Prevalence of Chronic Non - Communicable Diseases in Urban Population of Nagaland

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ABSTRACT

Background: It has been observed from several studies, that the deaths due to communicable diseases have drastically gone down during the last few decades, whereas deaths from chronic non-communicable diseases like cardiovascular diseases, cancer, chronic respiratory disease, and diabetes are alarmingly increasing.

Objectives: This study examines the effect of various socio-economic, demographic and cultural factors on the prevalence of chronic diseases among a representative sample population from Kohima and Dimapur towns of Nagaland.

Materials and Methods: The data source used is a primary one collected through a household survey. In all, 4640 respondents were interviewed during data collection, out of which 2328 respondents were selected for the logistic regression analysis.

Results and Conclusion: The result indicates that characteristics like age, gender, marital status, occupation, family income, physical exercise, chew tobacco, smoking, consumption of alcohol and body mass index have significant effect on prevalence of chronic diseases. The study recommended that there is a need to strengthen the health care services of Nagaland in the field of preventive medicine.

Key words: Chronic disease, prevalence of disease, logistic regression.

Introduction

Chronic non-communicable diseases are the leading causes of both disability and death worldwide and they strike hardest at the world's low- and middle - income populations [1]. In the Indian context, several studies have documented the prevalence of chronic diseases in India too [2]. An analysis of chronic diseases with regard to socioeconomic and demographic factors has been attempted by quite a few researchers like, Omran (1971) [3], Lowery et al. (1996) [4], Berendregt and Bonneux (1998) [5], Lopez (2006) [6], Gupta et al. (1995) [7], Das, Sanyal and Basu (2005)[8], Choudhury et al. (2009) [9] etc.

Various hypotheses have been put forward to explain the rising trend of chronic diseases, and consequence of urbanization is one of them. Though biological factors might have influences on chronic diseases, a majority of chronic diseases are due to lifestyle behaviours [8]. On the basis of this we hypothesise the prevalence of chronic diseases in urban areas of Nagaland.
Nagaland, the sixteenth state of the Indian union, is one of the smallest states of India. The state consists primarily of tribal population with 96% household heads belonging to schedule tribal communities [10]. The major tribes are the Angami, Ao, Chakhesang, Chang, Khemungan, Konyak, Lotha, Phom, Pochury, Rengma, Sangtam, Sema, Yimchunger and Zeliang. Kohima is the state capital and Dimapur is the largest commercial town of the state.

The health indices of Nagaland seem to be better than the national averages with infant mortality rate as low as 26 infant deaths per 1000 live birth [11], and life expectancy at birth 67.33(67.94) years for males (females) [12]. If life expectancy at birth is more than 55 years, then death due to chronic disease like cardiovascular diseases, cancer and diabetes become more prevalent and frequent [13]. As such there is every possibility of prevalence of different chronic diseases in urban areas of Nagaland. Keeping this in mind, this paper assesses and evaluates the influence of various socio-economic, demographic and cultural factors as well as some risk behaviours on prevalence of chronic diseases among a representative sample of urban population of Nagaland.

Materials and Methods

The data used in this study is a primary one collected through a household survey conducted in Kohima and Dimapur towns of Nagaland during May - August 2010. The primary objective of the survey is to gather information on chronic diseases prevailing in urban areas of Nagaland viz., in Kohima and Dimapur town. The municipal area of Kohima and Dimapur had a total population of 77,030 and 107614 respectively in 2001. There are 19 wards under Kohima town and 21 wards under Dimapur Municipal Corporation. The sample selection and implementation procedures were designed to ensure that the survey provides statistically valid estimates for population parameters.

We have used Stratified Random Sampling technique taking wards as strata [14]. It is more or less known that the wards are homogenous with respect to socio-economic, demographic and cultural factors in both the towns. From each ward, households were selected by Simple Random Sampling. The latest available voters list of both the towns was used for random selection of the household. For this purpose of data collection from the respondents, a structured schedule was prepared in accordance with local health related problems in the areas. The schedule was pre-tested in order to test the validity of questions with regard to the objective of the study. Basic information was collected on each person including age, sex, marital status, religion, tribe, education, occupation, household income, food habit, type of residence, cast and family type. Information is also collected on the prevalence of certain chronic diseases (cardiovascular, diabetes, cancer, chronic respiratory disease, cirrhosis of liver, renal failure, asthma) and on certain risk behaviours (physical exercise, consuming tobacco and alcohol, smoking, body mass index etc.).

Altogether 4640 respondents were interviewed from both the towns, out of which 2457 were male and 2183 were females, from 958 households. Identification of the chronic disease afflicted persons was based upon the information provided by the respondent or elder family members of the household, but not clinically tested.

The independent variable is divided into three categories viz. socio-economic, cultural and demographic. From socio-economic characteristic we have included annual family income, occupation and education. From demographic characteristics, variables like age, gender, marital status and residence type were included. Regarding cultural factors, we have considered, religion, caste, food habit and type of family. Some other risk behaviours like, chewing tobacco, addiction to smoking and consumption of alcohol, level of physical exercise and body mass index are also included for analysis.

The logistic regression analysis is used to examine the strength of association between each covariate and the dependent variate (presence of chronic disease). The dependent variable is dichotomous i.e., presence or absence of chronic disease in the respondent.

Let, Y denote the dichotomous outcome variable and $x_1, x_2, x_3, \ldots\ldots, x_n$ be a set of independent variables. Then the form of the logistic regression model is

$$\pi_x = \frac{1}{1+e^{-z}}$$

where $z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_k x_k$ … (1a)

A transformation of π_x is the logit transformation which is defined in terms of as Hosmer and Lemeshow [15].

$$g(x) = \log it(Y) = \log_e(odds) = \log_e\left[\frac{\pi_x}{1-\pi_x}\right]$$

$$= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_k x_k$$

… (1b)

Where β_0 is the Y intercept, β_i's (i= 1,2,…,k) are regression coefficients, and x_i's are a set of predictors.

Observations

We have observed from our data that out of the entire sample of size 4640 very few cases of chronic disease have been reported under age 25 years. Therefore for the analysis we have considered only those respondents who have attained age 25 years at the time of interview. Accordingly, the logistic regression analysis was carried out on 2328 respondents, out of which 1218 were male and 1110 were female. In the reduced sample 15.55% respondents were affected with chronic diseases.

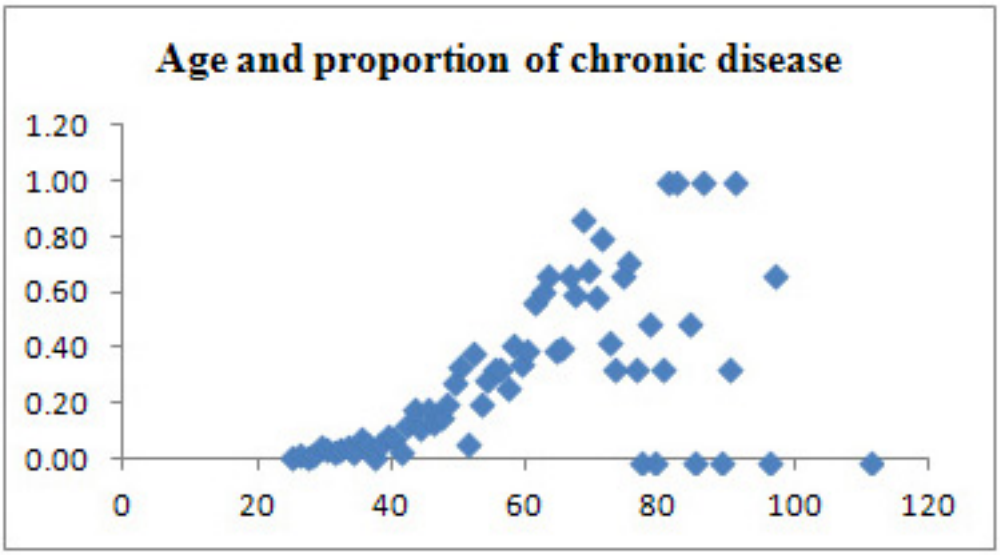

Figure 1: Scatter diagram showing age and proportion of persons affected by chronic diseases

From Figure 1 it has been observed that as age increases the proportion of persons suffering from chronic diseases also increases.

As mentioned earlier, we have used logistic regression analysis technique to examine the association between various factors and the prevalence of chronic diseases. To check the appropriateness of the fitted model we have compared the actual and the predicted outcomes derived from logistic regression analysis. The Analysis has been carried out by SPSS -11.5 software. The overall correct percentage is 72.5, which is found to be very satisfactory.

The Hosmer and Lemeshow test provides a formal test for whether the predicted probabilities for a covariate match the observed probabilities. The test shows large p-value (p = 0.830) indicating a good match to describe the relationship between the covariates and the outcome variable.

In Table 1.1, Table 1.2 and Table 1.3, some of the significant factors are presented along with their p-values for chronic disease, cardiovascular disease and diabetes respectively. The odds ratio corresponding to 95% confidence intervals is also being presented.

Results and Discussion

It is clear from Table 1.1, that there is a significant relationship between age and prevalence of chronic diseases. For our analysis we have categorized age into two categories viz. 25-50 years and above 50 years. This categorization is done, as out of total chronic diseases reported in the reduced sample, 62.71% chronic diseases are for persons age 50 years and above. Taking persons above 50 years of age as reference category, it is seen that persons in the age group 25-50 years are approximately 4 times less likely (odds ratio = 0.270) to have chronic disease compared to those above 50 years of age. Similar findings have been found by Gupta et al. in an investigation on the prevalence of coronary heart disease and coronary risk factors in an urban Indian population [7].

It has also been observed that there is a weak association (p-value = 0.071) between gender and prevalence of chronic disease. Taking female as a reference category, we find that males are one and half times less likely (odd ratio = 0.681) to have chronic diseases compared to females.

Table 1.1: Results of Logistic Regression for chronic diseases

Variables	B	S.E	p-value	Odd Ratio	95% CI for Odd Ratio	
					Lower	Upper
Age						
25-50 years	-1.308	.168	0.000*	.270	0.195	0.376
Above 50 yrs. ®						
Gender						
Male	-0.385	0.213	0.071**	0.681	0.448	1.033
Female ®						
Per capita income (Annual)						
< Rs.10000	-0.473	0.210	0.024*	0.623	0.413	0.940
Rs.10000 -Rs.30000	-0.366	0.170	0.031*	0.694	0.497	0.967
> Rs.30000 ®						
Physical exercise						
Any exercise	-1.273	0.147	0.000*	0.280	0.210	0.373
None ®						
Consume tobacco						
Yes	0.452	0.153	0.003*	1.572	1.164	2.124
No ®						
Smoking						
Smokers	0.393	0.201	0.051**	1.481	0.998	2.197
Non Smokers ®						
Consume alcohol						
Alcoholic	0.892	0.192	0.000*	2.440	1.673	3.558
Non alcoholic ®						
Body Mass Index						
<18(Underweight)	-0.987	0.313	0.002*	0.373	0.202	0.689
18-25 (Normal)	-0.691	0.156	0.000*	0.501	0.369	0.680
>25(Overweight) ®						

Note: ® Reference category, * Significant at 5% probability level, ** Significant at 10% probability level.

For the variable marital status, we have considered three categories viz. never married, widow/separated and currently married. Taking currently married as the reference category, we have observed that a never married person is almost 6 times less likely (odd ratio = 0.172) to have chronic disease as compared to the reference category. However, a widow/separated person is almost 3 times more likely (odd ratio = 2.700) to have chronic disease as compared to a currently married person. This may be possible because without their spouse they may have to take care of various problems in the family which leads to physical and mental stress.

For the variable types of residence, we have considered three categories - kachcha house, semi- pucca and pucca. It has been observed that persons living in kachcha houses are approximately three and half times less likely (odd ratio = 0.293) to have chronic disease compared to persons living in pucca house. Kachcha houses are made up of mud and thatched roof which provides very poor living conditions. People living in such environment may have higher prevalence of communicable diseases [16].

We have classified the per capita annual income into three categories viz., less than Rs.10000, Rs. 10000 to Rs. 30000 and above Rs. 30000. This classification has been done in accordance to the classification of the Organization for Economic Co-operation and Development (2003), which classifies India in the per capita annual income < $745 (approx. Rs.30000) group. Considering per capita annual income of more than Rs. 30000 as the reference category it is observed that persons with per capita income less than Rs. 10000 are one and half times less likely (odd ratio = 0.623) to have chronic disease. If per capita annual income is between Rs 10000 to Rs 30000, the chance of having chronic disease is reduced approximately by 30% as compared to the

reference category. Thus economically advanced persons have more chance of acquiring chronic diseases. People with lower family income may have higher prevalence of other communicable diseases. Similar results have been reported by Ghosh and Arokiasamy in an investigation on morbidity in India [17].

We also intended to examine the relationship between occupation and prevalence of chronic disease. It is observed that housewives have almost three times less chance (odd ratio = 0.308) of having chronic disease as compared to retired persons. However, a self employed person is two and half times less likely (odd ratio = 0.399) to have chronic disease compared to a retired person. Persons working in the private sectors are three times less likely (odd ratio = 0.318) to have chronic disease compared to retired persons. Government employees are approximately three times less likely to have chronic disease compared to retired persons. The other category includes both unemployed and elderly persons, which also is found to be significant (p-value = 0.002).

It has been observed that variables like education, religion, food habit, caste, family type etc. have no significant effect on prevalence of chronic diseases.

For the variable physical exercise it has been observed that persons doing regular exercise are three and half times less likely (odd ratio = 0.280) to have chronic disease compared to the reference category. There is evidence that regular physical exercise increases the high-density lipoprotein and decreases both body weight and blood pressure which are beneficial to cardiovascular health [18]. As far as the risk factors are concerned, physical activity can interact in various ways that influence the risk of several chronic diseases [1].

It has been observed that, persons who consume tobacco regularly are one and half times at high risk of having chronic diseases (odd ratio = 1.572) compared to persons not consuming it. For the variable smoking we have considered persons who smoke cigarettes daily or at least twice a week as smokers and others as non smokers. Taking non smokers as reference category we have observed that smokers are approximately one and half times (odd ratio = 1.418) at high risk of acquiring chronic disease compared to non smokers. This fact is widely acknowledged as smoking has been identified as a major coronary heart disease risk factor [18]. For the variable consumption of alcohol, we have considered those persons who consume alcohol regularly or at least once a week as alcoholic and others as non alcoholic. It is clear from the table that alcoholic persons are more than two and half times (odd ratio = 2.440) at high risk of having chronic disease compared to non alcoholic persons. Similar results have been observed by Lowry et al. (1996) [4]. Also, high alcohol intake (75g or more) per day is an independent risk factor for hypertension and all cardiovascular diseases [19].

For the characteristics body mass index, we have considered three categories viz. underweight (BMI<18), normal (BMI = 18-25) and overweight (BMI>25). If we take overweight as a reference category, then persons with BMI<18 (underweight) are two and half times less likely (odd ratio = 0.373) to have chronic diseases compared to overweight persons. Further, persons with normal weight are 50% less likely (odd ratio = 0.501) to have chronic disease compared to overweight or obese persons. Obesity may be mediated by other cardiovascular disease risk factors, including hypertension, diabetes mellitus, and lipid profile imbalances [20]. Overweight and obesity have a significant association with chronic disease [21].

It is observed from our data that in the reduced sample of persons of age 25 years and above, 6.4% persons are afflicted by cardiovascular diseases (CVD), 4.6% suffer from diabetes, 0.9% are afflicted by cancer and 3.7% are afflicted by other chronic diseases. Out of all persons suffering from chronic diseases, 40.89% suffer from CVD, 29.28% are from diabetes, 6.07% are from cancer and 23.76% are from other chronic diseases. These observations suggest that in our study prevalence of CVD is the most common and frequent followed by diabetes. Similar observations have been reported by Choudhury et al. in an investigation on prevalence of chronic diseases in Guwahati city [9].

Table 1.2 presents the results of the logistic regression analysis for cardiovascular diseases (CVD) with respect to different characteristics. It has been observed from the analysis that CVD in particular and chronic diseases taken together show similar types of results with few notable exceptions. There is a weak association (p-value = 0.071) between gender and prevalence of chronic disease taken together, but we found no significant association between gender and the prevalence of CVD. Also, the variable occupation has found to be associated with chronic disease, but there is no significant effect of occupation on prevalence of CVD. There is no significant relationship between food habit and prevalence of chronic diseases taken together, but we found a significant association between food habit and prevalence of CVD.

It is seen that vegetarians are two times more likely (odd ratio = 2.106) to have CVD as compared to non-vegetarians. This may be possible because most of the vegetarian people found in the survey are from non Naga community and they usually take food high in fats resulting increasing cholesterol level. In a study of dietary pattern of Japan and Finland, it is found that Japanese have low fat diets resulting in low serum cholesterol and low incidence of coronary heart disease [18].

Moreover, persons belonging to a joint family have almost one and half times less chance (odd ratio = 0.635) of having CVD as compared to nuclear family. There is a weak association (p-value = 0.098) between BMI and prevalence of cardiovascular disease in the urban setup of Nagaland. Persons with BMI<18 (underweight) are half times less likely (odd ratio = 0.45) to have chronic diseases compared to overweight persons.

The results of logistic regression analysis for diabetes are presented in Table - 1.3. It is observed that age, marital status, annual family income, physical exercise and body mass index have significant effect on prevalence of diabetes as well as chronic disease taken together. It is seen that persons in the age group 25-50 years are approximately three and half times less likely (odd ratio = 0.284) to have chronic disease compared to those above 50 years of age. Although diabetes may occur at any age, surveys indicate that prevalence rises steeply with age. [18] However, variables like gender, residence type, occupation, chew tobacco, smoking, consumption of alcohol were found to

Table 1.2: Results of Logistic Regression for Cardiovascular diseases

Variable	B	S.E	p-value	Odd Ratio	95% CI for Odd Ratio	
					Lower	Upper
Age						
25-50 years	-1.244	.230	0.000*	0.288	0.184	0.453
Above 50 years ®						
Marital status						
Never married	-2.414	0.736	0.001*	0.089	0.021	0.378
Widow/ Separated	1.065	0.262	0.000*	2.901	1.735	4.851
Currently married ®						
Per capita income (Annual)						
< Rs.10000						
Rs.10000 - Rs.30000	-0.182	0.283	0.519	0.833	0.479	1.450
Above Rs.30000 ®	-0.491	0.236	0.038*	0.612	0.385	0.972
Food habit						
Vegetarian	0.745	0.359	0.038*	2.106	1.042	4.260
Non-vegetarian ®						
Physical exercise						
Any exercise	-1.185	0.212	0.000*	0.306	0.202	0.463
None ®						
Consume tobacco						
Yes	0.423	0.214	0.048*	1.527	1.004	2.321
No ®						
Smoking						
Smokers	0.477	0.251	0.057**	1.611	0.985	2.634
Non Smokers ®						
Consume Alcohol						
Alcoholic	0.847	0.240	0.000*	2.332	1.456	3.734
Non Alcoholic ®						
Body Mass Index						
<18(Underweight)	-0.793	0.479	0.098**	0.453	0.177	1.158
18-25(Normal)	-0.254	0.213	0.233	0.776	0.511	1.178
>25(Overweight)®						

Note: ® Reference category, * Significant at 5% probability level, ** Significant at 10% probability level.

have no significant effect on diabetes unlike chronic diseases taken together. However, excessive intake of alcohol can increase the risk of diabetes by damaging the pancreas and liver and by promoting obesity [19]. We observe a weak association (p value = 0.058) between a person who belongs to a joint family and prevalence of diabetes. Persons belonging to a joint family are approximately one and half times more likely (odd ratio = 1.590) to have diabetes compared to the reference category nuclear family.

Conclusions

Chronic disease is primarily a mass disease. The strategy should therefore be based on mass approach focusing mainly on the control of underlying causes in whole populations, not merely in individuals. A small change in risk factor levels in total population can achieve the biggest reduction in chronic disease mortality. As there is a large proportion of chronic diseases cases are observed in urban areas of Nagaland, first of all, the overall burden of chronic disease risk factors should be lowered through population-wide public health measures, such as community level campaigns against cigarette smoking, unhealthy diets, and physical inactivity etc. In spite of the tremendous advancement in the field of preventive medicine, the health care services in tribal communities of Nagaland are still poor and need to be strengthened to reduce the occurrence of these potentially fatal chronic diseases.

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