district, records a high number of cases mostly during the warm and moist climatic conditions during the summer seasons. The summer season makes germs of Ef disease exponentially increase in growth rate which results in outbreak of disease. Upon further investigation, it is found that some circles in the district have high open defecation, low literacy rate, and sources of water from ponds, lakes, streams etc. result in a high number of Ef diseases in the district.

Figure 3.64: Monthly distribution of Ef in Tuensang district



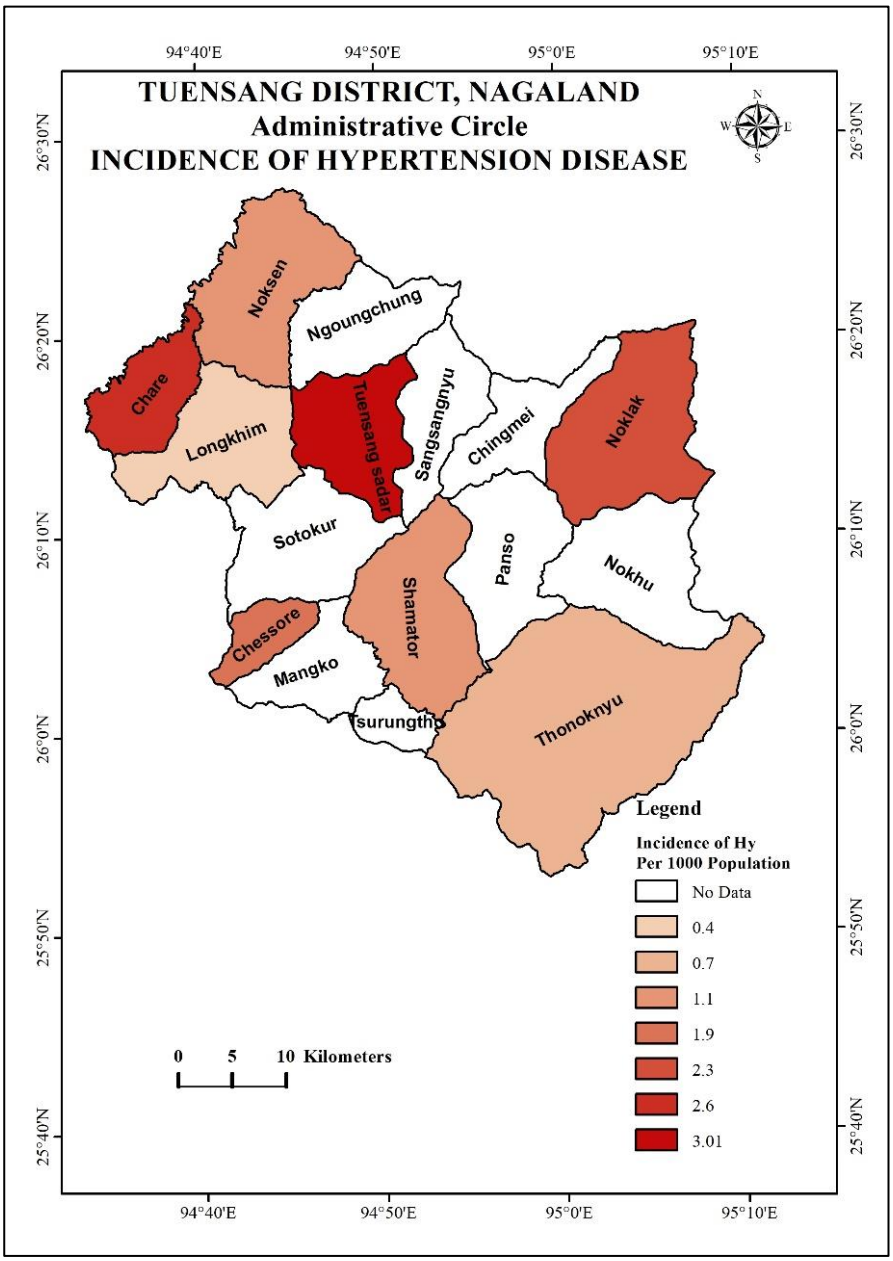
Source: Primary Data

3.3.9.3 Hypertension disease

Hypertension disease is a common disease in Nagaland and even in the district of Tuensang. Some of the issues due to the high number of Hy may be due to socioeconomic problems, rapid changes in lifestyle etc.

Tuensang Sadar has the highest incidence at 3.01, Chare at 2.6, Noklak at 2.3 and the least Longkhim at 0.4 per thousand populations.

Figure 3.65: Distribution and Incidence of Hy in Tuensang district (sampled area)



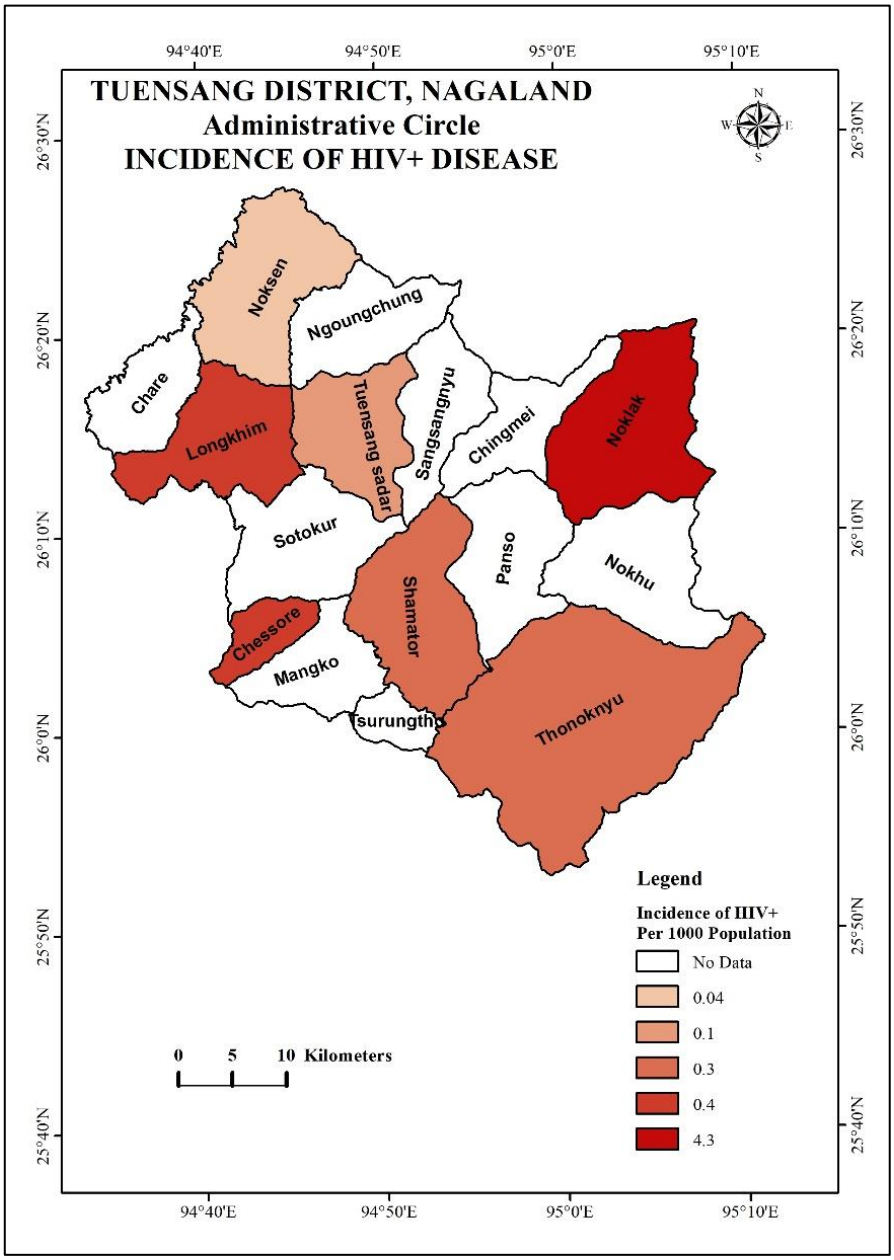
Source: Primary Data

3.3.9.4 HIV+ disease

During this study, the highest HIV+ disease recorded cases in Nagaland is found in Tuensang district under Noklak administrative circle at an incidence of 4.3 per thousand population.

Upon further investigation through questionnaires, direct and indirect interviews with local people and medical staff in the area, it is found that most of the cases are related to drug users. Nagaland is close to the international Golden Triangle and shares an international boundary line with Myanmar. The boundary line is porous and thickly forested, poor infrastructure, no communication system etc. has hampered the control of the influx of drugs into Nagaland. Tuensang is also one of the districts in Nagaland that shares a boundary line with Myanmar, moreover, Noklak town is located near the international boundary line which makes it easily accessible for drug users. Thus, this led to a high number of HIV+ cases in the district.

Figure 3.66: Distribution and Incidence of HIV+ in Tuensang district (sampled area)



Source: Primary Data

3.3.10 Wokha district

Wokha district is home to the Lotha tribe of Nagas. It has a total geographical area of 1628 sq. km with its headquarter at Wokha. The district health institution consists of 48 SCs, 12PHCs, 2CHCs and 1 DH.

During the field study in the district, it was found that health data management is poor and needs to systematise data collection. Some of the common diseases are the Oral cavity, Acute respiratory, Diabetes, Enteric fever etc.

Table 3.12: List of diseases in Wokha district (sampled area)

Sl. No.	**Name of Diseases**	**Total no. of Recorded case**	**Incidence per 1000 population**
1	Oral Cavity	945	7.01
2	Hypertension	798	5.92
3	Diabetes	168	1.25
4	Acute Respiratory	141	1.05
5	Enteric Fever	61	0.45
6	Eye	30	0.22
7	Pyrexia of unknown origin	27	0.2
8	Others	22	0.16
Overall Total		**2, 192**	

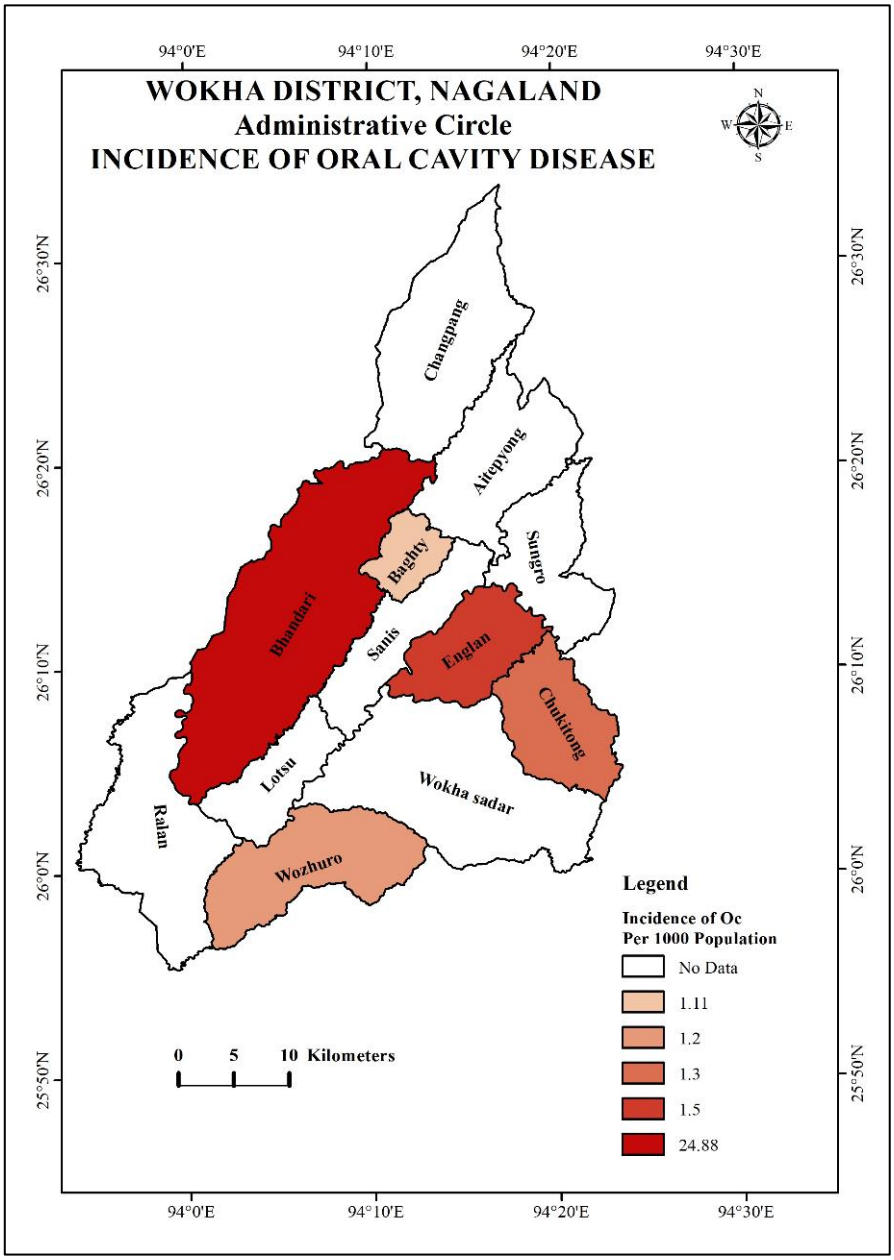
Source: Health and Family Welfare

3.3.10.1 Oral Cavity disease

The most common disease in the district is the oral cavity. There is not much evidence of Oc disease related to the environment but it mostly depends on the individual lifestyle and how he/she cares for his/her health.

The highest incidence of Oc disease in the district is under Bhandari circle at 24.88, Englan at 1.5, Chukitong at 1.3, Wozhuro at 1.2 and Bhagty at 1.1 per thousand population. To ascertain the nature of why there is a high incidence of Oc disease in the Bhandari circle, questionnaires along with personal interviews with the medical staff of the concerned health institution were carried out. It was found that most of the patient is into the habit of chewing tobacco products, improper care of teeth, and some patients are also registered from the neighbouring state of Assam.

Figure 3.67: Distribution and Incidence of Oc in Wokha district (sampled area)



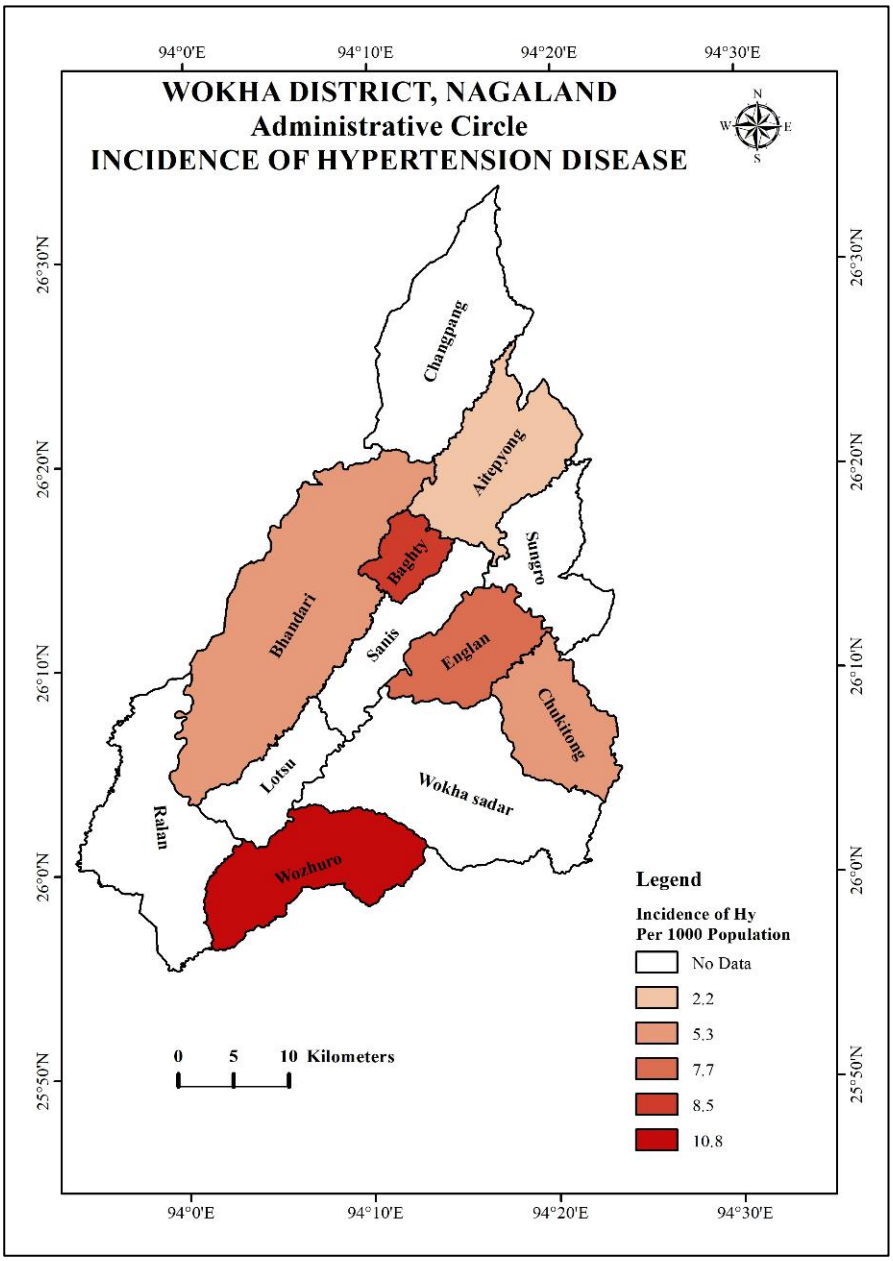
Source: Primary Data

3.3.10.2 Hypertension disease

Hy disease is also a common disease in the district. The highest incidence is Wozhuro Circle at 10.8, Bhagty at 8.5, Englan at 7.7, Chukitong and Bhandari at 5.3 and Aitepyong at 2.2 per thousand population. Socioeconomic problems, changes in lifestyle and even weather conditions do affect Hy disease. At Wozhuro Circle, the socio-economic conditions in the district are still poor and Chukitong and Bhandari circles are low-altitude areas, thus it

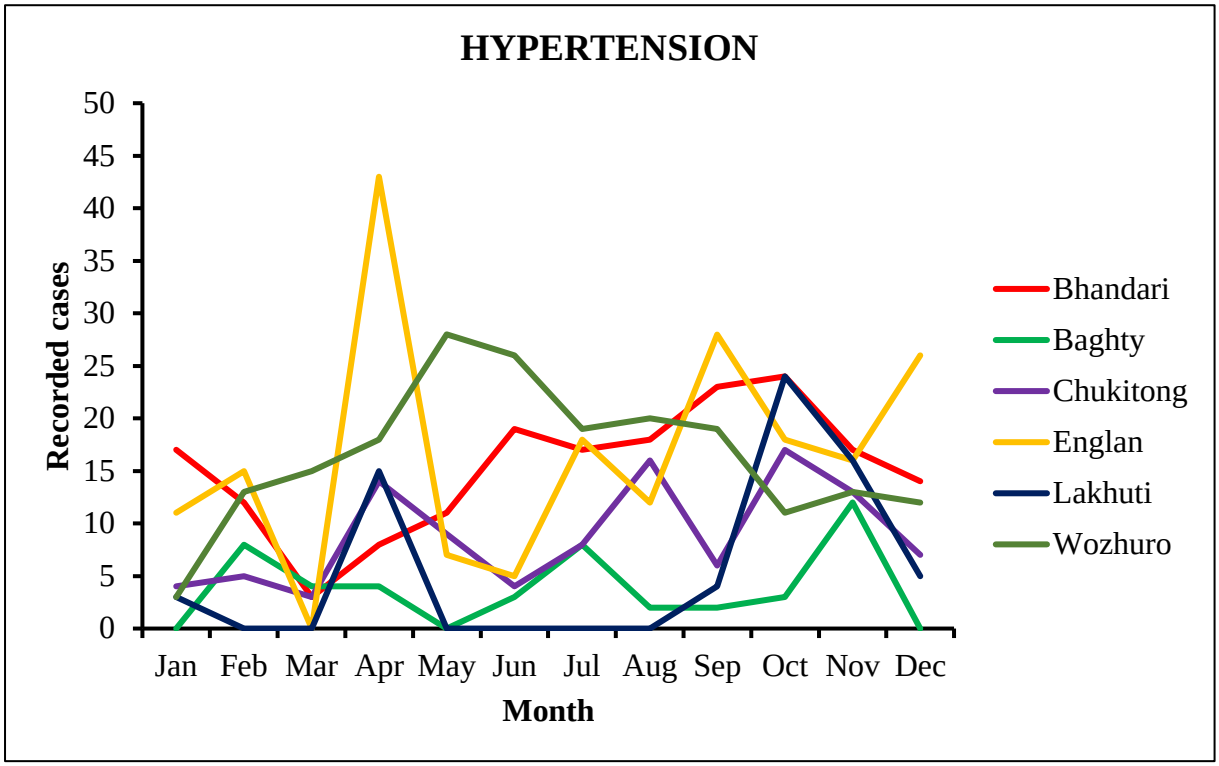
experiences warm climate conditions which can also affect the health of people living in this circle.

Figure 3.68: Distribution and Incidence of Hy in Wokha district (sampled area)



Source: Primary Data

Figure 3.69: Monthly distribution of Hy in Wokha district



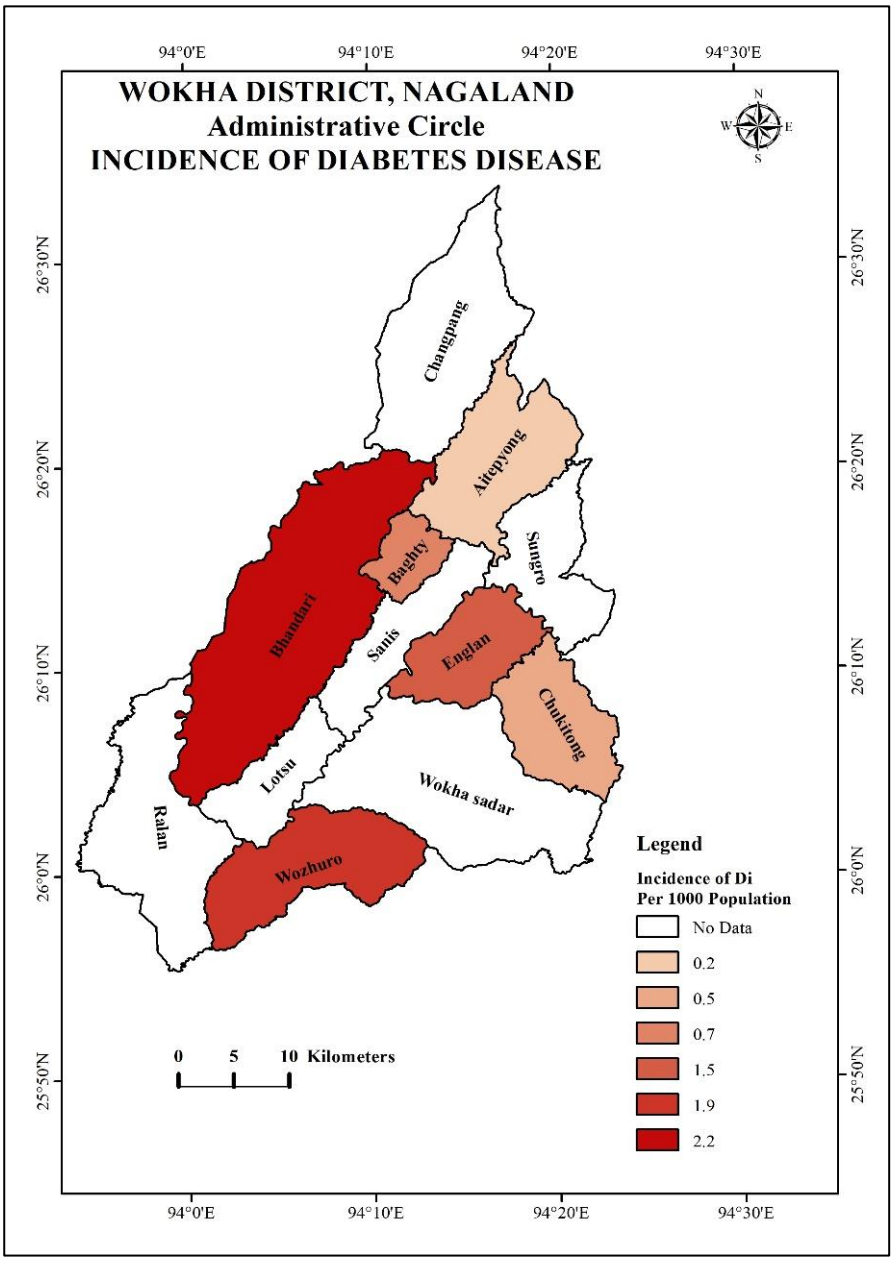
Source: Primary Data

As per the above figure no. 3.69, a consistently high number of cases is recorded during the warm and moist climate conditions. High cases are found in the months of August to October when the district experiences the maximum temperature and moisture conditions. A high number of cases is also recorded in the months of March and April due to the onset of warm climate from the cold winter season. Thus, temperature plays an important role in the occurrence and origin of Hy disease.

3.3.10.3 Diabetes disease

Di disease is also a major common disease in the district. The highest incidence is under the Bhandari circle at 2.2, Wozhuro at 1.9, Englan at 1.5, Bhagty at 0.7, Chukitong at 0.5 and Aitepying at 0.2 per thousand population.

Figure 3.70: Distribution and Incidence of Di in Wokha district (sampled area)



Source: Primary Data

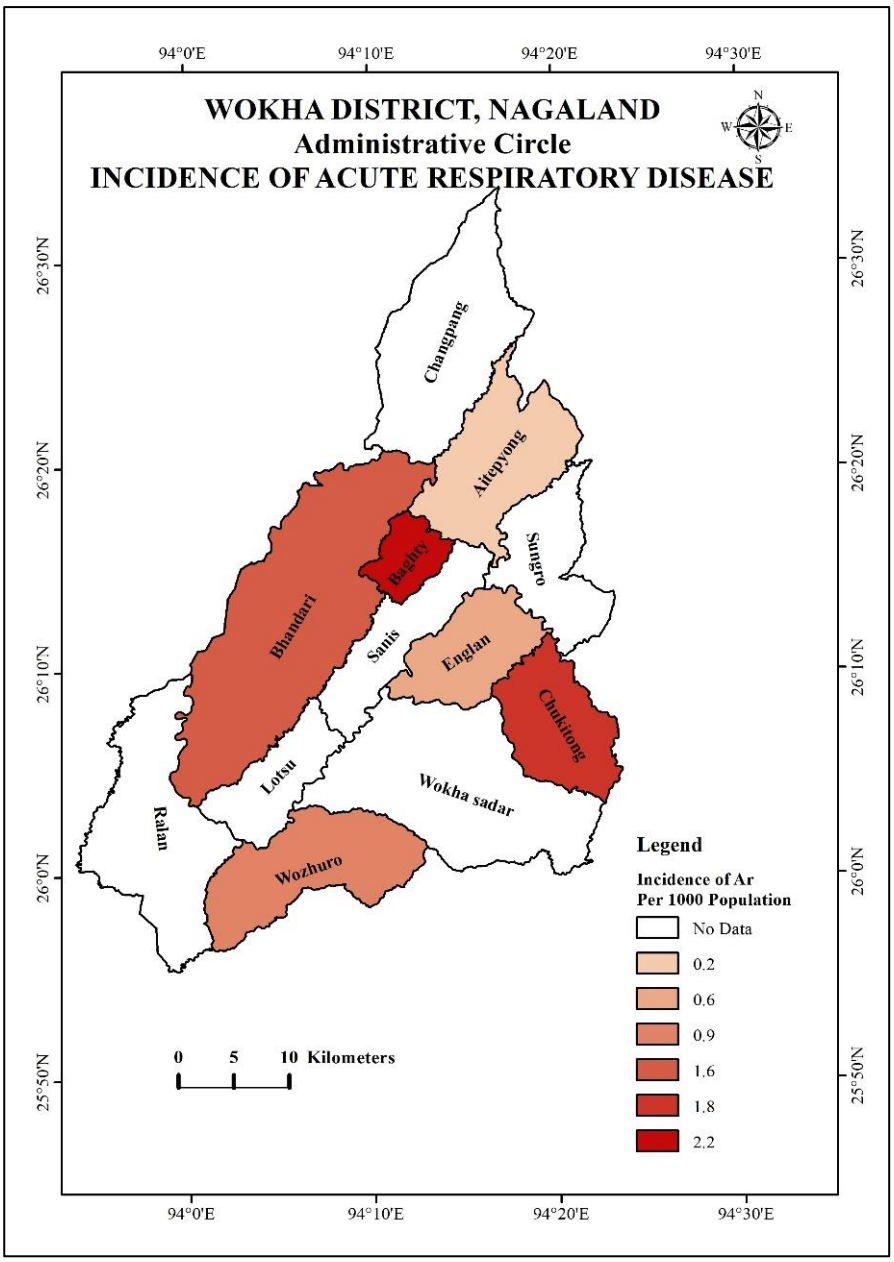
3.3.10.4 Acute Respiratory disease

Ar is a major communicable disease. This disease is mostly associated with the weather conditions. The highest incidence is under Bhagty at 2.2, Chukitong at 1.8, Bhandari at 1.6, Wozhuro at 0.9, Emglan at 0.6 and Aitepyong at 0.2 per thousand population.

Based on the incidence of Ar disease, most of the high incidences are located in circles that have high temperatures or warm climates e.g. Bhandari, Bhagty and Chukitong.

Aitepyong, Englan and Wozhuro circles do experience warm climates but are relatively colder than the other three circles i.e. Bhandari, Bhagty and Chukitong.

Figure 3.71: Distribution and Incidence of Ar in Wokha district (sampled area)



Source: Primary Data

3.3.11 Zunheboto district

Zunhebto district has a total geographical area of 1255 sq. km and is the middlemost district in the state of Nagaland. The district has a total health institution of 61 SCs, 13 PHCs, 2 CHCs and 1 DH.

Some of the common diseases in the district are Hypertension, Acute respiratory, Eye related, Pyrexia of Unknow origin etc.

Table 3.13: List of diseases in Zunheboto district (sampled area)

Sl. No.	**Name of Diseases**	**Total no. of Recorded cases**	**Incidence per 1000 population**
1	Hypertension	1765	11.26
2	Oral cavity	1687	10.76
3	Acute Respiratory	311	1.98
4	Eye	298	1.9
5	Diabetes	224	1.43
6	Pyrexia of unknown origin	80	0.51
7	Acute Daihhroal	44	0.28
8	Others	131	0.84
Overall Total		**4, 540**	

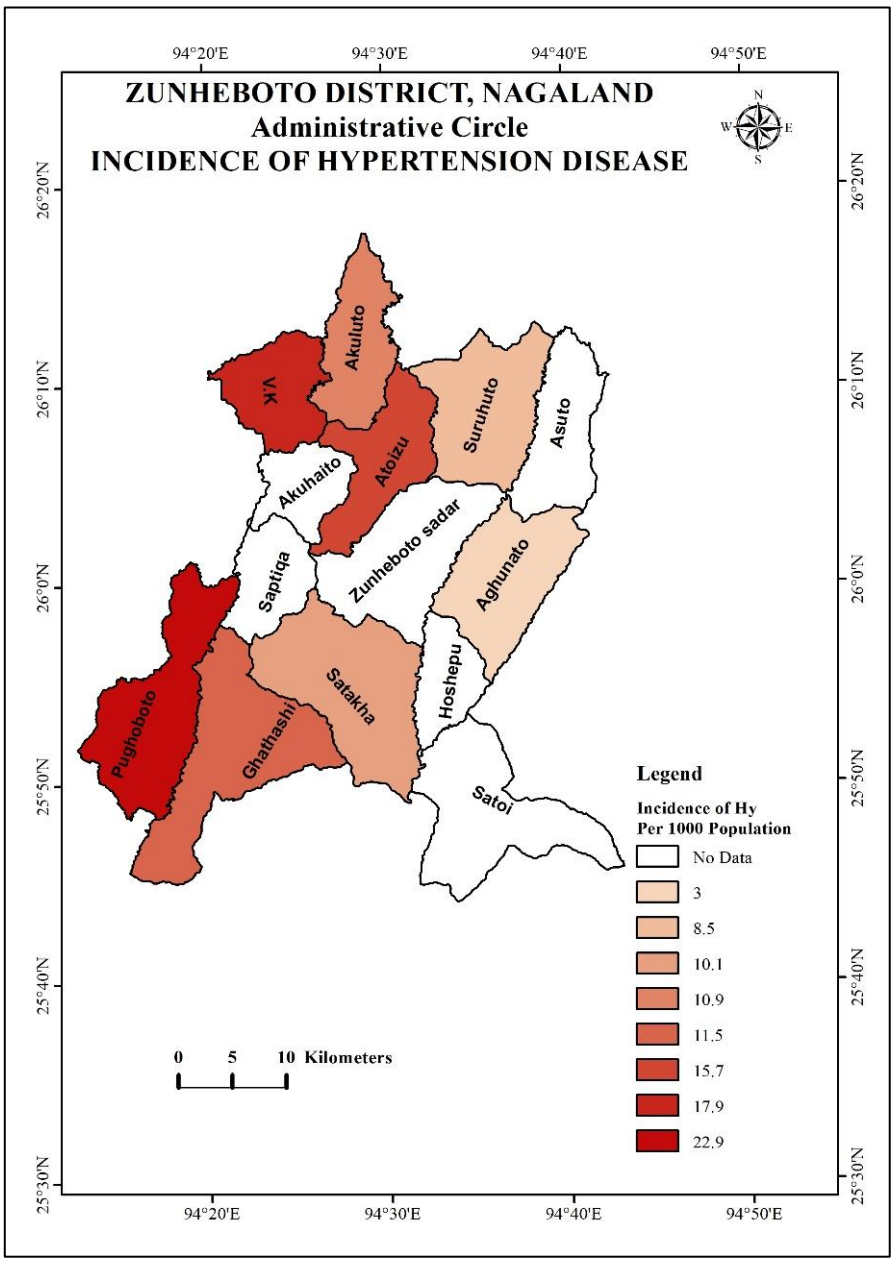
Source: Health and Family Welfare

3.3.11.1 Hypertension disease

The most common disease in the district of Zunheboto is Hy disease. It is a non-communicable disease but the incidence and recorded cases also remain high in the district.

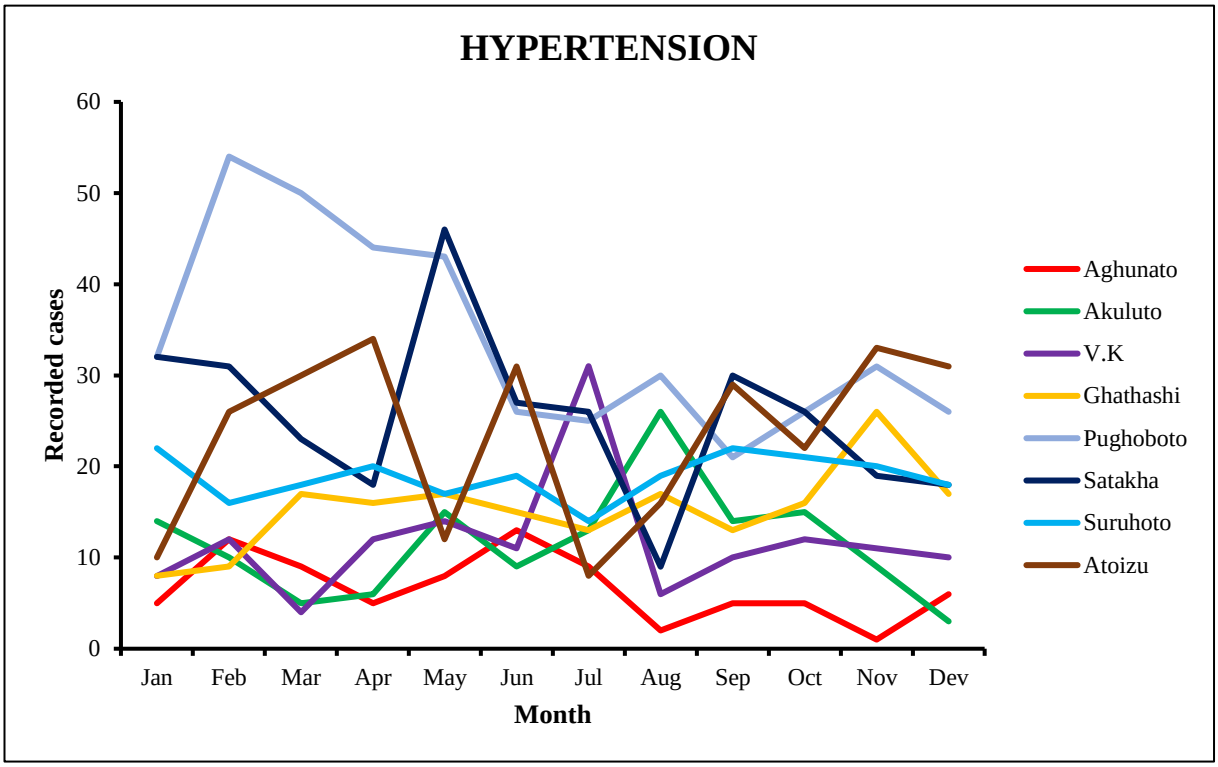
The highest incidence is recorded under the administrative circle of Pughoboto at 22.9, V.K at 17.9, Atoizu at 15.7 per thousand population and the lowest circles are Suruhuto at 8.5 and Aghunato at 3 per thousand population.

Figure 3.72: Distribution and Incidence of Hy in Zunheboto district (sampled area)



Source: Primary Data

Figure 3.73: Monthly distribution of Hy in Zunheboto district



Source: Primary Data

Hy disease can be related to temperature. As per the figure no. 3.73, given above most of the high recorded cases are in the months which have high and low temperatures. The high-temperature months are April to October and the low-temperature months are from November to March in the district of Zunheboto.

Aghunato which is one of the coldest circles in the Zunheboto district has recorded a high number of cases in high-temperature months i.e., June and July and in low-temperature months i.e., December and January.

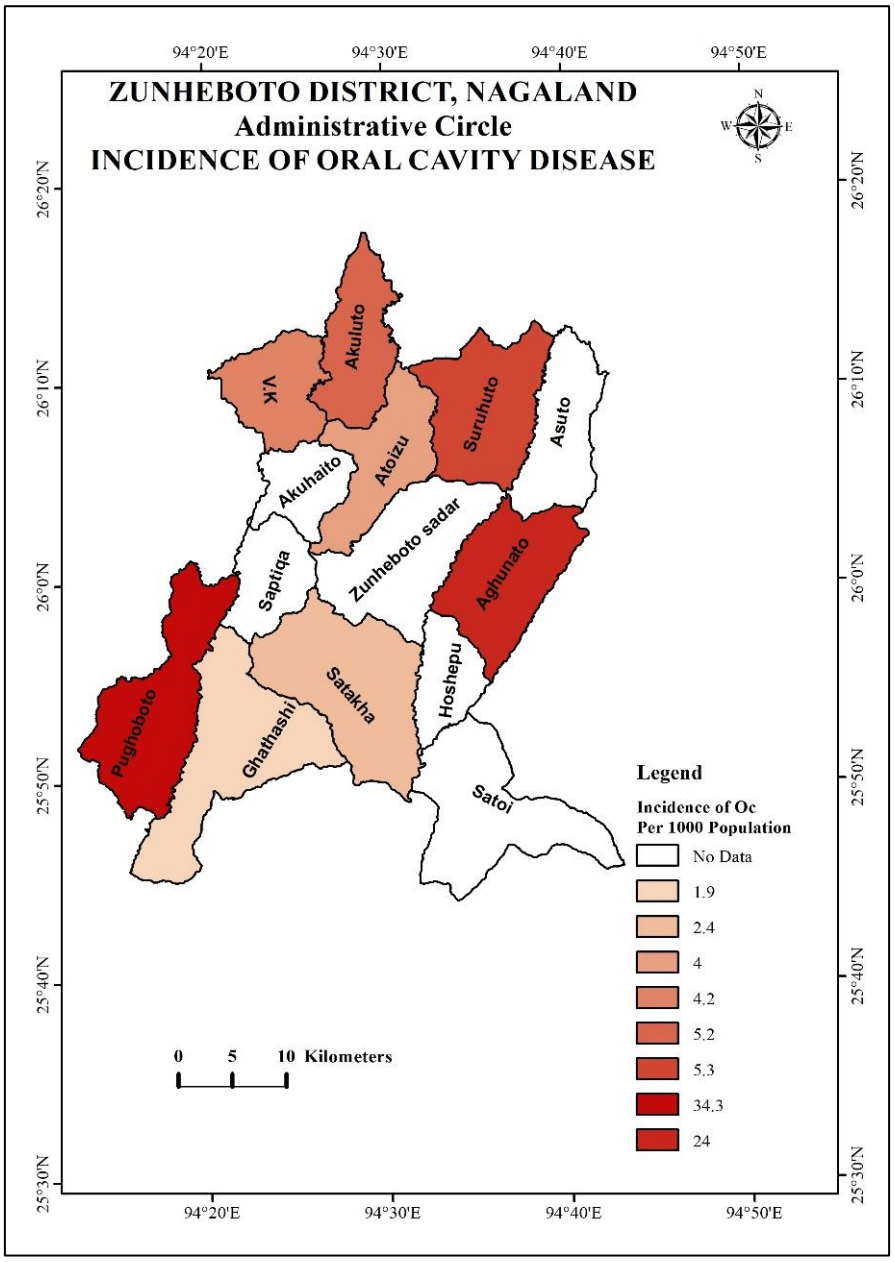
3.3.11.2 Oral Cavity disease

Oral cavity disease is another common disease in the district which also causes major problems for people in the district. Oc disease is mostly associated with unhealthy care of teeth and no proper or unhygienic oral-related issues cause more cases in the district.

Pughoboto circle at 34.3 is the highest incidence in the district, Aghunato at 24, Suruhoto at 5.3, Akuluto at 5.2, V.K at 4.2, Atoizu at 4, Satakha at 2.4 and Ghathashi at 1.9 per thousand population. Upon investigation, the presence of medical professionals in the assigned

health centre plays a crucial role in a high number of incidences of Oc related diseases in the whole of Nagaland.

Figure 3.74: Distribution and Incidence of Oc in Zunheboto district (sampled area)



Source: Primary Data

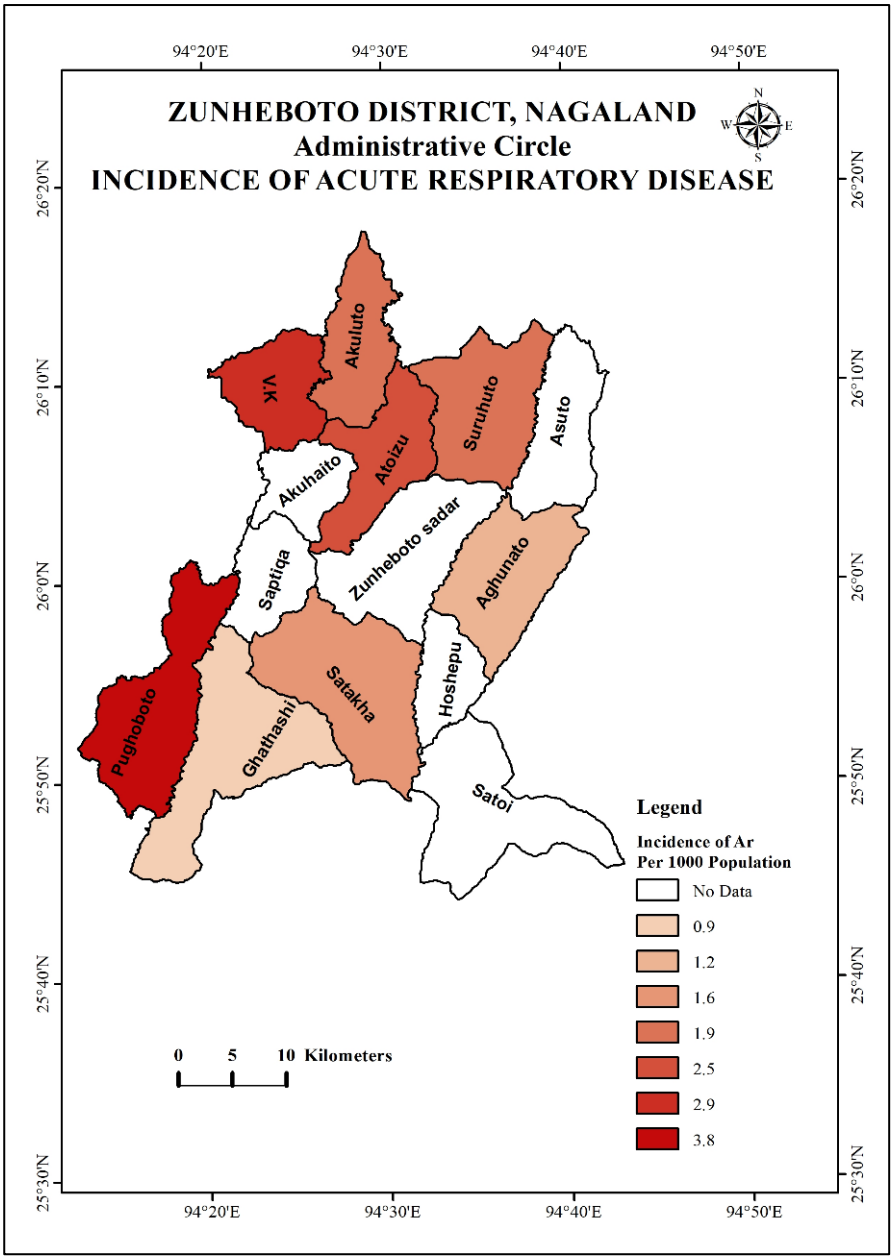
3.3.11.3 Acute respiratory disease

Ar disease is also a common disease in the district. The highest incidence is Pughoboto circle at 3.8, V.K circle at 2.9, Atoizu at 2.5 and the lowest circles are Aghunato at 1.2 and Ghathashi at 0.9 per thousand population.

The Ar disease in the district of Zunheboto is more prominent and causes more infection in circles that have a higher temperature than the other circles with lower temperatures. This indicates that temperature plays a crucial role in the occurrence of diseases. In the low-temperature circles, there is less incidence of Ar disease.

Apart from the geographical factors, the regular presence of medical staff in their assigned designated health centre also plays a crucial role not only in disseminating quality care but also in the number of incidences because the constant presence of medical staff means more patients.

Figure 3.75: Distribution and Incidence of Ar in Zunheboto district (sampled area)



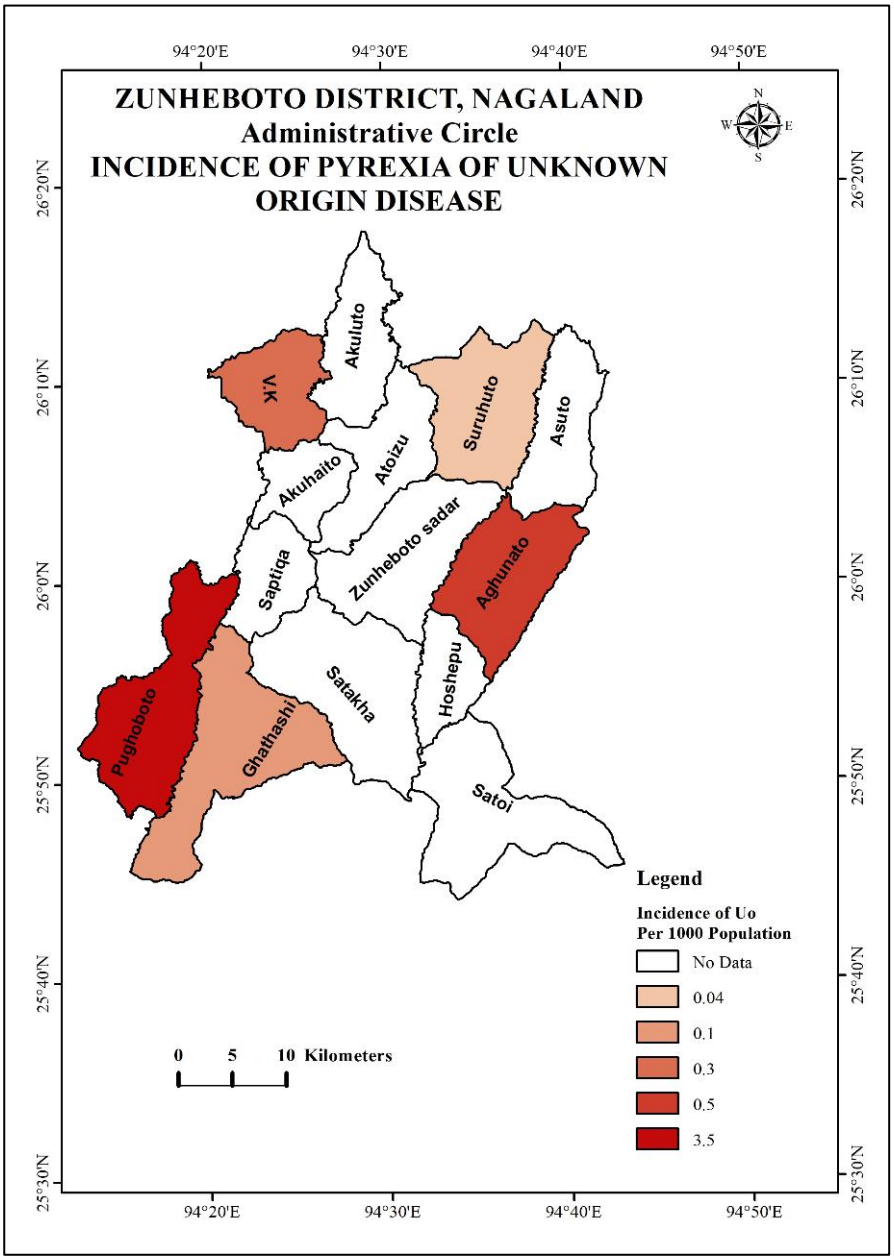
Source: Primary Data

3.3.11.4 Pyrexia of Unknown Origin

It is a common disease in the district and a major concern for the district because the nature, causes, occurrence etc. of this disease is not exactly known. The disease may adapt and become a harmful disease germ.

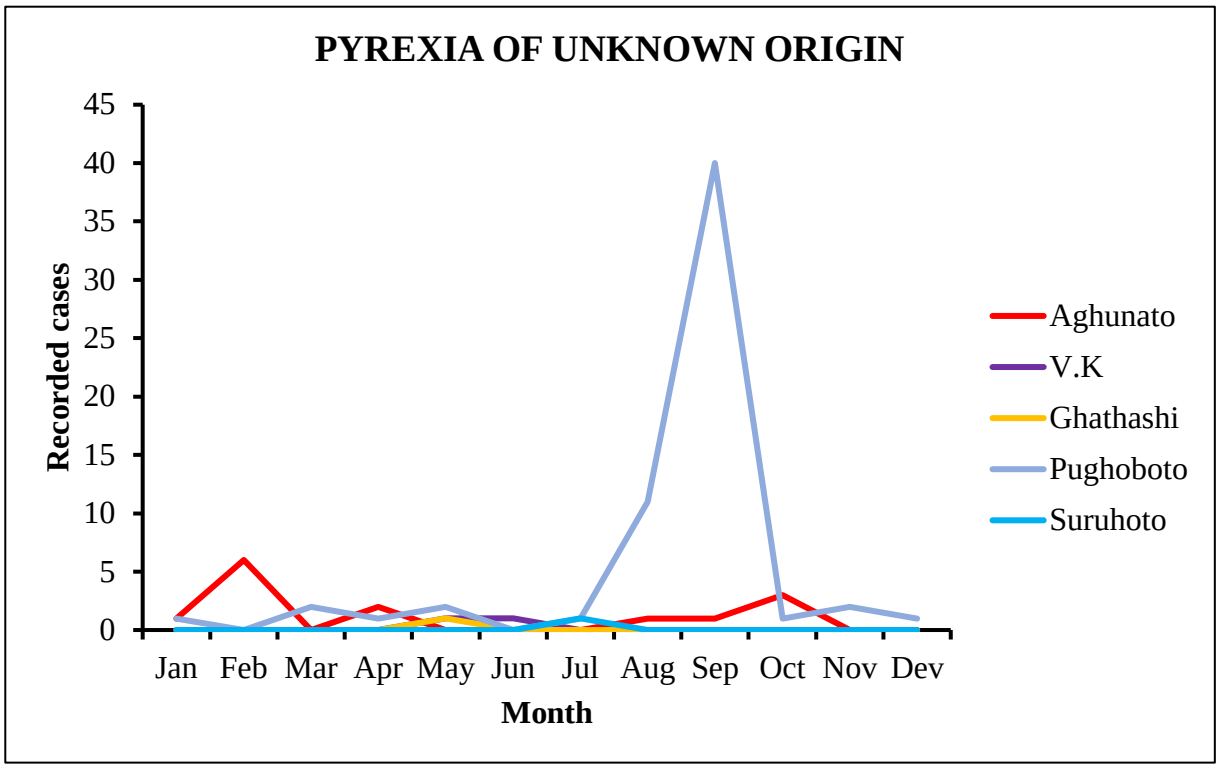
A high incidence is recorded under Pughoboto circle at 3.5 followed by Aghunato at 0.5 and the lowest Ghathashi at 0.1 per thousand population.

Figure 3.76: Distribution and Incidence of Uo in Zunheboto district (sampled area)



Source: Primary Data

Figure 3.77: Monthly distribution of Uo in Zunheboto district



Source: Primary Data

As per the figure no. 3.77, a high number of Uo cases is recorded when the district is experiencing warm and moist climatic conditions. These warm and moist climatic conditions allow the disease germs to thrive exponentially and when it is passed to humans, they get infected and cause biological disorder in the body. Another reason may be due to highly forested areas, there may be still many unknown disease germs that can harm humans and cause severe malfunction in the body.

CHAPTER – IV

DISEASES IN RELATION TO ENVIRONMENT

4.1 Introductory

This chapter focuses on the common diseases that are identified in Nagaland and their relation to the surrounding geographical conditions and implications on disease occurrence, intensity, distribution and effect on humans in a defined geographical perspective. Some of the diseases identified are induced due to geophysical environment but some are due to socioeconomic/ social environmental conditions that have triggered an unprecedented rise in different types of diseases.

The diseases discussed in this chapter are the top five most common diseases in Nagaland Hypertension, Acute Respiratory, Oral Cavity, Acute Diarrhea and Enteric fever which were identified during this course of study. These diseases were compared with the environment like population, climate factors, socio-economic conditions etc. in their respective administrative circles (sampled) of Nagaland. The population and socioeconomic data were collected from the Census Office of India, Kohima, Nagaland, and other data were gathered from concerned departments, and others through questionnaires, interviews and personal observation in the sampled administrative circles. These has been utilized for detailed elaboration on the causes, occurrence and distribution of diseases in Nagaland.

The data collected from various sources are tested by using the statistical technique and interpreted between disease and its relation to the environment by using Karl Person's Correlation method, Mean, Standard deviation etc. in SPSS software and Microsoft Excel. The Positive correlation indicates the disease being influenced by the environment and the Negative correlation indicates no relation between them. The main focus is to establish the relation between the positive or negative correlation matters more than whatever figures or data have been interpreted. P- value testing with alpha 0.01 is also used to test the data. This chapter brings insight into how the common diseases in Nagaland thrive either due to geophysical or socioeconomic/social environment conditions that can bring a closer understanding of preventing and mitigating disease outbreaks.

4.2 Hypertension Disease

The World Health Organisation (WHO), estimated that 1.28 billion adults aged 30–79 years worldwide have hypertension disease. However, an estimated 46% of adults are unaware that they have this disease. In India, about 220 million people are estimated to live with hypertension and only about 12% of people with hypertension in India have their blood pressure under control (WHO). Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India (Gupta, 2004). Hypertension disease is sometimes referred to as a silent killer disease.

Among the Non-Communicable diseases, Hypertension is the most common disease in Nagaland. Hypertension disease is induced due to geographical conditions like altitude, temperature, socio-economic conditions and most importantly his/her surrounding environment. Extensive studies also found that Hy disease may sometimes not reflect geographical conditions like altitude or temperature because people living in high-altitude regions get acclimatised and Hy disease does not affect them (Brook et al., 2011)

In Nagaland, one of the primary reasons behind is due to change in lifestyle. According to the National Family Health Survey (NFHS-5), the prevalent rate of hypertension in Nagaland in the age group of 15 years and above is 22.4% in female and 28.7% in male. In this study, it is also found out there is a high number of Hy disease cases and its overall percentage to other diseases stood at 22.99% to all kind of diseases.

Table 4.1: Relation between Hy and Population Density, Nagaland

Population Density Per Sq. Km	**Mean**	**Standard Deviation**
Low (Below 70.2)	138.5	109.8
Medium (70.2 – 123.2)	161	206.7
High (Above 123.2)	241.4	285.4
Correlation	**+ve 0.37**	
P -value	**0.002**	

Source: Primary Data

From the above table no. 4.1, the correlation indicates a positive 0.37 that Hy and population density are well defined. This relation indicates as the population density increases the Hy diseases too increase. Either Rural or Urban areas or administrative circles (sampled) which have a higher density of population result in inciting more cases of Hy-related disease.

Table 4.2: Relation between Hy and Altitude, Nagaland

Altitude (In M)	**Mean**	**Standard Deviation**
Low (Below 1025.4)	181.2	260.4
Medium (1025.4 – 1385.5)	229.3	248.9
High (Above 1385.5)	139.7	95.6
Correlation	**-ve 0.09**	
P – value	**0.475**	

Source: Primary Data

The correlation between Hy and Altitude shows a negative 0.09. This shows there is no relation between them i.e. even if altitude increases there is no increase of Hy cases. This studies, found that most Hy disease are correlated to altitude because as the height increases there is a change in temperature, pressure or weather elements. This results in change in blood pressure. But in Nagaland, Nagas have been living in a high mountainous environment for decades and their physical body is already acclimatised to high altitude environment, thus the geographical conditions do not act much but most of the cases of Hy disease in Nagaland as per questionnaires and interviews to medical staff and patients found out that the main cause is a change in lifestyle and poor socio-economic conditions. Nagaland is still an agrarian society and economic condition is still very poor in some administrative circles and district. This poor economic condition brings a burden to agrarian society which can cause anxiety, stress etc. which may cause Hy to an individual's body.

From the above table 4.2, a recorded a high mean is observed in low altitude areas because in Nagaland high population density is found in low lying areas due to better livelihood. Thus, altitude and population density reflect well to both positive and negative correlation.

Table 4.3: Relation between Hy and Temperature, Nagaland

Mean Temperature (In ^{0}C)	**Mean**	**Standard Deviation**
Low (Below 23.1)	109.9	100.6
Medium (23.1 – 26.4)	254.4	247.3
High (Above 26.4)	204.3	252.6
Correlation	**+ve 0.15**	
P – value	**0.217**	

Source: Primary Data

Hy disease and temperature show a positive 0.15 correlation. More administrative circles are in the medium temperature and also have more recorded cases compared to the high and low temperatures. The positive relation indicates there is an increase in Hy disease due to an increase in temperature. Rapid changes in temperature (high and low) can affect the body temperature which our body cannot adapt to it. Geographically the causes of hypertension may be due to cold ambient temperature, exposure to loud noise, air pollution, and high altitude (Jayarajah and Seneviratne, 2019).

Table 4.4: Relation between Hy and Rainfall, Nagaland

Rainfall (In mm)	**Mean**	**Standard Deviation**
Low (Below 1092.5)	128.7	109.7
Medium (1092.5 – 1344.3)	232.8	247.9
High (Above 1344.3)	195.7	256.5
Correlation	**+ve 0.17**	
P – value	**0.157**	

Source: Primary Data

There is a positive relation between Hy and Rainfall at 0.17. This positive relation reflects the temperature because as per the data collected some higher temperature areas in Jalukie, Mon and Mokokchung are receiving higher rainfall in Nagaland. Rainfall may not directly contribute to Hy disease but it is also an important climatic element that may influence other elements like temperature, humidity etc.

Table 4.5: Relation between Hy and Forest Cover, Nagaland

Forest Cover (In percentage)	**Mean**	**Standard Deviation**
Low (Below 67.6)	144.7	253.5
Medium (67.6 – 80.2)	172.9	108.8
High (Above 80.2)	232.3	245.4
Correlation	**+ve 0. 10**	
P – value	**0.422**	

Source: Primary Data

The correlation between Hy and Forest cover in Nagaland is a minimal positive at 0.10. Forest cover may not influence the disease of Hy and this result also indicates Hy disease in Nagaland may not contribute due to geographical conditions but changes in lifestyle, poor dietary habits or social problems result in more Hy disease.

Table 4.6: Relation between Hy and Literacy Rate, Nagaland

Literacy Rate (In percentage)	**Mean**	**Standard Deviation**
Low (Below 62.7)	100.5	120.1
Medium (62.7 – 73.03)	174.3	133.3
High (Above 73.03)	269.4	302.8
Correlation	**+ve 0.33**	
P – value	**0.006**	

Source: Primary Data

A good positive correlation is shown between Hy and literacy in Nagaland at 0.33. Based on the study, it was found out that high Hy disease is confined to circles that have high literacy example Ongpankong circle in Mokokchung district has 83.24% literacy rate with 1132 recorded cases. Upon further investigation to this circle (Ongpankong), most of the people in this circle are more in secondary or tertiary activity and lack physical activity, change in lifestyle etc which has caused more Hy disease.

In the higher Literacy area, people lack physical activity but reports and studies also found that some low literate areas/circles too have high Hy disease. Thus, literacy rate cannot be overlooked as the main causes of Hy disease.

Table 4.7: Relation between Hy and Open Defecation, Nagaland

Open Defecation (In percentage)	**Mean**	**Standard Deviation**
Low (Below 27.6)	249.5	277.6
Medium (27.6 – 47.7)	156.6	211.9
High (Above 47.7)	149.5	117.4
Correlation	**-ve 0.23**	
P – value	**0.062**	

Source: Primary Data

Open Defecation data which was extracted from the Census 2011 of Nagaland is used in this study because there are certain diseases that are directly and indirectly related to it. The relation between Hy and Open Defecation may not correlate but open Defecation data indicate that Nagaland is healthy, clean and have good sanitation. To this, in the above table no. 4.7, the correlation between Hy and open Defecation is a negative correlation at 0.23 which shows both Hy and Open Defecation are not influencing each other.

4.3 Acute Respiratory Disease

Acute respiratory infections (ARI) accounted for nearly 69% of the total cases of communicable diseases in India i.e., before the COVID-19 pandemic (Waghmode et.al). According to the National Health Portal of India (2019), a total of 4,19,96,260 cases and 3,740 deaths from respiratory infections were reported in India in 2018. Even in Nagaland from the sampled health institution in this study, it is found that there is a reported case of 11, 700 of Ar disease for the last 3- 4 years i.e., before the pandemic. Even after the pandemic, the Directorate of Health and Family Welfare, Nagaland 2023 in the month of March issued a health advisory on severe acute respiratory diseases in the whole state of Nagaland as there is an unprecedented rise of new cases of Ar disease.

Acute Respiratory disease is a bacterial infection that includes all kinds of respiratory infections, influenza, bronchitis, common cold etc. According to Cruickshank (1976), respiratory infections are more common in warm type of climates and resemble both bacteriological and epidemiologically to temperate regions. In the warm regions, the incidence is higher in the young group of people whereas it is higher in older people in the temperate regions. Ar-related cases usually occur more in winter seasons but in India, if often more prominent during the summer season. In Nagaland high number of Ar cases is usually reported with the onset of the summer seasons. With the rise of temperature after a cold winter, the warm and moist temperature makes disease germs thrive rapidly causing harm to humans. Since it is a communicable disease, the factor that can increase the number of cases is overcrowding, especially in schools, houses, public gatherings, etc. can enhance transmission (Park, 1997).

Table 4.8: Relation between Ar and Population Density, Nagaland

Population Density Per Sq. Km	**Mean**	**Standard Deviation**
Low (Below 70.2)	217.5	382.3
Medium (70.2 – 123.2)	99.0	121.7
High (Above 123.2)	188.9	272.7
Correlation	**-ve 0.03**	
P – value	**0.792**	

Source: Primary Data

The correlation between Ar and population density shows a negative correlation at 0.03. This indicates that the population density and the number of Ar cases are not related and thus Ar diseases does not increase with an increase in population density.

Some of the main reasons can be due to sample size, selected sample health institutions, number of recorded cases and also due to vast number of people in Nagaland still living in rural areas but their population size or density is not proportionate to large geographical area. For example, as per the sampled study area is concerned Dimapur Sadar has the highest population density (Approximately. 5521.4 sq. km.) but Ar related cases recorded is 61 and the lowest population density is Sitimi Circle with 92 Ar cases.

The high mean in low-density populated areas indicates more recorded cases, as in this study area the sampled health institution is mostly from the rural areas which have a lower density of population.

Table 4.9: Relation between Ar and Altitude, Nagaland

Altitude (In M)	**Mean**	**Standard Deviation**
Low (Below 1025.4)	86.4	103.9
Medium (1025.4 – 1385.5)	282.8	331.9
High (Above 1385.5)	154.9	323.2
Correlation	**+ve 0.11**	
P – value	**0.393**	

Source: Primary Data

From the above table 4.9, the correlation between Ar and Altitude shows a positive correlation at 0.11. The increase in altitude results in low climatic conditions like, temperature, humidity etc. This change in climate conditions affects the Ar disease. Cold, crowded conditions, low humidity and air pollution from traditional stoves or chulas cause more occurrence of Ar infections disease in high-altitude areas (Basnyat and Starling, 2015).

Table 4.10: Relation between Ar and Temperature, Nagaland

Mean Temperature (In ºC)	**Mean**	**Standard Deviation**
Low (Below 23.1)	101.7	151.9
Medium (23.1 – 26.4)	342.3	440.8
High (Above 26.4)	104.4	106.7
Correlation	**-ve 0.06**	
P – value	**0.647**	

Source: Primary Data

A negative correlation is established between Ar and Mean Temperature at 0.06. This indicates that if the temperature increases then Ar disease may decrease. High cases of Ar disease in Nagaland are mostly found in medium mean temperature, this may be due to geographical conditions as about 90% of the topography of Nagaland is a hilly state. These geographical conditions enable the state to experience cold climate conditions even in the summer seasons. In the Ar disease monthly distribution with corresponds to monthly temperature in all the sampled circle indicates as the temperature increases the number of Ar diseases cases starts to rise. As per the correlation, the value can also be considered a negligible negative value and the p-value is also more than 0.01 which can be false.

As altitude increases temperature does decrease and so also the population density in Nagaland is also low in higher altitude regions. Thus, all these climatic elements can contribute to the increase and decrease of Ar disease in Nagaland.

Table 4.11: Relation between Ar and Rainfall, Nagaland

Rainfall (In mm)	**Mean**	**Standard Deviation**
Low (Below 1092.5)	127.2	163.2
Medium (1092.5 – 1344.3)	113.9	258.9
High (Above 1344.3)	276.3	370.7

Correlation	**+ve 0.17**
P – value	**0.176**

Source: Primary Data

The relation between Ar and rainfall shows a positive correlation at 0.17, as shown in table 4.11. This positive correlation indicates even if the intensity of rainfall increases there is an increase of Ar disease. Thus, in this study, there is an association between rainfall and Ar disease. The higher rainfall areas show moist air which allows the disease germs to thrive more easily.

Table 4.12: Relation between Ar and Forest Cover, Nagaland

Forest Cover (In percentage)	**Mean**	**Standard Deviation**
Low (Below 67.6)	80	132.6
Medium (67.6 – 80.2)	101.8	137.9
High (Above 80.2)	345.8	409.5
Correlation	**+ve 0.34**	
P – value	**0.005**	

Source: Primary Data

Acute Respiratory disease and forest cover correlation show a positive 0.34, table 4.12, which indicates there is a relation between Ar and forest cover. Ar disease may originate or distribute due to the high density of forest cover because higher forest cover areas may provide a favourable environmental condition for the disease to multiply.

Table 4.13: Relation between Ar and Literacy Rate, Nagaland

Literacy Rate (In percentage)	**Mean**	**Standard Deviation**
Low (Below 62.7)	109,4	176.6
Medium (62.7 – 73.03)	261.1	414.4
High (Above 73.03)	152.7	184.2
Correlation	**+ve 0.15**	
P – value	**0.225**	

Source: Primary Data

The correlation between Ar and Literacy shows a positive correlation at 0.15, table 4.13. This relation may not directly influence the Ar disease distribution but rather higher literate areas or circles can control and prevent Ar disease outbreaks. Higher literacy rate can help in quality health care and also help individuals better hygienic conditions which can prevent disease.

Table 4.14: Relation between Ar and Open Defecation, Nagaland

Open Defecation (In percentage)	**Mean**	**Standard Deviation**
Low (Below 27.6)	277.2	317.6
Medium (27.6 – 47.7)	183.3	332.9
High (Above 47.7)	70.2	125.3
Correlation	**-ve 0.28**	
P -value	**0.025**	

Source: Primary Data

A negative correlation is established between Ar and Open Defecation at 0.28, as shown in table 4.14. The negative correlation indicates there is no association between Ar disease and Open Defecation in Nagaland.

4.4 Oral Cavity Disease

Oral cavity disease includes all kinds of diseases which are confined to the mouth and teeth. Oral diseases are not related to geophysical conditions like climate, temperature, humidity etc. but rather associated with numerous numbers of social and economic and most importantly to one's individual lifestyle.

Oral cavity related disease is a common disease in Nagaland. This disease is associated with improper care of teeth like not regular brushing, no knowledge of keeping their teeth healthy, no healthy diet during growth period etc. Another major cause of oral-related disease in Nagaland is mainly due to chewing of smokeless tobacco products and alcoholism can trigger early decay of teeth.

In distribution aspects of oral cavity disease in Nagaland, it is found that the distribution or incidence is not regular and also the number of cases recorded corresponding to the administrative circles' population size is not proportionate. During this study, it was found that it is due to the availability of medical professionals in a particular i.e., CHC health centre that attracts people from other circles which leads to high incidence in one circle and low in another. The unavailability of specialised medical staff for Oral disease has deprived the people in the state to get access to quality and affordable care.

Apart from the health sector's due to lack of medical staff and infrastructure in the state, most of the people in Nagaland do not have the habit of caring for their teeth, especially being agrarian and most people still live in rural areas (about 71 % in rural areas, 2011 census) do not have the knowledge to maintain a healthy life.

Table 4.15: Relation of Oc and Population Density, Nagaland

Population Density Per Sq. Km	**Mean**	**Standard Deviation**
Low (Below 70.2)	158.9	289.5
Medium (70.2 – 123.2)	142.5	164.4

High (Above 123.2)	140.1	197.3
Correlation	**- ve 0.02**	
P – value	**0.856**	

Source: Primary Data

The correlation between Oc and population is a negative correlation at 0.02, table 4.15. A negative correlation indicates that higher-density areas or circles have fewer cases of Oc disease. In contrast to this, during field visits, it found that most of the highly densely populated circles in Nagaland have better health facilities than in low-density areas. The high-density circles have CHC or even better health institutions and regular medical professionals for oral-related diseases. This allows the public to get access to health centres of their own choice which the study sampled cannot access to all the health institutions which can result in lower cases.

Table 4.16: Relation between Oc and Altitude, Nagaland

Altitude (In M)	**Mean**	**Standard Deviation**
Low (Below 1025.4)	142.5	283.3
Medium (1025.4 – 1385.5)	143.1	243.9
High (Above 1385.5)	149.1	227.1
Correlation	**+ve 0.02**	
P – value	**0.90**	

Source: Primary Data

Oc disease and altitude relation has a positive correlation at 0.02, as shown in table 4.16. The geographical factors may not contribute to the origin and causes of Oc disease but these factors can be correlated to other factors like altitude with population density to Oc related disease because the low number of Oc diseases is found in high population density circles and all these high population density circles are majority in the low altitude areas. The low-altitude

circles are better literate than high-altitude circles because high-altitude circles mostly consist of rural areas with lower literacy rate.

Table4.17: Relation between Oc and Temperature, Nagaland

Mean Temperature (In ^{0}C)	**Mean**	**Standard Deviation**
Low (Below 23.1)	143.1	241.6
Medium (23.1 – 26.4)	85.8	136.8
High (Above 26.4)	198.4	318.8
Correlation	**+ve 0.04**	
P – value	**0.715**	

Source: Primary Data

A positive correlation at 0.04 is shown, table 4.17, between Oc and temperature. Temperature may not directly influence the origin of Oc. Through observations, administrative circles like Diampur sadar, Medziphema, Bhandari, Jalukie, Longkhim etc experience higher temperature and are located in low lying areas of Nagaland. These circles have better health infrastructure and constant availability of medical professionals in the health centre, draws a vast number of people within their circles and also from other circles to their health centres, that indirectly or directly increase the incidence of Oc-related disease cases.

Table 4.18: Relation between Oc and Rainfall, Nagaland

Rainfall (In mm)	**Mean**	**Standard Deviation**
Low (Below 1092.5)	143.9	214.7
Medium (1092.5 – 1344.3)	205.1	320.8
High (Above 1344.3)	93.8	204.8
Correlation	**-ve 0.08**	
P – value	**0.517**	

Source: Primary Data

The relation between Oc and rainfall is a negative correlation at 0.08, as shown, table 4.18. It shows there is no relation between the number of Oc related cases and the amount or duration of rainfall. Thus, the geophysical climatic conditions do not contribute to the causes of Oc related diseases in Nagaland.

Table 4.19: Relation between Oc and Forest Cover, Nagaland

Forest Cover (In percentage)	**Mean**	**Standard Deviation**
Low (Below 67.6)	111.1	245.4
Medium (67.6 – 80.2)	186.5	244.2
High (Above 80.2)	138.8	260.8
Correlation	**+ve 0.02**	
P – value	**0.843**	

Source: Primary Data

The correlation between Oc and forest cover in Nagaland is positively correlated at 0.02, table 4.19. The vegetation cover may not contribute to the cause, origin and distribution of Oc disease.

Table 4.20: Relation between Oc and Literacy Rate, Nagaland

Literacy Rate (In percentage)	**Mean**	**Standard Deviation**
Low (Below 62.7)	105.2	173.5
Medium (62.7 – 73.03)	196.9	289.1
High (Above 73.03)	133.3	268.5
Correlation	**+ve 0.13**	
P – value	**0.279**	

Source: Primary Data

A positive correlation is established between Oc and the Literacy rate in Nagaland at 0.13. Most of the high literacy rate circles in Nagaland are from towns or urban areas of Nagaland. The report from The Global Youth Tobacco Survey -4 carried out in Nagaland among 1919 students (13 to 15 years of age, school going) 2019, indicates 35% of students consumed smokeless tobacco. This may be attributed to Oc related diseases in Nagaland and also shows why higher literary rates also have a higher number of Oc diseases.

Another reason may be due to the circles having better health facilities to serve people from rural areas, which can increase the incidence of Oc diseases indirectly in urban areas.

Table 4.21: Relation between Oc and Open Defecation. Nagaland

Open Defecation (In percentage)	**Mean**	**Standard Deviation**
Low (Below 27.6)	132.5	202.3
Medium (27.6 – 47.7)	154.5	307.9
High (Above 47.7)	154.5	238.2
Correlation	**+ve 0.36**	
P – value	**0.774**	

Source: Primary Data

The correlation between Oc and open Defecation is positively correlated at 0.36, table 4.21. A high open Defecation circles have a low literacy rate and people in these circles lack the awareness to care for their teeth. This contributes to a rise in Oc related diseases in Nagaland.

4.5 Acute Diarrhoel Disease

According to WHO, Acute Diarrhoel disease is the second leading cause of death in children under five years old. It is estimated each year diarrhoea kills around 5,25,000 children under five years of age. Infection of diarrhoel disease is more common when the area or country is in a shortage of adequate sanitation and hygiene and safe water for drinking, cooking and cleaning (WHO). In India, about 9 % of death of children is related to diarrhea which is

estimated to be 1.02 lakh children per year. Thus, it is a major disease, especially in children and it indicates India's need to develop in the health sector.

Acute diarrhoel is a major common disease in the state of Nagaland. Under the study area, 5,136 cases of diarrhoel disease recorded. The disease is mostly caused due to poor sanitation, warm temperature and bad quality of water for daily use. Temperature found suitable for pathogens of diarrhea is between 24ºC – 26ºC. A significant proportion of diarrhoel disease can be prevented through safe drinking water, adequate sanitation and hygiene in Nagaland but there are still many circles or areas that are yet to have access to clean water and proper sanitation facilities.

Table 4.22: Relation between Ad and Population Density, Nagaland

Population Density Per Sq. Km	**Mean**	**Standard Deviation**
Low (Below 70.2)	81.2	113.9
Medium (70.2 – 123.2)	30.05	45.7
High (Above 123.2)	107.3	229.3
Correlation	**-ve 0. 04**	
P – value	**0.78**	

Source: Primary Data

From the above table, the correlation between Ad and population density is a negative correlation but it is very low at 0.04, table 4.22. Ad disease is a communicable disease but the population density may or may not be involved in the occurrence and distribution of Ad disease in Nagaland. Upon further investigation of the data collected, field observation and interviews it is found that the higher population density circles (Urban areas) have better sanitation, availability of clean and portable water and also have the awareness of clean hygiene which results in low cases of Ad disease in Nagaland. The high number of Ad diseases are mostly from the rural areas or circles which lack basic amenities that contribute to more recorded cases of Ad disease in Nagaland.

Table 4.23: Relation between Ad and Altitude, Nagaland

Altitude (In M)	**Mean**	**Standard Deviation**
Low (Below 1025.4)	45.7	66.3
Medium (1025.4 – 1385.5)	144.3	233.2
High (Above 1385.5)	41.6	87.5
Correlation	**+ve 0.04**	
P – value	**0.77**	

Source: Primary Data

The comparison of Ad and altitude shows a positive correlation at 0.04 in table no. 4.23. This indicates the number of Ad diseases increases as the altitude in Nagaland or sampled health centre increases. The higher altitude circles mostly consist of rural areas and lack basic amenities like clean water, sanitation etc. and also have low knowledge to prevent Ad disease. Lack of individual hygiene is also an important cause that contributes to a high number of Ad diseases in Nagaland.

Table 4.24: Relation between Ad and Temperature, Nagaland

Mean Temperature (In ºC)	**Mean**	**Standard Deviation**
Low (Below 23.1)	38.3	66.5
Medium (23.1 – 26.4)	154.9	249.9
High (Above 26.4)	48.6	63.6
Correlation	**+ve 0.01**	
P – value	**0.967**	

Source: Primary Data

A positive correlation is shown between Ad disease and temperature at 0.01. This shows temperature can induce the occurrence and distribution of Ad disease in Nagaland. It may be due to an increase in temperature that may favour the disease germ of Ad to rapidly grow and infect human. The temperature of Nagaland steadily starts to increase from the month of March and continues to remain high up to September. During this period the diseases especially disease germ (Ar, Ad, Ef etc.) which favour warm and moist climates thrive exponentially and cause damage to man's health.

Table 4.25: Relation between Ad and Rainfall, Nagaland

Rainfall (In mm)	**Mean**	**Standard Deviation**
Low (Below 1092.5)	49.7	93.7
Medium (1092.5 – 1344.3)	29.8	70.7
High (Above 1344.3)	145.5	222.1
Correlation	**+ve 0.204**	
P – value	**0.09**	

Source: Primary Data

The relation between Ad and rainfall in Nagaland has a positive correlation at 0.204, table 4.25. According to WHO one of the main causes of Ad disease is due to unsafe use of drinking water. In Nagaland, many areas or circles still lack access to clean water for example the whole district of Longleng as per 2011 data, the majority of the people in the district access water from tanks, lakes, ponds, rivers etc which may trigger Ad diseases because the water may be polluted by nature or man.

Most of the Ad disease is recorded during the onset of summer and rainy(summer) seasons in Nagaland. During this season the water may get easily polluted because after the long spell of dry season, the rainfall may combine with polluted air particles and contaminates the water bodies. Even during the summer season, constant or enormous rainfall can contaminate the surface water. The rainwater flows and gets mixed with other organic particles which can pollute the water bodies.

Table 4.26: Relation between Ad and Forest Cover, Nagaland

Forest Cover (In percentage)	**Mean**	**Standard Deviation**
Low (Below 67.6)	34.2	71.7
Medium (67.6 – 80.2)	36.6	75.03
High (Above 80.2)	161.1	227.6
Correlation	**+ve 0.29**	
P – value	**0.017**	

Source: Primary Data

A positive correlation exists between Ad and forest cover in Nagaland at 0.29, table 4.26. It indicates forest cover can play a crucial role in the origin and distribution of Ad disease. The high temperature and high rainfall in thickly forested areas or circles can contribute to Ad disease occurrence and infect man.

Table 4.27: Relation between Ad and Literacy Rate, Nagaland

Literacy Rate (In percentage)	**Mean**	**Standard Deviation**
Low (Below 62.7)	55.1	98.01
Medium (62.7 – 73.03)	106.3	231.4
High (Above 73.03)	68.9	94.4
Correlation	**+ve 0.10**	
P – value	**0.427**	

Source: Primary Data

The relation between Ad and literacy rate indicates a positive correlation at 0.10, table 4.27. This relation indicates as the literacy rate increase the number of Ad cases also increases. Upon examining the causes, it is found that the better literate circles or areas do have recorded

more number of Ad cases, which indicates a literate person were more responsible to keep his/her health healthy and thus quickly get access to health care institutions to avail quality health care. This has also increased more numbers of Ad disease case. The data management in higher literate circles health centres are also better than the lower literate regions.

The positive correlation also indicates it is not only the literacy rate can prevent or causes more Ad disease but overall round development in every village or town in Nagaland is required to get access to quality basic amenities like drinking water to control diseases outbreaks.

Table 4.28: Relation between Ad and Open Defecation, Nagaland

Open Defecation (In percentage)	**Mean**	**Standard Deviation**
Low (Below 27.6)	126.7	228.6
Medium (27.6 – 47.7)	72.2	106.5
High (Above 47.7)	34.5	74.6
Correlation	**-ve 0.23**	
P – value	**0.062**	

Source: Primary Data

A negative relation at 0.23, table 4.28, is shown between Ad and Open Defecation. Apart from the geophysical conditions, Ad disease can be caused by improper sanitation, unclean water, poor personal hygiene and uncleanliness. Open Defecation is part of the man's social environment and reflects the importance of developmental activities which is required for quality health care. In the sample areas, there are some health institutions recorded high number of Ad cases with low open defecation and vice versa. It indicates low economic development, lack of social awareness and geophysical conditions like climate that usually influences Ad disease.

In Nagaland, there are still large areas or circles that practices open defecation. Even in the sampled areas like Mon district, Tuensang and Kiphire district, several circles are under very high in open defecation. Sampled circles like Thonoknyu at 82.01%, Shamator at 68.74,

Monyakshu at 75.81% and Amahator at 70.94% etc (2011, census) are relied under open defecation. These circles too have very low literacy rates and the public does not give importance to the social environment which can contribute to Ad disease.

4.6 Enteric Fever Disease

Enteric fever is also known as Typhoid. It is caused by a bacteria called 'Salmonella typhi'. It is a communicable disease and men get infected when they use contaminated food and water, close contact with the already infected person, poor personal hygiene, untreated water, improper hand washing, etc. In India, it's estimated reported about 10, 69, 772 cases in 2020 is the third highest disease under communicable diseases (NHP report 2021).

In Nagaland, it is also a major common disease. In this study, the data collected from the sampled health institutions for the Ef disease recorded case is 4,649. The highest recorded cases are under Tuensang district followed by Kohima and Phek districts.

Enteric fever disease can occur due to geophysical conditions like changes in temperature, rainfall and other factors like water, sanitation and personal hygiene. There is a high incidence of Ef disease in some circle because people in that circle does not report in time or do regular health checkup in health centre leading to increase or rapid distribution of Ef disease to the unaffected population.

Table 4.29: Relation between Ef and Population Density, Nagaland

Population Density Per Sq. Km	**Mean**	**Standard Deviation**
Low (Below 70.2)	71.9	159.3
Medium (70.2 – 123.2)	70.1	143.5
High (Above 123.2)	57.5	81.8
Correlation	**-ve 0.02**	
P – value	**0.856**	

Source: Primary Data

The above table 4.29 shows a negative correlation between Ef and Population density at 0.02. The result is a negligible number but the negative sign indicates that high population density circles may or may not induce Ef disease because as per the data collected and field observation, it is found that high case is usually in circles in low or moderate density. Even from the table no. 4.29, there is a high mean indication from low and medium circles. This result of population density may not contribute much to distribution or occurrence but other factors can be correlate with population density in Ef disease intensity.

Table 4.30: Relation between Ef and Altitude, Nagaland

Altitude (In M)	**Mean**	**Standard Deviation**
Low (Below 1025.4)	60.8	89.9
Medium (1025.4 – 1385.5)	68.04	109.3
High (Above 1385.5)	78.9	181
Correlation	**+ve 0.03**	
P – value	**0.819**	

Source: Primary Data

The Ef disease and Altitude have a positive correlation at 0.03, table 4.30, but it is a negligible figure. This data reflecting altitude may or may not be the factor in the occurrence of Ef disease. But from the temperature perspective, Ef disease can thrive in cold conditions so when the altitude increases the temperature also decreases which can result in the origin of Ef disease.

Table 4.31: Relation between Ef and Temperature, Nagaland

Mean Temperature (In ºC)	**Mean**	**Standard Deviation**
Low (Below 23.1)	49.1	127.8
Medium (23.1 – 26.4)	96.8	170.9
High (Above 26.4)	66.7	92.6

Correlation	**-ve 0. 02**
P – value	**0.896**

Source: Primary Data

From the above table no. 4.31, a negative correlation is shown between Ef and temperature at 0.02. The majority of the infected circles are in low altitude regions that have higher temperatures. Typhoid/paratyphoid fever epidemics occur in summer and autumn and the seasonal pattern varies across latitudes, indicating that meteorological factors may play a role in their transmission (Gao et. al. 2021).

Most of the Ef disease starts to rise steadily with the onset of Pre-monsoon and lasts with high intensity until the summer seasons in Nagaland. During this season Nagaland experiences warm and moist climate conditions which allows Ef disease germs to thrive.

Table 4.32: Relation between Ef and Rainfall, Nagaland

Rainfall (In mm)	**Mean**	**Standard Deviation**
Low (Below 1092.5)	94.9	160.2
Medium (1092.5 – 1344.3)	16.4	32.4
High (Above 1344.3)	88.9	143.6
Correlation	**+ve 0.001**	
P – value	**0.995**	

Source: Primary Data

A positive correlation is shown in Ef and Rainfall at 0.001, table 4.32. Water is one of the main sources of occurrence and distribution of Ef disease. As the rainfall intensity increases the intensity of Ef disease also increases. During very high rainfall months i.e., summer months when temperature is high and abundant of rainfall, the disease germs can multiple quickly and contaminate water. Most of the highly incidence of Ef disease is from the circles where most of their main source of water is from either lake, rivers, ponds etc. Another reason may be that

most of the people are farmers, they get drenched from rain while working in their agriculture fields can result in Ef disease.

Table 4.33: Relation between Ef and Forest Cover, Nagaland

Forest Cover (In percentage)	**Mean**	**Standard Deviation**
Low (Below 67.6)	86.1	142.7
Medium (67.6 – 80.2)	36.8	99.5
High (Above 80.2)	84.5	147
Correlation	**+ve 0.01**	
P – value	**0.919**	

Source: Primary Data

The correlation between Ef and Forest cover shows a positive correlation at 0.001, table 4.33, which is a very negligible figure and can be accepted as a neutral correlation. This shows forest cover may or may not affect the origin and distribution of Ef disease.

Table 4.34: Relation between Ef and Literacy Rate, Nagaland

Literacy Rate (In percentage)	**Mean**	**Standard Deviation**
Low (Below 62.7)	92.2	160.7
Medium (62.7 – 73.03)	59.9	141.4
High (Above 73.03)	56.7	86.8
Correlation	**-ve 0.02**	
P – value	**0.904**	

Source: Primary Data

A negative correlation at 0.02, table 4.34, is shown between Ef and Literacy rate. This negative correlation indicates higher literate areas have lower cases of Ef disease. Even the mean between Ef and literacy shows a lower mean value in High literate.

Most of Ef disease are spread either through contaminated water or food from infected to unaffected persons. Ef disease is a communicable disease but it can be controlled and prevented if people have know-how on diseases as well as understanding the importance of cleanliness and hygiene. During field visits, it found that lack of awareness in hygiene and illiterate people can be a key for distribution of Ef. An incident was observed in a hotel, where the customers were served with leftover food from one person to another person. The utensils that were used by customers were not even cleaned properly and coincidently the hotel is situated in an administrative circle (sampled circle) where a high incidence of communicable diseases like Enteric fever, Tuberculosis etc. was recorded. This is an example of why there is a high incidence of Ef disease due to not maintaining hygienic conditions and also lack of awareness that diseases can spread from contaminated food and unclean utensils.

Table 4.35: Relation between Ef and Open Defecation, Nagaland

Open Defecation (In percentage)	**Mean**	**Standard Deviation**
Low (Below 27.6)	91.89	145.82
Medium (27.6 – 47.7)	123.75	166.85
High (Above 47.7)	102.55	138.26
Correlation	**+ve 0.04**	
P – value	**0.315**	

Source: Primary Data

A positive correlation is shown between Ef and open defecation at 0.04, table 4.35. Free from open defecation can reduce Ef disease because WHO stated Ef disease is mostly associated with improper or poor sanitation. For example, Botsa circle under Kohima district has a high incidence of Ef disease and also a high percentage of open defecation at 37.7%, also the circle mostly depend water from tanks, lakes etc. There are other geo physical or socio environmental factors that can contribute to Ef disease. Through interviews with medical

professionals, Ef disease can also be due to forest areas and also unreported cases does sometimes leads to outbreak of Ef diseases. Other factors like Individual hygiene and cleanliness are the main causes that can prevent Ef disease origin and distribution.

Table 4.36: Factors influencing the most common diseases in Nagaland

Diseases	Physical	Social
Hypertension	Temperature	Population density, Poor economic conditions, Dietary habits, Social problems, Higher literate areas, Unhealthy and change in lifestyle, Physical exhaustion
Acute Respiratory	Altitude, Temperature, Rainfall, Higher Forested areas	Poor hygiene, Infrastructural development
Oral cavity related		Higher Literate areas, Chewing of tobacco products, Poor hygiene
Acute Diarrhoel	Temperature, Rainfall, Polluted water, Higher forested areas	Poor economic conditions, Poor sanitation, Low literate, Contaminated food
Enteric fever	Temperature, Rainfall, Polluted/poor quality water,	Low literate, Lack of awareness, Poor sanitation, Poor hygiene, Contaminated food

The above table 4.36, shows the various Geographical elements both physical and social factors that have been influencing the most common diseases leading to origin, causes and distribution in Nagaland.

CHAPTER - V

DISTRIBUTION AND ACCESSIBILITY OF HEALTH CARE INSTITUTION

5.1 Introductory

Diseases are a burden to human and to effectively prevent, control outbreak, get quality care etc health infrastructure in a proper geographical location plays a significant role in disseminating quality care to the public. The presence of health infrastructure alone will not provide health care but the regular presence of effective medical professionals, health workers, proper distribution of health institutions and more importantly accessibility to the health institutions can cater the needs of the people and also prevent disease outbreaks.

This chapter examines the effectiveness of health infrastructure in the state of Nagaland, and whether it can provide quality care and affordability to the people. In Nagaland, there are various health institutions but the Primary Health Centre and Community Health Centre are the primary giver of health care for the public because these health centres are normally located in rural areas. Other health institutions like Sub -Health centres are located at village levels but in this centre, the highest qualified medical staff is a nurse and no doctors (medical professionals) are available. Thus, this chapter focuses on the primary health giver institutions i.e., PHC and CHC to examine their effectiveness in providing quality care to the rural populations.

To examine the distribution of health institutions in Nagaland, the health infrastructure report was extracted from the Annual Statistical Report of Nagaland 2018. The study was based on 2018 health infrastructure data because, upon investigation during the field visit, it was found that there was rapid development in health sectors after the COVID-19 pandemic. Before the pandemic, there was a snail pace of development and a lack of staff in almost all the health centres. So, to bring fairness to the study, it chose to study the health infrastructure before the pandemic struck the state.

All the health infrastructures were analysed in detail, based on the secondary and primary data. The data were interpreted through graphs by using MS Excel and SPSS software. Mapping for accessibility and distribution of health centres were carried out by using ArcGIS

software and also to collect geographical coordinates Gramin GPS and Google Earth search engine were utilised.

5.2 Measures for health infrastructure

Health infrastructure consists of the health centre, service it provides, facilities, presence of medical professionals, nurses, health workers etc which can work cohesively and provide effective and quality care to the public (Medeo, 2023). Being a hilly, mountainous region, remote state of India etc a good health infrastructure is crucial in the state. About 70% of Nagas live in rural areas and their economic activity is rudimentary. Being mostly farmers, the socio-economic conditions are poor and affordable to health centres becomes a challenging task. Thus, proper health institutions become crucial in a state like Nagaland.

The location of a health centre in a well-defined geographical area is phenomenal to deliver quick and easy access to the public at times of dire need. As per the National Health guidelines rural health centres like Sub-Centre, PHCs and CHCs should be located in a specified geographical location with a well-marked boundary in terms of population, radial size, the right type of health institutions etc. to cater for the accurate needs of health care to public. India as per the 2011 census nearly 70% population lives in rural areas and thus setting up health infrastructure in rural areas is a top priority to achieve a better quality of life and overall growth and development of the country. From the table no. 5.1, the structure of rural health institutes is proportionate to the population size in various geographical areas as given below:

Table 5.1: Rural Health Care Norms in India

Health Institute	**Population size**	
	Plain Area	**Hilly/Tribal/Difficult Area**
Sub Centre (SC)	5,000	3,000
Primary Health Centre (PHC)	30,000	20,000
Community Health Centre (CHC)	120,000	80,000

Source: India Health Report – 2021 -22

The national norms of health institutes service to certain population sizes in India are important for quality care and equality in the health care system to the public irrespective of large or small population size. As per the table no. 5.2, the latest average rural area of the health institute of India is discussed below

Table 5.2: Health Institution in terms of serving/ providing health care to no. of population between Nagaland and All India in 2021

State	**Health Institute**		
	SC	**PHC**	**CHC**
Nagaland	2, 911	9, 489	59, 190
All India	5, 734	35, 602	163, 298

Source: National Health Profile – 2021 – 22

From the above table no. 5.2, the state of Nagaland has a good proportion of health institutes in comparison to population size. All the health institutes are serving a much lesser size of population, which is way lower than the national average. In percentage, a sole SC centre in Nagaland is serving a 50.77% lower population size than the national average likewise, PHC is 26.65% and CHC is 36.25%.

The Nagaland Health Institutes in relation to national norms on population size per health centre has achieved well for quality health because the National Health Profile Report 2021-22 shows health institutes across Nagaland are set up in a well-defined population size.

Nagaland topography is treacherous and as per the health report it is under the category of hilly or tribal or difficult area. Being a rough topography, irrespective of the norms that have been laid down, it would be beneficial to the public if more health institutes were set up which will give privileged to the public to access health institutes more easily and affordably. Nagaland is also one of the Indian states where resources are limited and the health subject as per the Constitution of India is categorised under the State List where all the expenses, policy, planning etc should be bear by the concerned state. These steps have discouraged state governments like Nagaland, where resources are limited from setting up more health institutes and any type of health development. But under the initiative of the Central government, various

health programmes were introduced for all round development of health institutes across the state of India. With this programme, Nagaland state was not left behind but rather helped in the development of the health sector.

The location of a health institute is not only confined to the human population but geographical area and especially radial distance from the health institute is crucial for quick accessibility in terms of emergency. Another factor may be that the land has a vast area and all man-made structures have a certain limit to cater for the needs of large areas and also meet the demands of the growing population. So, in order to protect and preserve this infrastructure from breaking down, a certain area or distance is required to provide quality and quick health care. The health sector of India has made a certain rule in terms of geographical coverage area and radial distance of health institutes across India in the given below table

Table 5.3: Average rural area norm per health institute, India

Health Institute	**Rural Area (Sq. Km)**	**Tribal Area (Sq. Km)**
Sub Centre (SC)	19.55	21.65
Primary Health Centre (PHC)	123.85	143.37
Community Health Centre (CHC)	563.52	572.44

Source: Health Report India, 2021 -22

Table 5.4: Radial distance norm of health institute, India

Health Institute	**Rural Area (in Km)**	**Tribal Area (in Km)**
Sub Centre (SC)	2.49	2.62
Primary Health Centre (PHC)	6.28	6.75
Community Health Centre (CHC)	13.39	13.50

Source: Health Report India, 2021 -22

The table no. 5.3 and 5.4, show the norms or rules for setting up health institutes in rural India. This norm is applicable in all the states of India to provide quick and easy access to health institutes.

As per the National Health Report of India 2021 -22, India has developed in area coverage and even the state of Nagaland has set up a definite number of health institutions to have better coverage and easily available health institutes.

Table 5.5: Average rural area coverage and radial distance between Nagaland and All India in 2022

Item	**State**	**Health Institute**		
Average Rural area Coverage (in Sq. Km)		**SC**	**PHC**	**CHC**
	All India	9.55	123.85	563.52
	Nagaland	38.86	124.7	777.88
Average Radial distance (in Km)	All India	2.49	6.28	13.39
	Nagaland	3.49	6.3	15.73

Source: Health Report India, 2021 -22

Based on the table no. 5.5, Nagaland has also achieved a lot in delivering quality health care by setting up numerous health institutes across the state. This huge development can cater to the demands of the public for affordable and quality care.

According to 2011 census, about 68.84% of India's population lives in rural areas, in Nagaland about 71% of the population resides in rural areas i.e., in villages. So, in order to cater for the large rural population a definite number of villages assigned to health institutes is crucial for quality health. The given below table indicates the average number of villages covered by a particular health institute.

Table 5.6: No. of villages covered per Health Institute in Nagaland and All India 2021

Average No. of villages covered	**Health Institute**		
	SC	**PHC**	**CHC**
Nagaland	4	13	78
All India	4	27	121

Source: National Health Profile, 2021 -22

Another key measure in health infrastructure, certain conditions have been set up for efficiency in health administrative-related work in the Indian Health system which is applicable across the state. For that purpose, 3 SCs should be under the administration (health) of a single PHC and 6 PHCs under a sole CHC.

5.3 Distribution of Health Infrastructure

Nagaland has a total geographical area of 16, 579 sq. km with 16 district headquarters. However, in this study, the focus was on 11 districts because 5 districts were recently created viz Chumukedima, Nuiland, Tseminyu, Noklak and Shamator. The state also has 119 administrative circles for efficient law and order in the state.

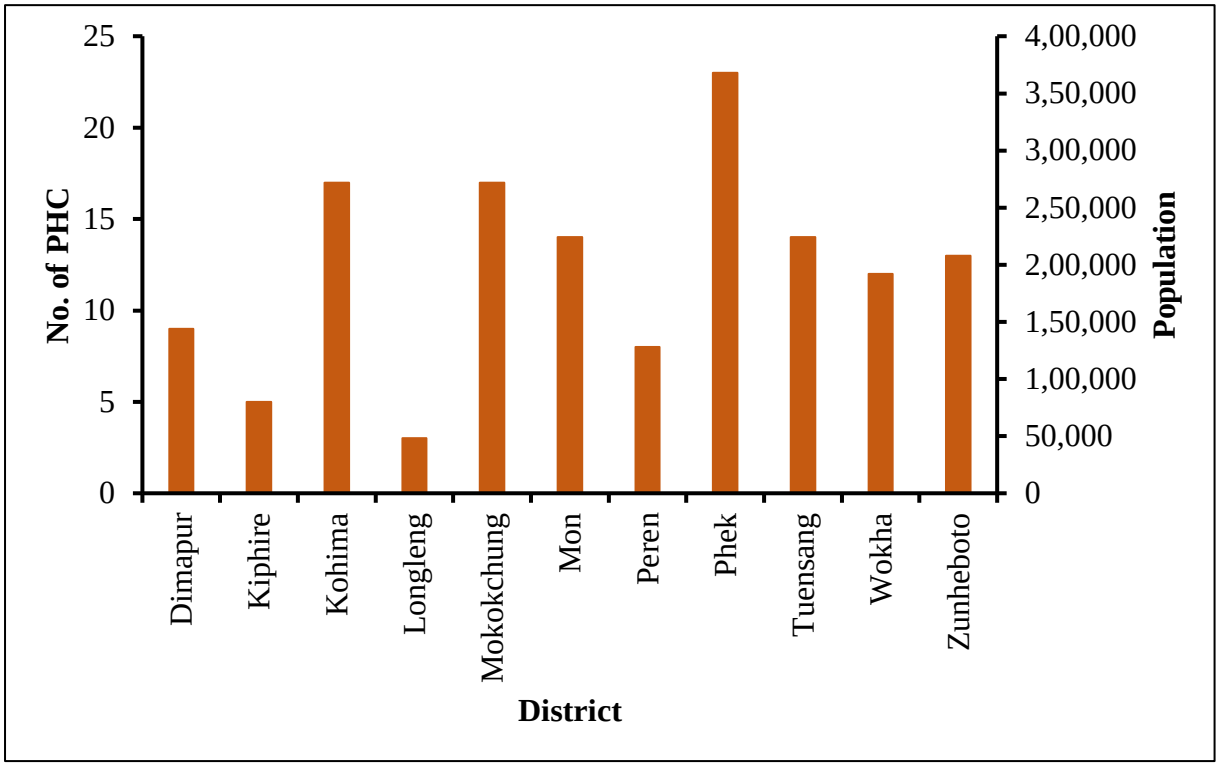
In the health sector, as per 2018 health information, Nagaland has 11 district hospitals (DH), 25 Community Health Centres (CHCs), 135 Primary Health Centres (PHCs) and 559 Sub-Centres (SC). There are also other health institutions like TB hospitals, Nursing institutes etc. but this study focuses on the primary or rural health care system of Nagaland. The data on health infrastructure were collected at rural levels by visiting the health centre, questionaries, personal interviews etc methods were used to ascertain the health infrastructure of Nagaland.

For administrative purposes, the district level is headed by the Chief Medical Officer, the District Hospital is headed by the Medical Superintendent, the Community Health Centre is headed by the Senior Medical Officer and the Primary Health Centre by the Medical Officer.

5.3.1 Distribution of rural or primary care centres (PHC and CHC)

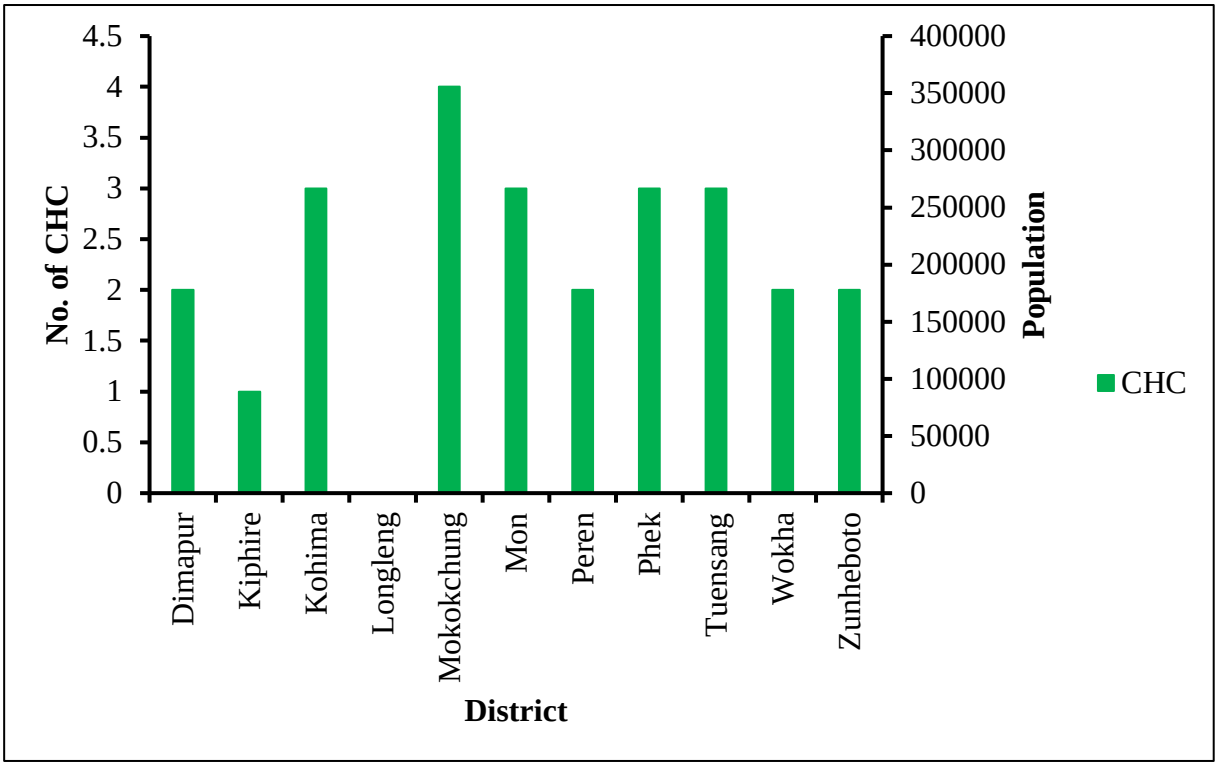
Primary health centres (PHCs) and Community Health centres (CHCs) are the main health centres to deliver to the primary or rural population. They are owned by the state government and are considered to be the first point of contact with medical professionals i.e., Doctors in rural areas. In PHC, there is one medical doctor, a nurse, a pharmacist and other medical staff to support the medical doctor as well as run the centre whereas in CHC there are 3 or 4 medical doctors consisting of a specialist in medicine, surgeon, gynaecology etc assisted by a nurse, pharmacist and other staff to carried out medical related works. Thus, CHCs are better at providing quality care to the people. Both these centres have ambulance services.

Figure 5.1: Distribution of PHCs and population district-wise, Nagaland



Source: Primary Data

Figure 5.2; Distribution of CHCs and population district-wise, Nagaland



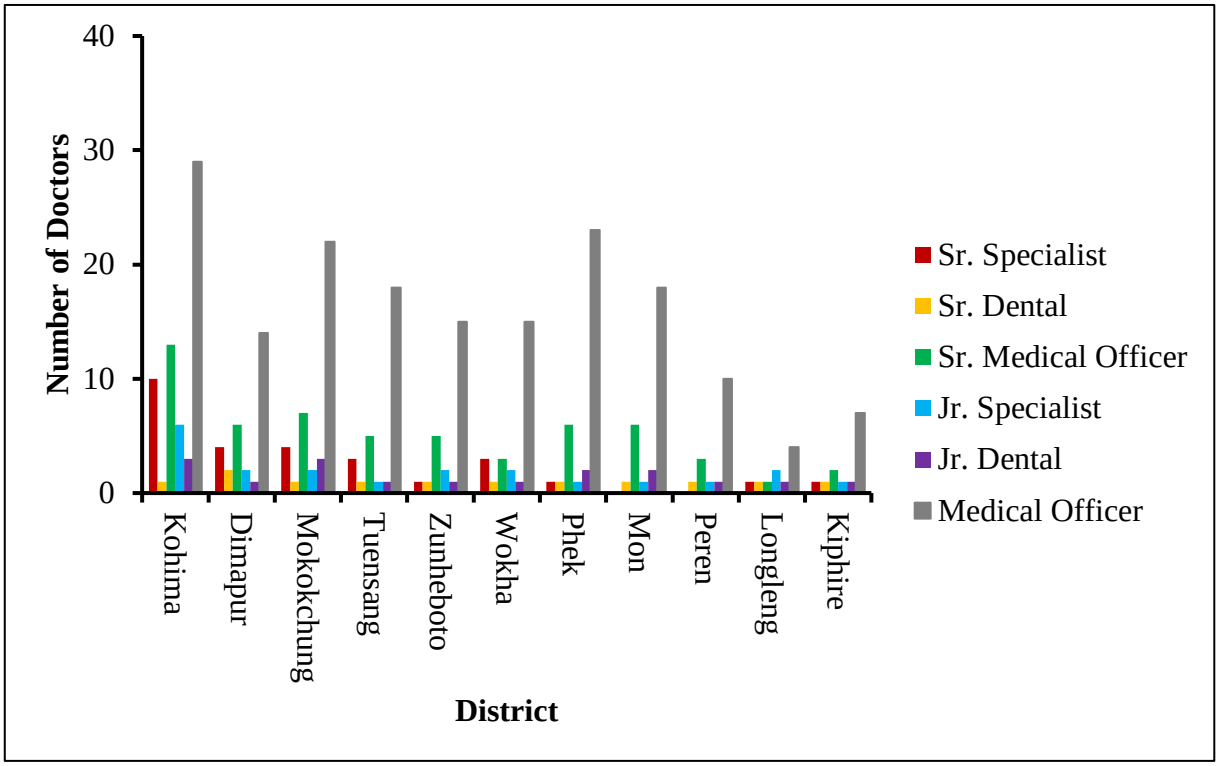
Source: Primary Data

The distribution of PHCs and CHCs in relation to population size differs from one district to another. The highest number of PHCs is Phek district followed by Mokokchung and Kohima districts with the least being Longleng district. In CHCs, the highest is Mokokchung district with 4, followed by Kohima, Phek, Tuensang and Mon districts. Initially, Longleng district was the only district which does not have a single CHC but during the field visit in the year 2022, the Tamlu PHC was converted to CHC. The distribution of health centres is not equal and there are some areas that are in dire need of upgrading health centres or rather setting up new centres. Being a mountainous state, traversing from one administrative circle to another was quite an experience.

5.3.2 Distribution of Doctors

The availability of health professionals or doctors in health institutions is crucial because they are the primary people to deliver a quality healthcare system. In the state, there are about 428 medical doctors of which 39.49% of doctors directly or indirectly involved in administrative-related work, 10.04% of doctors are in the Directorate of Health and Family Welfare, Kohima, Nagaland, 14.25% are specialist doctors and about 44.86% are medical officer and junior dental surgeon.

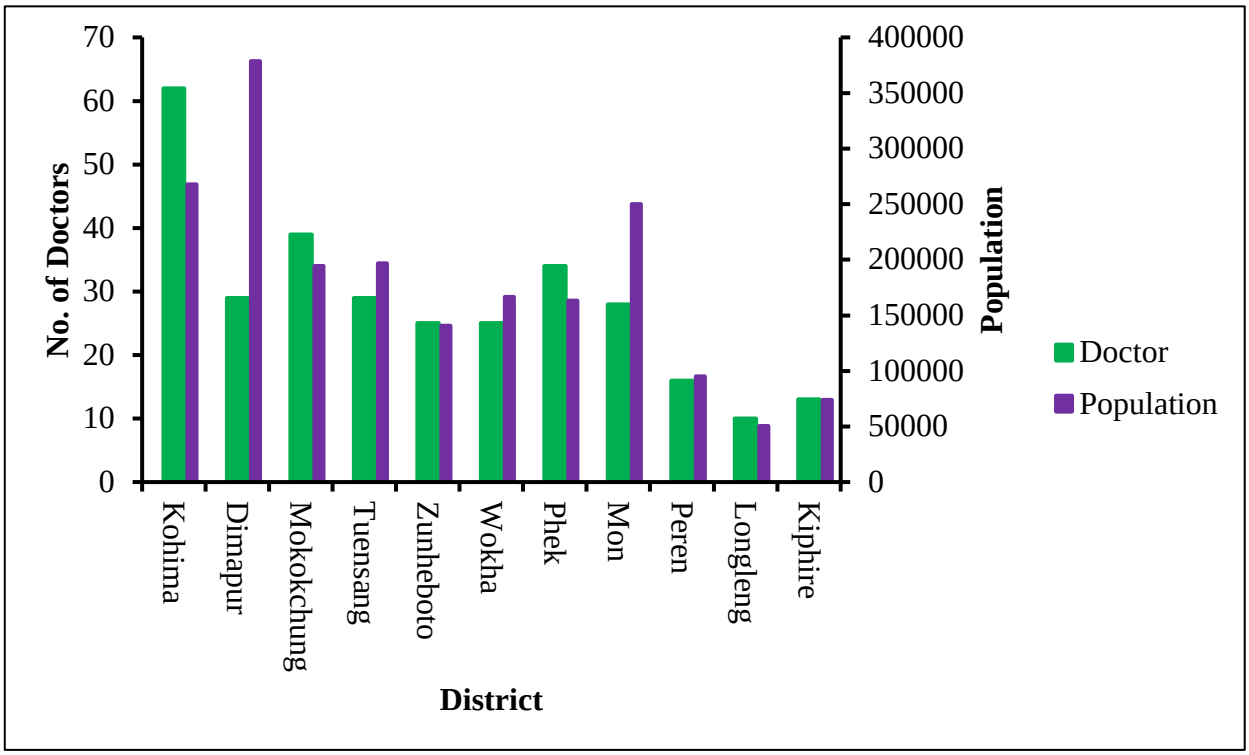
Figure 5.3: Distribution of Medical Doctor district-wise in Nagaland



Source: Statistical Handbook of Nagaland 2018

As per the figure no. 5.3, Kohima district is first in the state which constitutes about 27.1% of all doctors. Kohima has the highest percentage because of the presence of the Directorate of Health and Family Welfare, Government of Nagaland, a good sum of doctors is involved in the health administrative work, framing policies and programmes for the state. The second highest number of doctors is Mokokchung district with a proportion of 10.98% of the state. The third highest is Phek district with a proportion of 9.35%. The lowest number of doctors is Longleng district with a proportion of 3.74% of the state.

Figure 5.4: Population and Doctor district-wise Nagaland



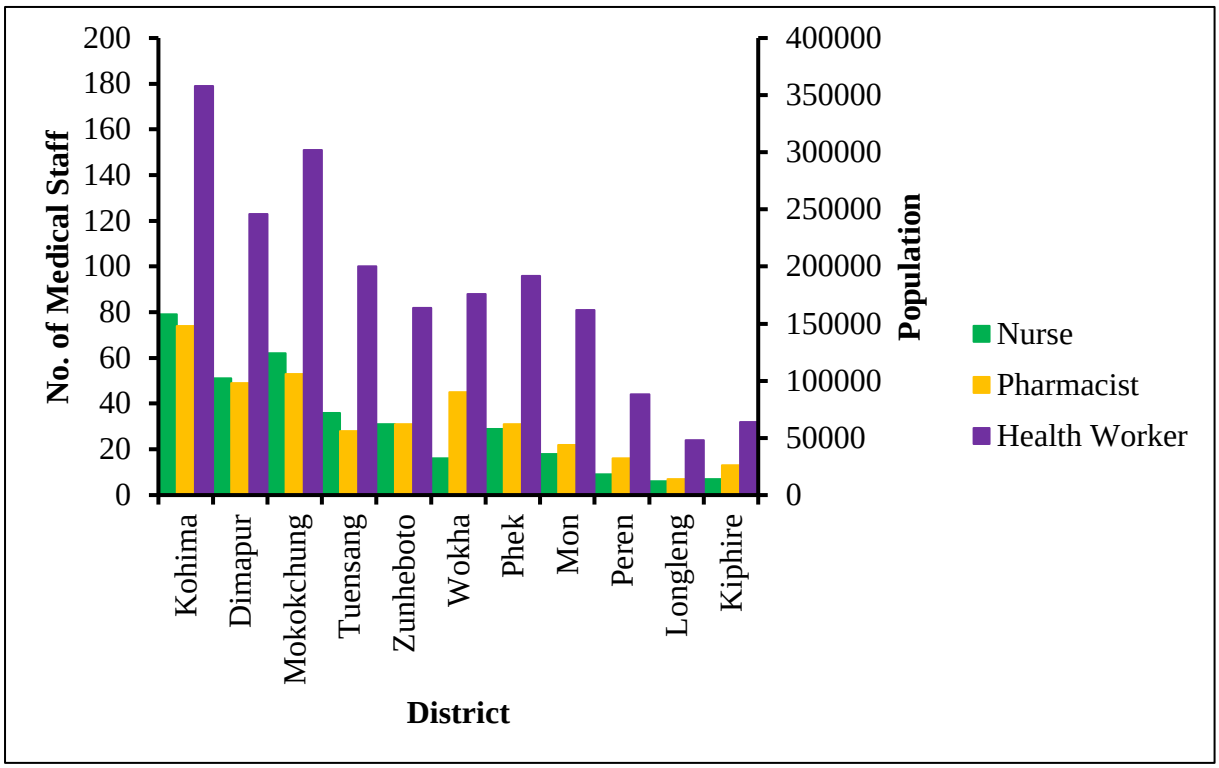
Source: Statistical Handbook of Nagaland 2018

The distribution of medical professionals in the state is unequal, some district there are more than one medical professional in the same related expertise field. Thus, in this study, it was found that in Tuensang District Hospital, there were three Specialist surgeons and no child and anaesthesia specialist. The distribution of doctors is sometimes not rational as in some instances a single doctor is attached to two or more health centres. Another key problem in the Nagaland health sector, doctors do not want to serve in rural areas and rather wish to serve in urban areas which result in irregular and in some cases total absence of doctor in his/her assigned health centre.

5.3.3 Distribution of Medical Staff

Apart from the doctors, medical staff which include nurses, pharmacists and other health workers are also equally important in health centres, to work as a team with perseverance and deliver quality health care to the general public.

Figure 5.5: Distribution of Medical staff district-wise, Nagaland



Source: Statistical Handbook of Nagaland 2018

The highest number of medical staff is under Kohima district, followed by Mokokchung district and Dimapur district. Kohima is the capital of Nagaland and is under Kohima district where the Directorate of Health and Family Welfare is located. This caused a large number of medical staff assigned to the Directorate for Administrative Works, which resulted in a high number of staff.

The presence of an equal number of doctors and medical staff provides an uninterrupted flow of work culture as well as quality care. The least number of medical staff especially nurses is under Longleng and Kiphire district. The understaffing resulted in low-quality health care and even during the field visits in these two districts it was found that a low number of nurse staff had affected the health care system which was conveyed by the doctors during interviews.

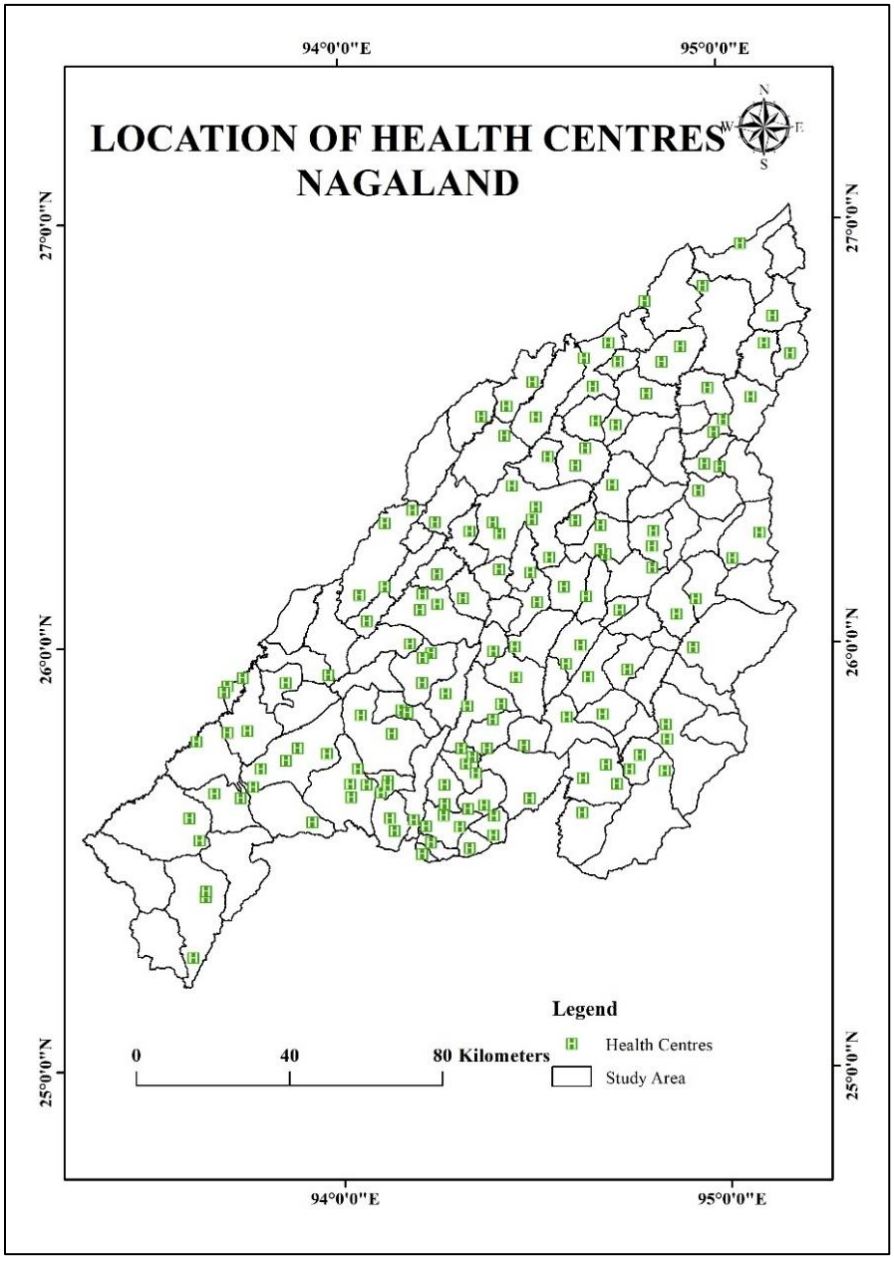
The number of both medical doctors and staff also varies every year due to retiring from government service, transfer, sharing of medical staff between centres etc. leading to fluctuating in the distribution.

5.4 Accessibility to Health Institution

Easy and affordable accessibility to the health centre or institute provides good quality health care to the public. The geographical analysis of health institutes is important for planners and for the future development of health institutes in the state. Geographical Information system provides technicalities to the geographers to access the pattern of distribution and accessibility in the given geographical area. Various GIS tools have been widely used to analyse the pattern of distribution of health facilities and find out the new location of health facilities (Lone and Mayer. 2022)

In Nagaland, there is a wide regional disparity in health facility distribution due to geo-physical, socio-economic conditions, population disparities, improper state policies and programmes and most importantly political attitudes in favour of a particular region or area. Apart from the government health care system, there are also numerous private health institutes but this study was focused on the government sector i.e., PHC and CHC because they are the primary health institutions (rural areas) in the state.

Figure 5.6: Location of all active PHC/CHC, Nagaland



Source: Primary Data

5.4.1 Health facility to population ratio

The availability and accessibility of health facilities to population ratio is important for policy and programme planning purposes for the development of health sector and also provide basic needs to the demands of the population. A well-balanced ratio will provide quality health, especially to the rural population of the state.

Table 5.7: Rural health centre and population ratio

District	Population (2011 census)	Total no. of CHC and PHC	Ratio
Dimapur	378811	10	1:37,881
Kiphire	74004	6	1: 12,334
Kohima	267988	20	1: 13,399
Longleng	50484	3	1:16,828
Mokokchung	194622	21	1: 9,268
Mon	250260	17	1: 14,721
Peren	94954	10	1: 9, 495
Phek	163294	26	1: 6, 281
Tuensang	196596	17	1: 11, 564
Wokha	166343	14	1: 11,882
Zunheboto	140757	15	1: 9,384

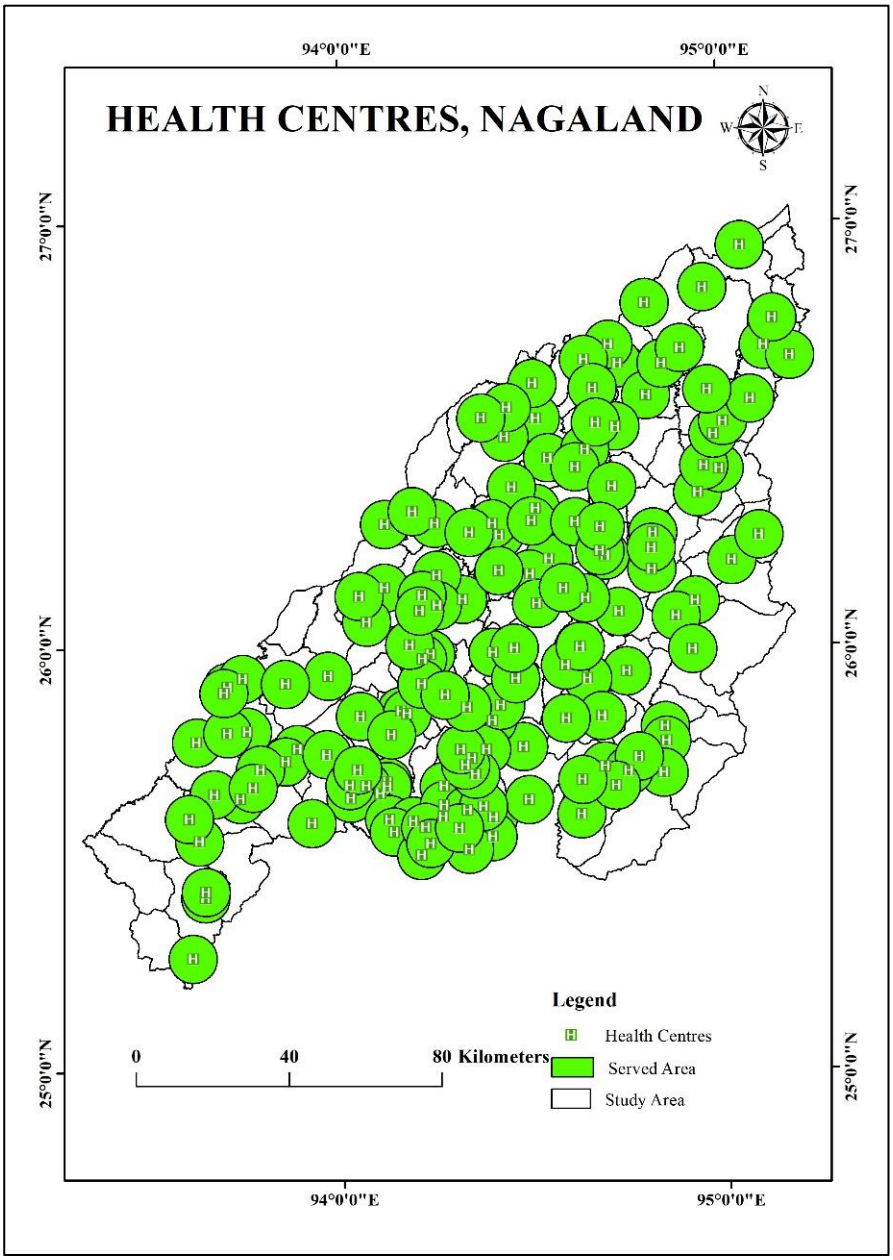
Source: Primary Data

5.4.2 Spatial distribution of health centres (PHC and CHC)

As per the National norms, the radial distance from one health institution to another in tribal rural areas is 6.75 km for PHC and 13.50 km for CHC. The radial distance allows the health institute to facilitate and disseminate quick responses in terms of emergencies for both

patients and medical professionals. The distance from health centre to village level can play a crucial role even in administrative-related work. In the latest data as provided from the National health profile Nagaland 2022, radial distance for PHC is 6.3 km and CHC is 15.73 km. In PHC level Nagaland is below average than All India radial distance but in CHC level Nagaland still needs to set more CHC centre to cater the rural population.

Figure 5.7: Radial distance and served area of PHC/CHC, Nagaland

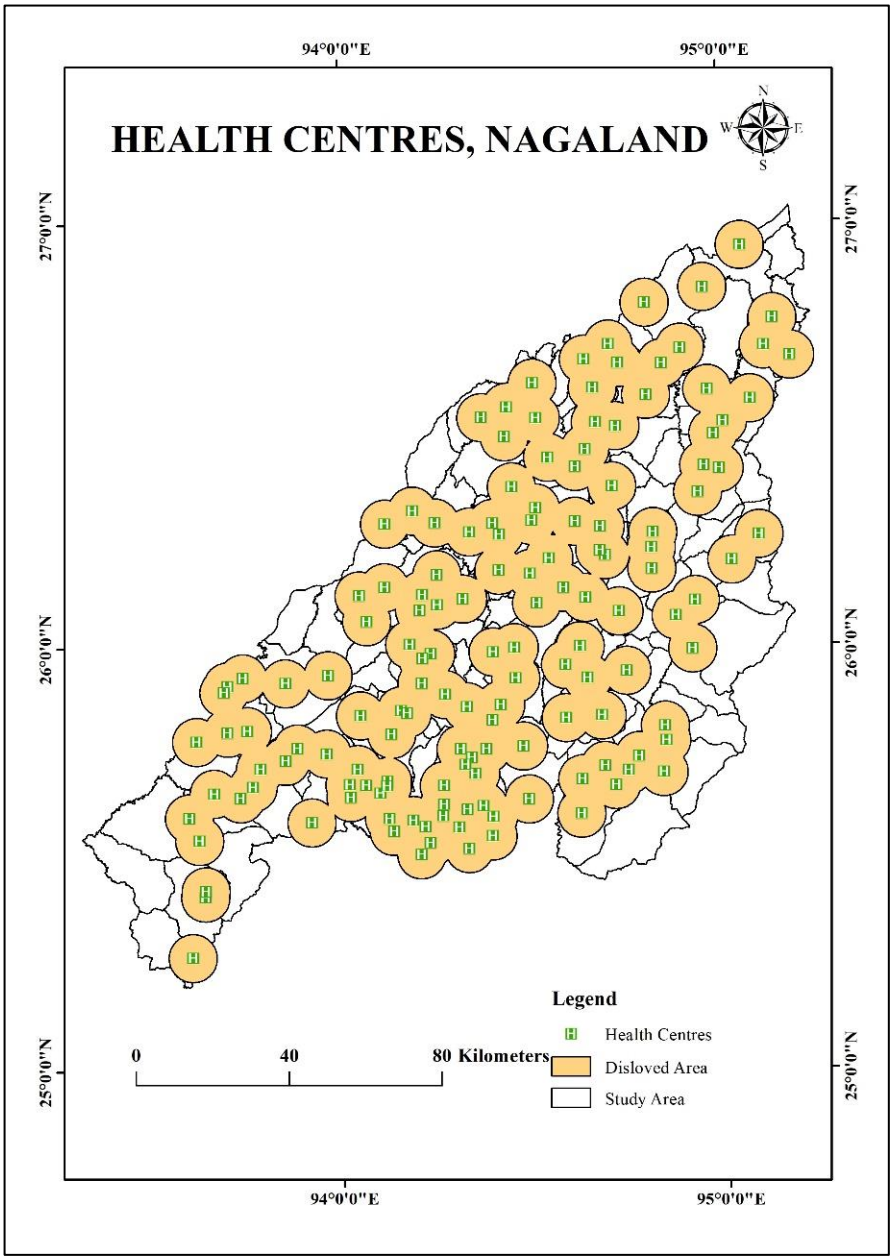


Source: Primary Data

The above figure no. 5.7, it depicts the radial distance of a sole health centre (PHC/CHC) that can serve the population and also the geographical distance it can cover. A fixed geographical area, number of villages or population to a sole health centre can bring efficiency to health institutes where it can perform and bring quality care to public health. there are about 160 (PHC/CHC) primary care giver health institutions in Nagaland included in this map.

5.4.3 Buffer analysis of health centre

Figure 5.8: Buffer analysis (Dissolved served area) of health centre, Nagaland



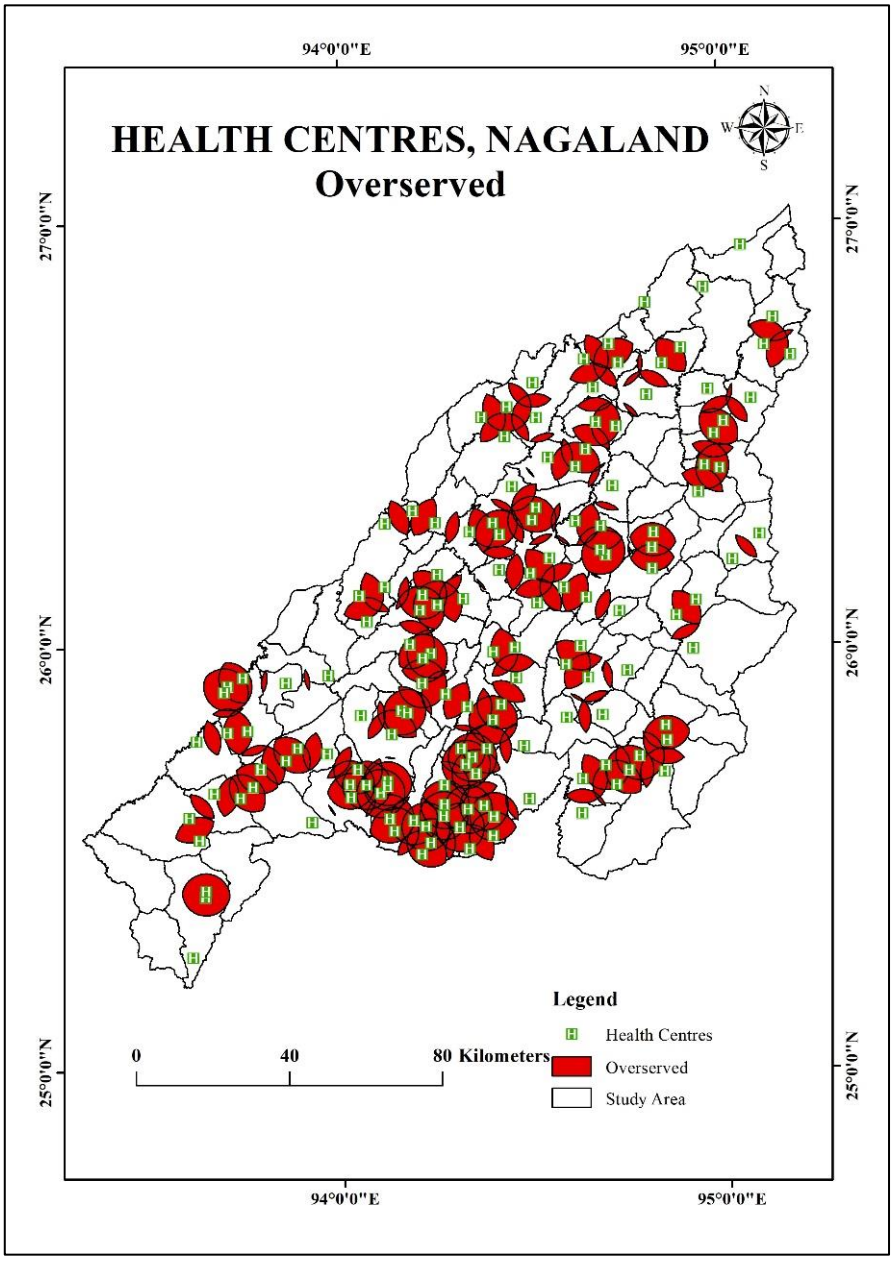
Source: Primary Data

From the above figure no. 5.8, the dissolved serve area or intermingling of two or more health centres is shown with an average radial distance of 6.3 km from the centre point of the health centre. The mapping will indicate to what extent the health centre can serve or the public can access the health centre and it also shows the overlap of one health centre to another which shows over service area.

5.4.4 Overservice area of health centre

Some health centres exceed the geographical area where they can able to give their service. This is due to improper planning, political attitudes, social and economic problems etc. resulting from the government setting up a health centre randomly without assessing the real need for a health centre. These overservices show a high concentration of health centres in a given geographical area. The overservice area can result in huge financial loss to the government of the day as well as may not bring quality healthcare to the public.

Figure 5.9: Overserved health centre, Nagaland



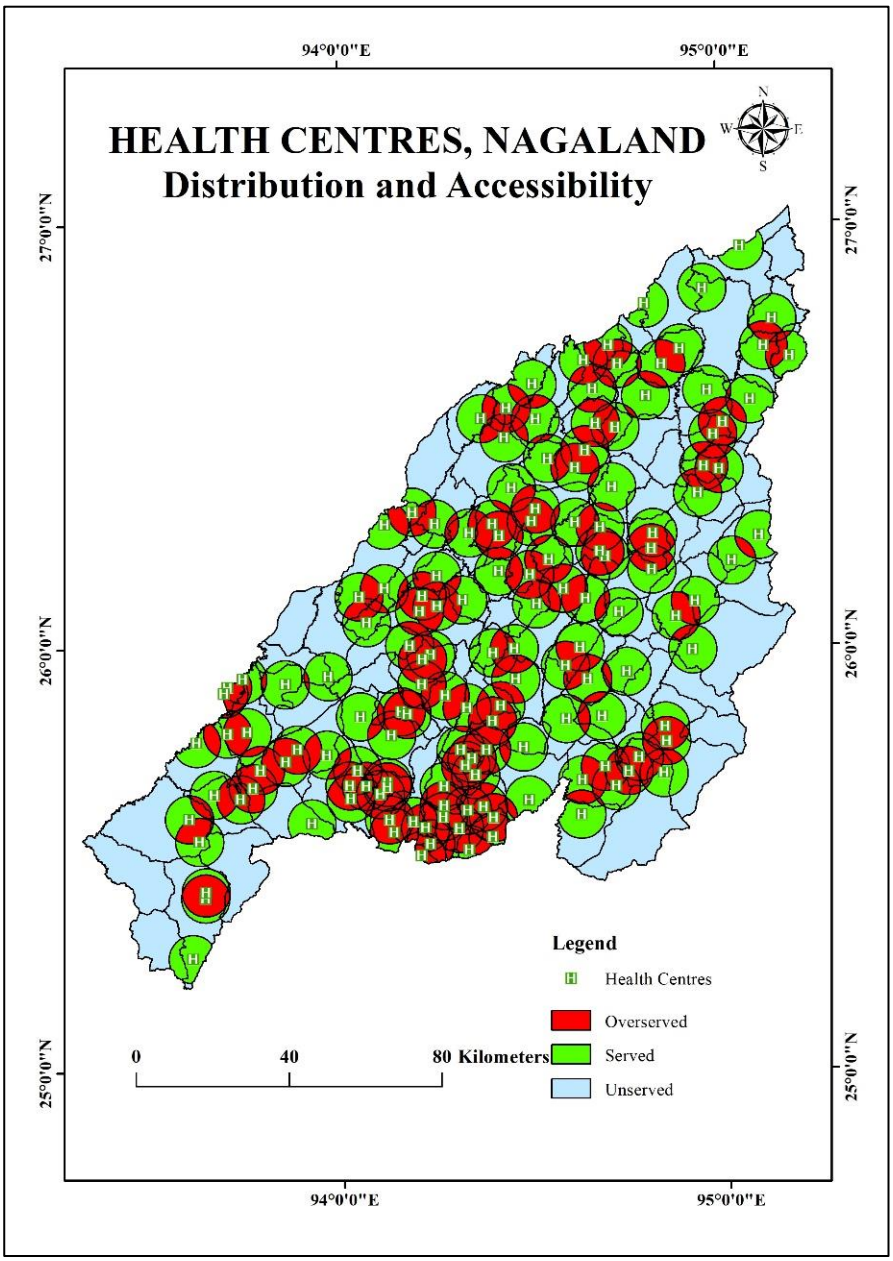
Source: Primary Data

From the above figure no. 5.9, Tenning Administrative Circle under Peren district has the highest served area because under this circle there are three health centres which has very close proximity to each other. It is followed by Ongpankong administrative circles under Mokokchung district and Chumukedima administrative circles under Dimapur districts.

The lowest overserved area is Tuensang sadar under Tuensang district, followed by Phor under Phek district. Under Tuensang sadar there is a District Hospital and if taken into

account then the lowest overserved area would be Phor but in this study, all District Hospitals are not taken into consideration.

Figure 5.10: Health centres (PHC/CHC) of Nagaland – Distribution and Accessibility



Source: Primary Data

The above figure no.5.10, depicts the rural health centres across Nagaland indicating areas where the health centre is Unserved, Served and Overserved service to the public. There are still vast geographical areas that need to be connected with the primary health care system.

A well-balanced service of health centres is required in order to bring quality, affordable and easy accessibility to health institutes.

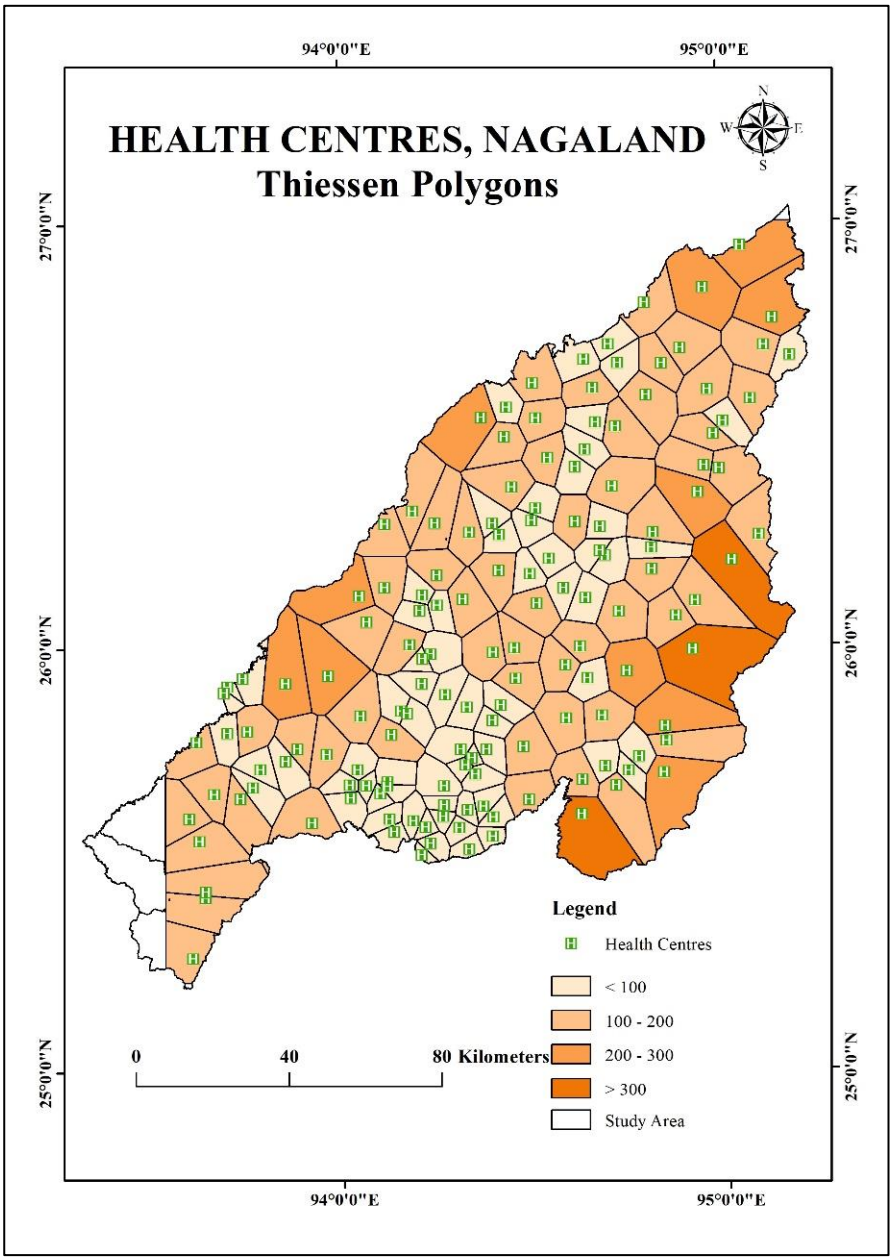
About 14.96 % of total geographical area of Nagaland is under unserved area or in need of health centre, about 15.46% area in served and 69.57% area is overserved.

5.4.5 Thiessen Polygon of health centre

Thiessen polygon tool is used by a point to divide the area covered. Each point in a given area is influenced by its sample point. In this thisessen polygon, it is found that Thonokyu PHC under Thonoknyu administrative circle served the largest geographical area of approx. 416 sq. km, followed by Liphori PHC under Liphori administrative circle of approx. 349.8 sq. km and Nokhu PHC under Nokhu administrative circle of approx. 71.2 sq. km.

The lowest geaographical area is Duncan UPHC under Dimapur sadar administrative circle of approx. 11. 07 sq. km followed by Khezakeno PHC under Khezakeno administrative circle with approx. 14 sq. km.

Figure 5.11: Thiessen Polygons of PHC/CHC Health Centres, Nagaland



Source: Primary Data

5.5 Services and Facilities in the Health Centre

Services and facilities are one of the main cores in maintaining and delivering good health to the public. In this study, all the health centres across were not taken into account but the sampled health institutions i.e., about 50.63% of primary health care centres (PHC and CHC) were covered to determine the health sector in Nagaland.

5.5.1 Service provided

In the service provided by the concerned health institutions, 6 options were given in a set of questions to the health centre. These 6 services are the primary for every rural health centre that needs to be set up to cater for the public for quality health care and even control of any disease outbreak.

Out Patient Department (OPD)

All the health centres that were sampled i.e. 81 health centres have OPD facilities where the medical doctors can interact with patients. For privacy between the patient and doctor, all health institutes have separate rooms but in some health centres due to infrastructure constraints, one or more doctors are in the same room, especially in CHC centres.

In- Patient Department

Out of the 81 sampled health institutions, 17 health centres do not have this facility. This facility can provide to patients those who seek more medical attention. All the CHCs have this facility except in PHCs this facility is not provided because of a lack of infrastructure and also some PHCs were set up to cater only for immunization and provide primary health to the public.

Operation Theatre (OT)

Every health centre has a separate room for OT but all these operations are minor and no major can be done. Even at the District Hospital level, only a few like Mokokchung, Kohima and Dimapur DH can perform major operations the rest are all minor. Irrespective of minor or major surgery, all district hospitals should be well equipped with all the requirements like equipment, staff, doctors etc to perform surgery and provide quality care. All DHs are in dire need of improving the OT. There are also reports of a lack of equipment in PHC to even perform minor operations.

Laboratory

All the sampled health institutions have a laboratory that can detect endemic diseases like, enteric fever, HIV+, Scrub typhus etc. which help to contain disease outbreaks.

Blood storage

All the sampled health institutions do not have blood storage facilities. At the district level except for Kohima, Dimapur and Mokokchung, the rest do not have this facility. It is a major drawback in the health sector in Nagaland. Based on the strategic geographical locations, blood storage facilities should be available to the public.

Immunization and other service

All the health centres across the state provide facilities for immunization programmes. Other services that the health centre provide to the public also include free or special health camps, seminar or awareness programme and also set up programmes in collaboration with NGOs, Angawadi etc. to share the importance of health and various health schemes to the general public.

5.5.2 Facilities provided

General facilities are important not only to the patient but the health centre for standardising and meeting the rapid change in health infrastructure. Another is that good health facilities can quickly disseminate health care in an emergency and also provide an uninterrupted workflow in the health sector.

All the health institutes are connected with electricity and water which are the basic needs of the health centre. In some instances, in some administrative circles or areas due to public negligence, the water connectivity is damaged or pipes are stolen and the stealing of light bulbs are nuisance to the health sector.

During the field survey, it was found that all sampled centres have a set of computers and printers for administrative work but upon further investigation, most of this equipment is just lying in the office and they are hardly used. For instance, all the disease data or other data are still recorded in a register or on a sheet of paper. These custom needs to immediately change because technology can provide fast-track pieces of information and all data can be permanently stored, which can provide future reference at times of need. One reason why this technology is not utilised is due to the ignorance of technical know-how in the health centre.

Other facilities that should be available are ambulance services and general toilets for patients and the general public for quality health care. Generator or solar facilities needs to be

installed in all health centre in order to have an uninterrupted power supply. Nearly 50% of the health sampled centre does not have proper biomedical waste management which can pollute the surrounding environment and may even cause disease outbreak.

5.5.3 Questionaries on Services and Facilities

The questionnaires were provided to the medical staff to find the efficiency of health centres and their response to the public, with facilities that are provided in the health centre by the Government of Nagaland. Some important and relevant questions about facilities and services are highlighted below

1. Duration to response between health centre to village level to mitigate, in case of disease outbreak.

Item	**Result (in percentage)**
Less than 6hrs	11 %
6 – 10 hrs	20 %
10 – 15 hrs	9 %
15 – 24 hrs	27 %
More than 24 hrs	33 %

2. Duration to response between district level (CMO) to health centre (PHC) to mitigate, in case of disease outbreak.

Item	**Result (in percentage)**
Less than 24hrs	2 %
1 – 3 days	15 %
4 – 7 days	22 %
1 week	24 %
More than 1 week	37 %

3. Duration to response between state level (Directorate) to health centre (PHC) to mitigate, in case of disease outbreak.

Item	**Result (in percentage)**
Less than 1 week	47 %
1 – 2 weeks	33 %
More than 2 weeks	20 %

The response level from the health centre to the village, from the district level to the centre or from the state level to health centre needs to improve. The first point of contact centre (health) to the village level needs more efficiency and quick information of requirements and causes of disease to the higher authority where they can quickly prepare and respond to tackle disease outbreaks. This will help to reduce the spread of disease and human lives may be safe too.

4. Which modern technology does your health centre use for referral systems to consult higher health centres/ expert doctors?

   The majority of health centres use social media i.e., WhatsApp platform (88%) to connect. Other methods that are also used are through email and telephonic conversation.

5. Medical emergencies or disease outbreaks, which modern technologies do you use to communicate to the higher authority to disseminate information and take necessary action?

   Most of the health centres rely on WhatsApp and Telephonic conversation.

6. Is your health centre equipped with modern, software, mobile apps etc. for the accumulation of data, health records etc.?

   99% of the sampled health institutions does not have this facility

7. Does your health centre/ institution use mobile-based technology to monitor the health/condition of in-patients?

   No health centre in Nagaland has this technology.

Nagaland is still lagging in technology-oriented facilities which the government of the day need to give more concern. A drastic policy change and planning technique needs to be taken up to use modern technology for effective health care systems. The most discouraging factor is the recording of day-to-day activity of health centre need to be quickly revamped, properly implanted and the right technical know-how person be appointed for proper health management.

Another key significant in Nagaland's health sector is the active participation of local people, NGOs etc. improved the health services and facilities across Nagaland. For example, Ao Baptist church in commemoration of the Golden Jubilee, constructed and donated a building in Kohima for the patient guest room. Other instances where local people and NGOs contribute, furnitures, beautification of Hospitals or health centres, generators, cleanliness drives etc. have improved the health infrastructure in general to the health sector of Nagaland. The launch of Chief Minister Health Insurance Scheme (CMHIS) in 2022, to provide Health Insurance coverage to state government employees, pensioners households and other households not covered under PM-JAY with a sum of Rs. 5 lakhs per family per year will help the people in the state to avail quality and affordable health care.

CHAPTER VI

SUMMARY AND CONCLUSION

6.1 Introductory

This chapter is divided into four sections which include the summary, conclusion, findings, suggestions and limitation.

6.2 Summary

This research is to examine and identify the common diseases in Nagaland and how the diseases are distributed in the vast and varied topographical conditions of Nagaland. The diseases identified were analysed in a geographical perspective. The research work is divided into six chapters.

In chapter one, it consists of the Introduction of the research topic, concept and definition of health and diseases, relevance of study, statement of the problem, status of health in Nagaland, objectives carried out in this research to fulfil the research topic, methodology and techniques, which is used in analysing data, and the chapter is concluded with literature review. Geography of health is a new academic endeavour in the North East, India and especially in the remote state of Nagaland. Nagaland has a vast geographical area of 16, 579 sq. km and shares an international boundary with Myanmar on the Eastern part of the state. About 90 percent of the geographical area of Nagaland is mountainous and a few plains is found in the Western part of the state that borders with Assam. The state is dominated by tribal people and as per 2011 census, 71. 14 percent of the population lives in rural areas. About 76.11 percent (2011 census) is considered to be literate but the literate percentage do differ from one district to another. The lowest literate district is Mon with 52. 58 percent. Nagaland with unique topography and imbalance in socio-economic development have been a causative factor in distribution of diseases in Nagaland.

Geophysical and socio-economic conditions of man is connected to human health. In chapter two, some important physical and socio-economic conditions in Nagaland have been discussed. The state with physiographic uniqueness located in a tropical region do experience tropical climate but some part experiences subtropical climate due to

mountainous physiography. There are also variations in altitude, rainfall and temperature. With these variations in climatic elements,

i. The forest cover also differs from one region to another.

ii. High population density is found in low lying areas and in major urban centres of Nagaland.

iii. Literacy rate is not proportional in the state, higher literacy rate is found in urban areas.

iv. Health facilities in urban areas of Nagaland are far better than the rural areas.

v. Other conditions like the source of water, some district mostly rely on ponds, lakes etc. in such areas unique diseases are reported which is not found in the other parts of the state.

The third chapter explains the main frame of this research work. Common diseases in Nagaland were identified, arranged according to the Rank size and distribution in district-wise sample area of Nagaland. The data set collected from the health centres was analysed statistically and GIS tool used for mapping and interpretation, based on the Geographical and Non-geographical causative factors. The diseases were also interpreted along with interviews conducted. The study, found that non-communicable diseases are becoming more prominent than communicable diseases and this is mostly due to the socio-economic conditions of the state. Some major tropical diseases like malaria cases are declining in the state but the number of Dengue cases seems to be steadily rising and affecting the unaffected areas. This is due to geographical phenomena like global climate change that has increased the temperature in the state. Whooping cough disease is associated with both geographical and non-geographical factors, found particularly in the Mon district. The state needs proper planning and development to counter diseases in the state.

Chapter Four studies the environmental impact on disease distribution. The most common diseases in the state were analysed with the most important physiography and socio-economic factors. Hypertension disease a non-communicable disease is associated with physical factors like temperature, rainfall and forest cover and socioeconomic factors like population density and literacy rate. Acute respiratory disease is closely associated with

geophysical factors – altitude, rainfall and forest cover. Oral cavity-related disease are associated with altitude, temperature, forest cover, literacy rate and open defecation. Altitude, temperature, rainfall, forest cover, and literacy rate play a significant role in influencing Acute diarrhoel disease. Enteric fever is influenced by Altitude, rainfall and literacy rate.

Disease studies are incomplete without examining the health infrastructure. In chapter five it examines the quality and quantity of the health care system in Nagaland. The setting up of required numbers and location of health centres both in rural and urban areas are as per to the National norms. Except in some districts, excess health centres are found. The ratio between population and number of medical doctors in the district needs to be improved. The distribution of health infrastructure is not equally distributed, whereby better facilities are found more in urban areas than the rural areas. Health infrastructure needs urgent upgradation with required medical staffs and facilities to combat any disease outbreaks in Nagaland.

The last chapter six is a sum up of all the research works carried out to study the spatial distribution of common diseases in Nagaland, a geographical analysis. It concludes with the findings and suggestions and limitations that is found in this study.

6.3 Conclusion

Human diseases are interwoven with the geophysical and social environment. Diseases can occur or be distributed due to various factors and it requires collaborative efforts to analyse and interpret their causes and effects on humanity. In this research, the diseases that are common in Nagaland were identified and studied from a geographical approach. The major common diseases identified in Nagaland are Hypertension, Acute Respiratory, Oral Cavity, Acute Dairrhoel, Enteric fever etc. These diseases are unevenly spread across the geographical areas of Nagaland.

Diseases occurs and propagates due to geophysical conditions and this has been established in this study too. It occurs in favourable climatic conditions and has caused harm to man's health. Climatic conditions correspond to the disease and as such requires better understanding of the nature of the disease and its environment. Geography of health is the main field that can correlate human health and the environment by using various techniques and methods that will be beneficial for planners, policymakers and academic disciplines. With the change in global

climate, the occurrence and distribution of disease have become unpredictable for example the recent occurrence and spread of Dengue in Mon district is due to a temperature rise. Thus, Geography of Health should be incorporated into health studies or medical sciences to improve the quality and quantity of health care systems in Nagaland.

6.4 Findings and Suggestions

i. The official recorded geographical area of Nagaland is 16, 579 sq. km. This recorded area does not include the administrative circles of Aghunaqa, Kuhuboto, Nihokhu and Nuiland under newly created district of Nuiland and also the administrative circle of Merangmen under Mokokchung district which are directly under control of Government of Nagaland. With the inclusion of this circles, the total geographical area of Nagaland is approximately 17, 250 sq.km. The Government of Nagaland on urgent basis should rectify the geographical area that is inhabited by the people of Nagaland to these administrative circles and newly created district.

ii. Health studies in India require more collaborative research or study in academic disciplines to solve health and related issues. Geography of health can be a new discipline that can bridge the gap between human health and the environment because Geography studies both physical and social environments from a spatial as well as regional perspective. The spatial studies will enable us to understand health issues in diverse forms and the regional study will allow us to examine the health issues in more detail and specified areas where it has been affected.

iii. Human health study along with medical sciences needs geophysical and social environment academic studies to understand the nature of diseases better. Medical science's main focus is to cater and provide care to human health in the event of any disease infecting his/her body. Diseases mostly occur due to physical conditions like topography, climatic factors, forest area etc. Social environment or socio-economic development can also cause disease to thrive. E.g., National Highway construction in Sechu (Zubza) area under Kohima district causes air pollution which increases Acute Respiratory diseases. Thus, medical science and other related academic disciplines need to collaborate to prevent disease origin and its distribution.

iv. Diseases in Nagaland still have a high number of cases of both communicable and non-communicable disease. Based on the geographical areas the distribution of disease differs from one region to another, due to geophysical conditions and lack of awareness to prevent the disease from being distributed. In this study, a microanalysis of a particular geographical area or disease could not be carried out. So, in order to understand the disease, it is recommended to study its effects, causes, origin and distribution, to enhance the scope and nature of Geography of Health.

v. Proper scientific approach and collaborative study in the academic discipline are immediately required to study the non-communicable diseases in Nagaland. This disease affects a large number of population and has become an alarming factor to the health sector and the general public.

vi. Men require socioeconomic development to attain better livelihood and standard of living but this cannot be achieved without the destruction of the environment which can result in the origin or distribution of some diseases. Eg. Ar disease in Kohima district. Improper planning, lack of quality workmanship, etc can allow the disease to distribute and harm man.

vii. All round development is needed to address in the event of disease origin, outbreaks in order to prevent disease spread to the unaffected areas. Proper healthcare infrastructure, presence of medical professionals, collaborative and well-coordinated approach with health-related disciplines other than medical professionals, development of other factors related to health like proper water, sanitation, education etc are required to prevent disease which will allow man to live a healthy and free disease life.

viii. Health management and storage of data are crucial for the state to progress, develop, proper planning, prevent disease outbreaks and improve the health sector. In some cases, the health data storage format differs from one district to another, with no proper or assigned person to handle data, irregularity of staff and most of the data still recorded and stored in old traditional methods i.e., register or a piece of paper. With the advancement of technology, the health sectors have also received modern technology like computer sets in almost all health centres in Nagaland. The health

data should be stored in those modern technologies to easily access as well as it will prevent them from losing or destroying crucial health data.

ix. A unified portal for data storage in Nagaland is required to collect and properly store data and all other health information with up-to-date information.

x. Uniform distribution of health institutions and infrastructure is crucial for quality healthcare system. Health infrastructure distribution in Nagaland is not uniform and this issue can be addressed from a geographical perspective with the help of using remote sensing and GIS techniques. Mapping health-related issues can help planners and policymakers set up an efficient and effective healthcare system in Nagaland.

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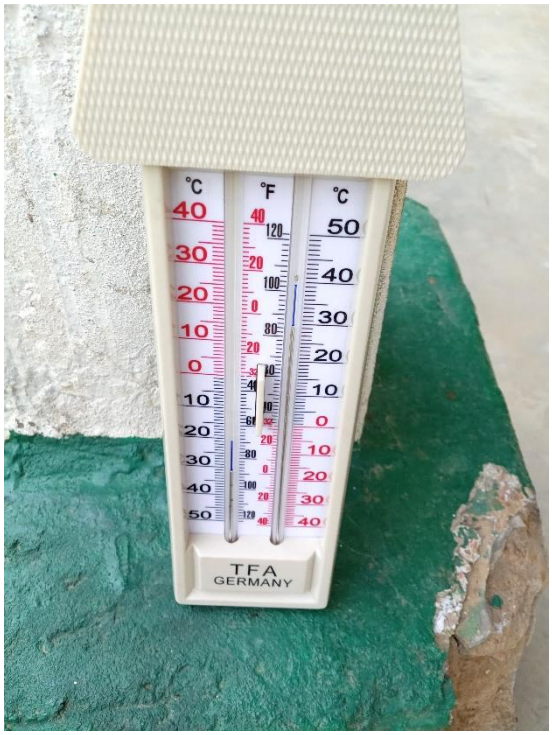
PHOTO PLATES

Plate 1: MO & Staff at Srinagesh PHC, Tuensang (1st PHC in Nagaland, Set up in remembrance of S.M. Srinagesh, Retd. Gen. the first Governor of Naga Hills)

Plate 2: District Hospital, Phek District (secured the first place in the Kayakalp award for the financial year 2020-21 under the District Hospital category)

Plate 3: Group photo with Medical Officer and Staff

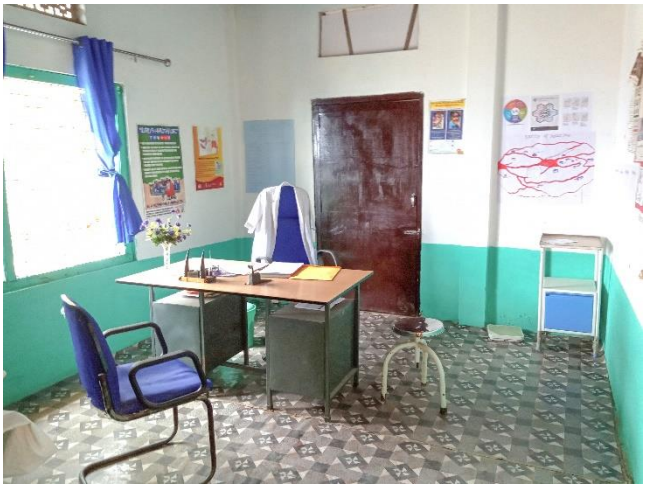
Recording GPS reading



Recording Temperature

Selfie with respondent

Plate 4: Field Visit



Medical Officer Room

Labour Room

General ward in CHC

Patient waiting area, Mokokchung DH

Immunisation in PHC

Pharmacy in health centres

Plate 5: Health Infrastructure

ANNEXURE I

Research Paper Published

Sl. No.	Title of Research Paper	Name of Journal	Remarks
1	Rainfall trend analysis of Nagaland by using Mann-Kendall test	International Journal of Science and Research (IJSR) (A Peer Reviewed) Volume 12 Issue 3, March 2023 ISSN: 2319-7064 SJIF (2022): 7.942 Page 917 to 921	Published
2	Major disease distribution in Phek district, Nagaland: A Geographical analysis	Gradiva Review Journal UGC-CARE Approved Group 'II' journal Volume 9, Issue 10, 2023 ISSN NO: 0363-8057 Page 155 to 160	Published

ANNEXURE II

Paper Presented

1. **"A climate trend analysis of rainfall and temperature for nine districts of Nagaland"** on Development challenges in Northeast India, **National Seminar** held by Department of Political Science, Nagaland University and Centre for Southeast Asian Studies, Nagaland University, Lumami on 28th May 2022

2. **"A geographical analysis of major diseases distribution in Kohima district, Nagaland"** on World Congress on Environment, Climate, Food, Agriculture and Health (WCECFAH2022), **International Seminar**, organized by Council for promotion of UN Sustainable Development goals India, Voice of Indian concern for the Environment, India and ACE International Pte Ltd, Singapore on 4th and 5th June 2022 (Virtual)

3. **"Major Communicable disease distribution in Nagaland: A Geographical analysis"** in the SJU 1st **International Conference** on Multidisciplinary Research and Innovation (ICMR-2023) organised by Quality Assurance Cell (IQAC), St. Jospeh University, Chumukedima, Nagaland on 9th and 10th November 2023

ANNEXURE III

Permission for Data Collection

GOVERNMENT OF NAGALAND
DIRECTORATE OF HEALTH & FAMILY WELFARE
NAGALAND : KOHIMA.

NO. DHFW-8/31/Misc/2016/595 *Dt. Kma the 16th February 2021*

To,

The Chief Medical Officer
Kohima/ Dimapur/ Mokokchung/ Wokha/ Zunheboto/ Phek/ Mon/ Tuensang/ Kiphire/ Peren/ Longleng.

The Medical Superintendent
NHAK/ Dimapur/ Mokokchung/ Wokha/ Zunheboto/ Phek/ Mon/ Tuensang/ Kiphire/ Peren/ Longleng.

Sub: **Data collection for Ph.D. Research-reg.**

Sir/Madam,

Mr. Zaleto Medeo is pursuing his PH.D research on the topic "Spatial distribution of common diseases in Nagaland: A Geographical Analysis" under the Department of Geography, Nagaland University. In order to pursue his research work, he needs to collect a wide range of health information and data of Nagaland for the last 15 years i.e 2003-2018 from various health institutions of the State.

In this regard, you are requested to facilitate the said Scholar in collecting the necessary information/data for the fulfillment of his research work.

(DR. KEVICHUSA MEDIKHRU)
Principal Director
Directorate of Health & Family Welfare
Nagaland: Kohima

NO. DHFW-8/31/Misc/2016 *Dt. Kma the February 2021*

Copy to:-

1. The Principal Secretary, Health & Family Welfare Department, Nagaland, for information.
2. The Mission Director (NHM)/ Director (ME&RS)/ Project Director (NHP), for information.
3. Zaleto Medeo, for information.
4. Office copy.

15/2/2021

(DR. KEVICHUSA MEDIKHRU)
Principal Director
Directorate of Health & Family Welfare
Nagaland: Kohima

ANNEXURE IV

Name of Respondent: _____

Address: _____

Age: _____ Sex: Male/ Female Educational Qualification: _____

Occupation: _____ Contact Number: _____

Date: - _____

*(*For any enquires contact Zaleto Medeo Mobile no.8974444531 or Email: zammedeo@gmail.com)*

(GENERAL PUBLIC)

(Tick in the applicable boxes)

1. Total number of family members? Please specify number of male and female.

Total	
Female	
Male	

2. Total number of literates in the family.

Total	
Male	
Female	

3. Type of House/Residence

Pacca	
Semi pacca	
Katcha	
Other	

4. Does your house have sufficient rooms for every member in the family?
   Yes ( ) No ( )
5. Does your house have proper ventilations in all the rooms?
   Yes ( ) No ( )
6. How often do you take bath?

Regular	
After 1/ 2 days	

After 3 days	
More than 4 days	
None of the above	

7. Which type of diet do you prefer?

Vegetarian	
Non – Vegetarian	

8. Blood group

A	
B	
AB	
O +ve	
O -ve	

9. Source of energy for cooking

LPG	
Firewood	
Cow Dung	
Bio - Gas	

10. Does your house have separate building for Kitchen or attach with living/other rooms?

    Yes ( ) No ( )

11. Source of water for household use.

Tap water	
Spring	
Well	
Hand Pump	
River	
Rainwater	
Any Other	

Is it treated? Yes ( )/ No ( )

12. Do you purify/boiled water before drinking?
    Yes ( ) No ( )
13. Types of toilet available/use.

Flush	
Pit	
Public	
Open Defecation	

14. Do you smoke? Yes ( ) / No ( ) .If yes, are you passive or active smokers.

Passive	
Active	

15. Do you drink alcohol?
    Yes ( ) No ( )
16. Do you consume tobacco products? Yes ( )/ No ( ). If yes, please state quantity (terms of cash) in a day.
    Amount: Rs……..
17. Is your house located near to industries, factories and domestic animal shed? Yes ( ) / No ( ). If yes, specify distance between residence and industries and also type of industries, factories etc.

Distance (in meter / feet)	
Types	

18. Is your house/residence located near to water bodies? Yes ( ) / No ( ). If yes, please identify the types and its distance to your residence.

Pond / Fishery	
Lakes	
River	
Streams	
Drainage (Nullah)	
Any Other	

    Distance (in meter / feet)……

19. Do you involve in agriculture activity? Yes ( ) / No ( ).If yes, please specify types of farming.

Jhum	

Paddy/ Terrace	
Kitchen garden	
All the Above	

20. Are you the bread earner for family?
    Yes ( ) No ( )
21. As per the occupation, please provide brief information on work environment (surroundings).

    _____

22. Does your occupation affect your health? Yes ( ) / No ( ). State the reasons

    _____

23. What is your family Annual income (in a year)?

Below Rs. 30,000	
Rs. 30,000 – 1.5 lakhs	
Rs. 1.5 – 3.5 lakhs	
Rs. 3.5 – 5.5 lakhs	
Rs. 5.5 lakhs & above	

24. Can your family members able to access health institution for better health treatment? Yes ( ) / No ( ). If No, please specify it briefly.

    _____

25. Name the diseases which have affected / experience so far?

    _____

26. Cite diseases which you often get infected as per different seasons.

Winter (*Dec–Feb*)	
Autumn (*Mar–May)*	
Summer *(Jun–Sept)*	
Retreating *(Oct–Nov*)	

27. Which type of treatment do you prefer for disease cure?

Modern Medicine /Allopathy	
Traditional	
Ayurveda	

Others (Specify)	

28. As per your choice in question no. 27. Please state the reasons of your preference for disease cure.

_____

29. Being tribal, do you have any traditional knowledge to prevent or cure disease? Yes ( ) / No ( ). If yes, state it.

_____

30. Which type of health institution do you prefer for treatment?

Primary Health Center	
Community Health Center	
District Hospital	
Private Hospital	
Private Clinic	
Others (Specify)	

31. As per your choice in question no. 30. Please give reason at least one point each on advantage and disadvantage.

_____

32. Is there health institution in your locality? Yes ( ) / No ( ). If yes, please identify types of institution.

Primary Health Center	
Community Health Center	
District Hospital	
Dispensary	
Sub - Center	
Other (Specify)	

33. Are you satisfied with the available health institution (PHC, CHC, DH etc.) in your locality?
Yes ( ) / No ( ). Please give reasons.

_____

Have you attended any health programme (eg. Seminar, health camp etc).Yes ( ) / No ( ). If yes, please specify total number attended and organizer?
Total number attended……

Organised by Govt.	

NGO's (name)	
Others (Specify)	

34. Any Seminars, workshop, health camp etc conducted in your locality by Govt. / NGOs etc for prevention and cure of diseases?
    Yes ( ) No ( )
35. Do you receive any incentive or Govt. aided schemes for health care? Yes ( ) / No ( ). If yes, specify.

    _____

36. Does your village/colony/town authority put effort for prevention of diseases outbreak? Yes ( ) / No ( ). If yes, please specify.

    _____

37. State some reasons to improve health care system in your locality, village or town area.

    _____

ANNEXURE V

Name of Respondent: _____

Address: _____

Age: _____ Sex: Male/ Female Educational Qualification: _____

Occupation: _____ Contact Number: _____

Date:- _____

*(*For any enquires contact Zaleto Medeo Mobile no.8974444531 or Email: zammedeo@gmail.com)*

(MEDICAL STAFFS)

(Tick in the applicable boxes) ***Locality – Health Center circle**

1. Identify some of the prominent and less prominent diseases in your locality?

   Prominent_____

   LessProminent_____

2. In your locality, mention common diseases as per the annual seasons.

   Autum(*Mar - May*)_____

   Summer (*Jun - Sept*)_____

   Winter (*Dec–Feb*)_____

   Retreating (*Oct - Nov*)_____

3. Mention factors/ causes of diseases in your locality?

   _____

4. Is there any epidemic in your locality? Yes ( ) / No ( ). If yes, please mention disease name and the steps taken to prevent it.

   _____

5. Any lack of coordination between medical professional during disease epidemic? Yes ( ) / No ( ) Maybe ( ). Give reasons.

   _____

6. During diseases outbreak, does state level health authority provides sufficient medical equipments/ supplies to contain the spread of diseases. Yes ( )/ No ( ) If No, please give reasons.

   _____

7. Duration to response between health center to village level to mitigate, in case of disease outbreak.

Less than 6hrs	
6 – 10 hrs	
10 – 15 hrs	
15 – 24 hrs	
More than 24 hrs	

8. Duration to response between district level to health center to mitigate, in case of disease outbreak.

Less than 24hrs	
1 – 3 days	
4 – 7 days	
1 week	
More than 1 week	

9. Duration to response between state level to health center to mitigate, in case of disease outbreak.

Less than 1 week	
1 – 2 weeks	
More than 2 weeks	

10. Any pre guidelines or pre SoP in case of communicable diseases outbreak. Yes ( )/ No ( ). If yes please mention diseases name.

_____

11. In the event of diseases outbreak, does the available resources in the health institute/center can control or prevent its outbreak?

    Yes ☐ No ☐ Maybe ☐

12. Is there sufficient trained personal to tackle in the event of diseases outbreak.

    Yes ☐ No ☐

13. Any water and air borne disease outbreak in your locality? Yes ( ) / No ( ). If yes, please specify it.

_____

14. Due to climate change, is there any evidence in occurrence/ spread/ outbreak of diseases? Yes ( )/ No ( ). If yes, please specify it.

_____

15. Any outbreak/ epidemic/occurrence of diseases due to developmental activity in your locality? Yes ( ) / No ( ). If yes, please specify it.

_____

16. Any locally endemic diseases? Yes ( ) / No ( ). If yes, please mention disease name.

_____

17. Did Government ignore any disease outbreak in your locality? Yes ( ) / No ( ). If yes, please specify.

_____

18. Due to religion, social, taboo etc, did the community ignore or forbid any immunization or vaccine to prevent disease outbreak? Yes ( ) / No ( ). If yes, please give reasons and disease name.

_____

19. Any drug resistant diseases in your locality? Yes ( ) / No ( ). If yes, please mention it.

_____

20. Do health institutes receive grants/ remunerations to organize seminar, workshop etc for diseases prevention and cure measure? Yes ( ) / No ( ). If yes, please specify source of funding and any outcome/impact to community.

_____

21. Which modern technology does your health center used for referral system to consult higher health centre/ expert doctor?

Email	
Social Media (Type)	
Telephone	
Mobile Apps based	
Telemedicine	
Any other (Specify)	

22. Medical emergencies or diseases outbreak, which modern technologies do you used to communicate to higher authority to disseminate information and take necessary action.

Email	
Social Media (Type)	
Telephone	
Mobile Apps based	
Telemedicine	
Any other (Specify)	

23. Does your health centre equip with modern technology, software, mobile apps etc. for accumulation of data, health records etc? Yes ( ) / No ( ). If yes, please specify it.

_____

24. Does your health center/ institution used mobile Apps based technology to monitor the health/condition of in - patients? Yes ( ) / No ( ). Please specify it.

_____

25. Do community/ NGO's involve in health programmes? Yes ( ) / No ( ). If yes, Please specify.

_____

26. Is there any health committee under your health center? Yes ( ) / No ( ). If yes, please mention the Composition of Health committee.

_____

27. Are you satisfied with the health facilities provided to health center / institution? Yes ( ) / No ( ). Please specify.

_____

28. Express your own ideas on how to improve health care system and diseases prevention?

_____

ANNEXURE VI

List of Health Centre Sampled

District	Administrative Circle	Health Centre
Dimapur	Medziphema	Medziphema CHC
		Piphema PHC
		Ruzaphma PHC
	Chumukedima	Chumukedima PHC
		Singrijan PHC
	Kuhuboto	Kuhuboto PHC
	Nuiland	Nuiland PHC
	Dhansiripar	Dhansiripar CHC
	Dimapur sardar	Burma UPHC
		Duncan UPHC
Kiphire	Amahator	Amahator PHC
	Pungro	Pungro CHC
	Sitimi	Sitimi PHC
	Seyochung	Seyochung PHC
Kohima	Jakhama	Jakhama PHC
	Chiephobozou	Chiephobozou CHC
		Zhadima PHC

	Botsa	Botsa PHC
		Touphema PHC
	Tseminyu	Tseminyu CHC
		Chunlikha PHC
	Sechu (Zubza)	Sechu PHC
		Khonoma PHC
Longleng		District Hospital, DH
	Tamlu	Tamlu PHC
Mokokchung	Onpangkong	Longsa PHC
		Longkhum PHC
		Yimyu UPHC
	Kubolong	Longjang PHC
	Chuchuyimlang	Chuchuyimlang PHC
	Mangkolemba	Mangkolemba CHC
	Tuli	Tuli CHC
		Kangtsung PHC
	Alongkima	Alongkima PHC
	Longchem	Longchem PHC
Mon	Naganimora	Naganimora PHC
	Tizit	Tizit PHC
	Shangnyu	Shangnyu PHC

	Mon Sadar	Oting PHC
	Monyakshu	Changlanshu PHC
	Phomching	Phomching PHC
	Chen	Chen PHC
Peren	Jalukie	Jalukie CHC
	Tenning	Tenning PHC
		Azielong PHC
	Pedi	Poilwa PHC
	Ahthibung	Ahthibung PHC
Phek	Khezhakeno	Khezhakeno PHC
	Zuketsa	Zuketsa PHC
	Razieba	Razieba PHC
	Chezami	Chezami PHC
	Pfutsero	Pfutsero CHC
	Chetheba	Chetheba PHC
	Chozuba	Chozuba CHC
	Phek Sadar	Lozaphehu PHC
	Meluri	Akhegwo PHC
		Meluri CHC
	Phor	Phor PHC

Tuensang	Chare	Chare PHC
	Noksen	Noksen PHC
	Longkhim	Longkhim CHC
	Noklak	Noklak CHC
	Shamator	Shamator PHC
	Tuensang sadar	UPHC
		Srinagesh PHC
	Thonokhyu	Thonoknyu PHC
	Chessore	Chessore PHC
Wokha	Chukitong	Chukitong PHC
	Englan	Englan PHC
	Bhandari	Bhandari CHC
	Baghty	Baghty PHC
	Wozhuro	Wozhuro PHC
	Aitepyong	Lakhuti PHC
Zunheboto	Pughoboto	Pughoboto CHC
	Ghathashi	Ghathashi PHC
	Atoizu	Atoizu PHC
	Satakha	Satakha PHC
	Suruhoto	Suruhoto PHC
	Akuluto	Akuluto PHC

	Aghunato	Aghunato PHC
	V.K	V.K PHC