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Factors Influencing Morbidity due to Non-Communicable Diseases in Rural Nagaland: A Cross Sectional Study

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ABSTRACT

Non Communicable diseases (NCDs) are the fastest growing causes of morbidity and influencing factors need to be analysed. Objectives are to find the prevalence rate, examine the existence and strength of influencing factors of morbidity due to NCDs and to detect the disease clusters in rural Nagaland. This study is based on cross-sectional primary data. A sample of 5404 subjects was obtained using multistage sampling technique. Final analysis for NCDs was carried out with 3356 subjects who attained 20 years of age or more. The data were analysed by multivariate logistic regression. 56.99% of the total morbidity was due to NCDs. Leading causes were cardiovascular followed by diabetes mellitus and gastro-enteritis. Independent factors such as age, education, per capita income, marital status, body mass index and habit of smoking had significant influence on morbidity due to NCDs. Cases of morbidities were higher than expected in Dhansiripar Rural Development Block.

KEYWORDS: Non-Communicable Diseases, Morbidity, Influencing Factors

INTRODUCTION

Health transition characterized by demographic transition in age profile of people and epidemiologic transition marked by the shift of the burden of diseases from communicable diseases to non-communicable diseases (NCDs) is witnessed largely throughout the world since the second half of the twentieth century (Omran, 1971; Olshansky and Ault, 1986). Many parts of India have also been undergoing rapid epidemiological transition as a consequence of economic and social changes (Gupta et al, 2001; Reddy et al., 1998 and Reddy et al., 2005). The probability of a man or women of dying from a non-communicable disease is higher in the sub-Saharan Africa and other developing regions than in established market economies (Murray and Lopez, 1997). The share of NCDs to the total diseases in the developing countries increased from 47% in 1990 to 56% in 2000 (Boutayeb and Boutayeb, 2005). By 2020, it is predicted that NCDs will account for 80 percent of the global burden of disease, causing seven out of every 10 deaths in developing countries (WHO, 2003). The burden of NCDs affects the poor less than those who are better off; however, these diseases also contribute to the excess death and disability among the poor in terms of mortality and the loss of disability-adjusted life years (Gwatkin and Guilot, 2000).

As the NCDs are increasing at an alarming rate worldwide, therefore, it has become an obligatory duty of every researcher who are involved in epidemiological researches to study about the factors that influences NCDs. Accordingly, the analysis of chronic non-communicable diseases with regard to its association with non conventional health dimensions such as socio-economic, demographic, cultural and behavioural factors has been attempted by many researchers (Omran 1971; Gupta et al., 1995; Lowry et al., 1996; Lawrence et al., 2004; Pronk et al., 2004: Choudhury et al., 2009). Omran(1971) first used the term 'epidemiologic transition' to characterize the regular transformation of causes of death pattern from communicable diseases like infectious and parasitic diseases to non-communicable diseases such as cardiovascular, cancer, accidents, etc. in a population. Later on Caselli et al.,(2002) argued in favour of replacing the concept of 'epidemiologic transition' by the wider notion of 'health transition'. Lowry et al.,(1996) acknowledged the relationship between socio-economic status and risk behaviour for chronic diseases among a representative sample of adolescents in the United States. They observed that among adolescents, risk behaviours for chronic diseases are common and inversely related to socio-economic status (SES). Lawrence et al.,(2004) made an attempt to provide an up to date picture of multiple risk factor prevalence and clustering in the US population. They found that many demographic and health factors such as gender, age, ethnic caste, education, marital status, presence of chronic diseases, country of birth, etc, were significantly associated with the mean number of risk factors.

In the Indian context, Sachadev and Datta(1989) carried out a cross-sectional morbidity survey to study the prevalence of chronic illness in a semi-urban community in Pune. Age, literacy status and economic status were found to have an effect on prevalence rate while sex, religion, type of family and occupation were found to have no effect on prevalence of chronic illness. Dental caries, senile cataract, dermatophytosis and dermatomycosis, hypertension, chronic tonsillitis and lumbago-sciatica were the most prevalent chronic illness detected. Gupta et al. (1995, 1997, 2002) examined the prevalence of coronary heart disease (HD) and the risk factors in an Indian urban population. They found that there existed a significant association of coronary heart disease with age, sedentary lifestyles and smoking. Choudhury et al. (2009) examined the effect of various socio-economic, demographic and cultural factors on the prevalence of chronic diseases among a representative sample of adult population from Guwahati city of Assam. They observed that age, marital status, occupation, per capita income and habit of smoking had significant effect on the prevalence of chronic diseases. The NCDs and chronic diseases are the leading causes of deaths in the rural areas of Andhra Pradesh. The observed pattern of death provides new insight into the rapid progression of epidemiological transition in rural India (Joshi et al, 2006).

Relative risks of prevalence of diseases are not usually homogeneous along the study region. Differences between relative risks may lead to zones where they are higher (or lower) than expected and, hence, a cluster may be present. One of the main concerns in Public Health surveillance (Aylin, Maheswaran, Wakefield, Cockings, Jarup, Arnold, Wheeler, and Elliot, 1999) is detection of clusters of diseases, i.e., the presence of high incidence rates around a particular location, which usually means a higher risk of suffering from diseases of study. Roughly speaking, a disease cluster is a region or neighbourhood where the number of cases substantially exceeds the expected number of cases at a specific time or for a specific time period (Gomez et al, 2003). There is a special interest in the clustering of disease events because it may help in identifying a common factor or source of exposure (Schwabe et al., 1977). Therefore, it becomes necessary to the health workers as well as planners to know the spatial location of the diseases where the relative risk of prevalence is higher than the expected.

Nagaland is a backward hilly state situated in eastern part of India. No academic study to estimate the prevalence rate of NCDs has been taken so far in the rural areas of Nagaland. Therefore, our interest is to estimate the prevalence rate of NCDs and to investigate the association between socio-economic, demographic, physiological and behavioural risk factors with NCDs in the rural areas of Nagaland. Moreover, whether regional disparity or non-homogeneity in the prevalence of NCDs exists or not will also be analysed by detecting the disease clusters.

MATERIALS AND METHODS

This study is based on cross-sectional primary data collected through household survey during May-July, 2011. The multi-stage sampling design was adopted to collect data. The households under the selected villages are the ultimate sampling units. Here, the household indicates the family living under the same roof and sharing the same kitchen. In our study, a sample of 1150 households was considered from the selected 23 villages of Kohima and Dimapur districts. Data were collected from all the members of the selected households. For the purpose of collecting data from the respondents, a semi-structured schedule was prepared which was pre-tested by pilot survey in order to test the validity of the questions incorporated with regard to the objectives of the study. Altogether, we interviewed 5404 respondents from the total sampled households. It was a challenging task to reach out the sampled households in the remote villages due to very bad road connectivity in the jungle hilly terrain.

Of the total interviewed respondents, only those respondents were considered for analysis of NCDs who attained 20 years or more on the date of interview. This censoring was necessary as very few cases of NCDs were reported under age 20 years.

[Figure-1: Scatter diagram showing the proportion of persons afflicted by Non-Communicable Diseases (NCDs) in different age groups: Here]

Therefore, for the analysis of non-communicable diseases (NCDs), 2048 persons were discarded who didn't attain 20 years of age. Consequently, we carried out our analysis for NCDs with 3356 individuals of which 1664 were males and 1694 were females. In this reduced sample, 14.0% of the respondents were afflicted by NCDs.

The enquiry on morbidity or the prevalence of NCDs was conducted with a reference period of 30 days. All spells of ailment suffered by any member of the sample household during the 30 days preceding the date of enquiry, whether or not the patient was hospitalised for treatment, were covered in the survey. A respondent was classified as afflicted by NCDs if he/she reported to be ailing from any kind of NCDs within the reference period. The prevalence rate of morbidity due to NCDs were determined by

$$Morbidity\ \Pr evalence\ Rate = \frac{No.\ of\ ailing\ persons\ due\ to\ NCDs}{Total\ population\ present\ in\ the\ sample} \times 1000$$

The morbidity data collected in the survey were based on the respondents' own assessment of their medical status, rather than on medical examination. While collecting data, we checked their prescription if the respondents reported to have visited any doctor and noted down the symptoms accordingly. But, for those who reported to have afflicted by NCDs and did not visit any doctor, for them only the symptoms of the disease were noted down. The identification of a particular NCD was done in consultation with a government doctor of Nagaland on the basis of the collected information regarding the diseases' symptoms and these NCDs were coded in accordance with the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10-CA)*.

We disaggregated data by the various categorised independent factors such as age, gender, occupation, per capita income, education, marital status, body mass index, fuel used for cooking, sanitation facility, habit of smoking, chewing tobacco and drinking alcohol.

The data were quantified by preparing cross tables to see the existence of association between the independent characteristics and the prevalence of NCDs. The strength of association between each of the multilevel independent covariate and the dichotomous dependent variate (i.e., presence or absence of prevalence of NCDs) was examined by multivariate logistic regression analysis.

For detecting disease clusters, our study region was divided into 4 non-overlapping regions which are the four Rural Development Blocks (RDBs) – Kohima, Chiphobozo, Medziphema and Dhansiripar.

Let us represent by O_i the observed number of cases (i.e., ailing persons) in region i, E_i its expected number, and P_i the population at risk in region i. By O_+, E_+ and P_+ we will represent the sums over all the regions of observed cases, expected cases and population.

The population was stratified according to age. So, P_{ij} will mean people at stratum j in region i. It is clear that

$$P_i = \sum_{j=1}^{k} P_{ij}; (i = 1, 2, ..., n)$$

. O_{ij} and E_{ij} can be defined in a similar way. E_{ij} 's are usually calculated using indirect standardisation. That is, if we have a reference population from which we know their incidence rates

$$\left(r_{ij} = \frac{O_{ij}'}{P_{ij}'} \right)$$

for each stratum, then we have $E_{ij} = P_{ij} r_i$. When the reference population is the same as the population under study, standardisation is called internal and it holds that $O_+ = E_+$.

We consider O_i 's to be independent and drawn from a Poisson distribution whose mean is $\theta_i E_i$, where θ_i is the relative risk, which measures the local deviation of the disease. If the relative risk is over 1 then there is an excess in risk in that region.

The maximum likelihood estimator for θ_i, which is called the standardised Morbidity Ratio (S.M.R.), is $\hat{\theta}_i = O_i / E_i$ (Gomez et al, 2003).

Tests for homogeneity: Pearsonian Chi-Square Statistic:

The value of this statistic is well known: .

$$T = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \quad ..... (1)$$

Test hypotheses are as follows:

$$H_0 : \theta_1 = \theta_2 = ... = \theta_n = \lambda$$

$$H_1 : not\ H_0$$

Since, we have used internal standardisation, therefore, λ must be 1 and the degrees of freedom for Chi-Square statistic are $n-1$ (Potthoff and Whittinghill, 1966a).

RESULTS

The total number of persons suffering from NCDs was 505 out of the total 886 morbid persons. Thus, 56.99% of the total morbid persons were suffering from NCDs.

The prevalence rate of the specific NCDs are shown in Table-1. From this table it is evident that the leading causes of morbidity among the NCDs are the diseases of circulatory system i.e., cardiovascular diseases (I00-I99) (22 persons per thousand) followed by diabetes mellitus (E10-E14) (15 persons per thousand) and gastro enteritis diseases (A06-A09) and diseases of respiratory system (J00-J99) both having prevalence rate of 11 persons per thousand.

Table-1: Disease specific prevalence rate of NCDs in rural Nagaland:

Diseases with ICD-10 Code	Number of Persons Afflicted by NCDs	
	(n=5404)	(n=1000)
Diseases of Respiratory System (J00-J99)	60	11
Diseases of the circulatory system i.e. Cardiovascular (I00-I99) 118	22	
Diabetes Mellitus (E10-E14)	83	15
Diseases of Liver (K70-K77)	27	5
Malignant Neoplasm (C00-C96)	49	9
Diseases of Musculoskeletal and Connective Tissues (M00-M99)	27	5
Gastro enteritis diseases (A06-A09)	61	11

Renal Diseases (N17-N29)	35	7
Diseases of Appendix (K35-K38)	20	4
Dental Carries and Other disorders of Teeth and supporting structures (K00-K08)	25	5
Total	505	94

The existence and strength of associations of demographic, socio-economic and behavioural Factors with morbidity due to NCDs in rural Nagaland is shown in Table-2.

Table-2: Associations of Demographic, Socio-economic and Behavioural Factors with Morbidity due to NCDs in Rural Nagaland

Independent Factors	n	Percentage	P	OR	95% CI
Gender					
Male	1664	15.0	0.30	0.87	(0.66 – 1.14)
Female	1692	13.0		Ref	
Age (in Years)					
20-49 (Prime Working Age)	2593	9.3	0.00*	0.22	(0.16 – 0.29)
50-59 (Working Age)	433	21.2	0.00*	0.39	(0.28 – 0.55)
60 or above (Old Age)	330	41.2		Ref	
Occupation					
Labour and Cultivation	559	19.7	0.57	1.10	(0.79 - 1.55)
Self-Employment	700	14.0	0.20	1.23	(0.90 - 1.68)
Student	443	2.9	0.03*	0.48	(0.25 – 0.92)
Others (HW, Child <4 yrs)	837	13.9	0.84	0.97	(0.69 – 1.35)
Govt. Service	817	16.3		Ref	
Per Capita Income					
Rs.46000 or Less	2037	13.5	0.01	0.62	(0.44 – 0.88)
Rs.46001 to Rs.63000	962	13.9	0.23	0.80	(0.56 – 1.15)
Rs.63001 or More	357	16.8		Ref	
Education					
Illiterate	443	23.7	0.06**	1.49	(0.98 – 2.25)
Primary (Class I to VIII)	556	20.0	0.01*	1.66	(1.14 – 2.43)
Secondary (Class IX to XII)	1581	11.8	0.65	1.08	(0.78 – 1.49)
College (Graduation) Or Above	776	8.6		Ref	
Marital Status					
Never Married	1116	5.5	0.01*	0.62	(0.44 – 0.87)
Separated/Divorced/ Widowed	204	34.3	0.01*	1.59	(1.12 – 2.28)
Currently Married	2036	16.7		Ref	
Body Mass Index (BMI)					
<18 (Underweight)	306	10.1	0.15	0.71	(0.45 – 1.13)
18-25 (Normal)	2511	13.1	0.01*	0.72	(0.56 – 0.93)
>25 (Overweight)	539	20.4		Ref	
Fuel for Cooking					
LPG	1882	13.4	0.82	1.03	(0.82 – 1.30)
Wood	1474	14.8		Ref	
Sanitation Facility					
Flush Toilet	2512	13.5	0.41	0.90	(0.69 – 1.17)
Pit Toilet Or No Toilet	844	15.4		Ref	
Smoking					
Yes	448	23.2	0.00*	1.78	(1.29 – 2.47)
No	2908	12.6		Ref	
Chew Tobacco					
Yes	1065	17.1	0.14	1.21	(0.94 – 1.56)
No		2291	12.6	Ref	
Drinking Alcohol					
Yes	448	19.3	0.48	1.13	(0.81 – 1.59)
No	2908	13.2		Ref	

From this table, it is clear that gender differentials were not significant for the prevalence of NCDs. That is, man and woman were equally likely to suffer from NCDs.

It was found that there existed significant association between age and the prevalence of NCDs. In reference to the old people (60 years and more), it was found that the people of prime working age (20-49 years) were almost 4.5 times less likely (OR=0.22; 95%CI=0.16-0.29) and working age (50-59 years) were about 2.5 times less likely (OR=0.39; 95%CI=0.28-0.55) to suffer from NCDs.

With respect to the occupation, considering government service as reference, it was observed that except students, other categories of occupations were not significantly associated with prevalence of NCDs. Students are usually of less age compared to the government employees.

We also examined the association between income and prevalence of NCDs. We considered the persons having per capita income (PCI) of

Rs.63001.00 or more as reference category. It was observed that the people with lower PCI were having lower chances of suffering from NCDs. Specially, if PCI of Rs.46000.00 or less, the chance of having NCDs reduces by almost 38 percent (OR=0.62; 95%CI=0.44-0.88).

From the same table, it was observed that the education is significantly associated with the prevalence of NCDs. We classified education into four categories- illiterate, primary (Class I-VIII), Secondary (Class-IX-XII) and College (Graduation) or more. Here, People with education up to college (Graduation) or more was considered as reference category. Compared to the reference category, we found that less educated people were more prone to the prevalence of NCDs. Considering college (graduation) or more as reference category, we found that those people who were illiterate were nearly 1.5 times more likely (OR=1.49; 95%CI=0.98-2.25) and those with primary level education were 1.7 times more likely (OR=1.66; 95%CI=1.14-2.43) to have NCDs.

The table further reveals that if "currently married" status is taken as the reference category, then we find a significant relationship between marital status and prevalence of NCDs. A 'never married' person is almost 1.7 times less likely (OR=0.61; 95%CI=0.44-0.87) to have NCDs. On the other hand, 'separated/widowed/divorced' were having more than one and half times more (OR=1.59; CI=1.12-2.28) chances of suffering from NCDs.

To examine the physiological effect on NCDs, we calculated body mass index (BMI). BMI was calculated as weight in kilograms divided by height in meters squared, rounded to zero decimal place based on the information supplied by the respondents regarding the height and weight of the individuals. We found that overweight persons were having more chances of suffering from NCDs. It was observed that compared to overweight people, normal weight people were having almost one and half times less chances (OR=0.72; 95%CI=0.56-0.93) of suffering from NCDs.

For the variable 'fuel used for cooking', we considered only two categories viz, Liquefied Petroleum Gas (LPG) and Wood with 'Wood' as reference category. We observed a weak association between (P=0.82) between 'fuel used for cooking' and prevalence of NCDs.

It was also observed that sanitation facilities were not having any significant impact on the prevalence of NCDs. We made only two categories of the variable 'sanitation facilities' namely- 'flush toilet' and 'pit or no toilet'. We observed a weak association between 'sanitation facilities' and 'prevalence of NCDs'. Taking 'pit or no toilet' as reference category, it was found that the NCDs were almost equally likely (OR=0.90; 95%CI=0.69-1.17) to prevail for both the category of people.

We also examined the association of behavioural characteristics such as habit of smoking, chewing tobacco and drinking alcohol with morbidity. A person was regarded as smoker, chewer and alcoholic if he had had the habit of smoking minimum 2/3 sticks of bidi or cigarettes, at least 3 times chew tobacco and drinks alcohol minimum once in a day.

It was found that the association between smoking and prevalence of NCDs were highly significant (P=0.00). The 'smokers' were at 1.8 times higher risks (OR=1.78; 95%CI=1.29-2.47) of suffering from NCDs than 'non-smokers'.

In regard to the variables 'chewing tobacco' and 'taking alcohol', poor association (P=0.14 & 0.48 respectively) was observed between these habits and the prevalence of NCDs. But, the higher odds ratios (OR=1.21; 95%CI=0.94-1.56 for 'chewing tobacco' & OR=1.13; CI= 0.81-1.59 for 'drinking alcohol') suggests that the people having these habits were at higher risks of suffering from NCDs compared to those who do not have these habits.

With regard to the detection of disease clusters, it was found that the calculated value of Pearsonian chi-square statistic is significant at 1% level of significance (Table-3).

Table-3: To calculate Pearsonian Chi-Square test statistic:

Regions	O_i	E_i	$O_i - E_i$	$\frac{(O_i - E_i)^2}{E_i}$	$\hat{\theta}_i = O_i / E_i$
1	151	157	-6	0.23	0.96
2	95	107	-12	1.35	0.89
3	153	165	-12	0.87	0.87
4	106	76	30	11.84	1.40
Total				14.29*	

But, $\chi^2_{(0.01;3)} = 11.43$.

This implies that there exists difference in the relative risks for the prevalence of NCDs over the four rural development blocks (RDBs). Moreover, $\hat{\theta}_4$ is more than 1 implying that the cluster was present in the 4th RDB i.e., Dhansiripar. Here, the cases of morbidity due to NCDs were more than expected.

DISCUSSION

The share of NCDs found in our study is similar to the figure provided by World Health Organisation, 2005a. According to them, more than 60 percent of deaths stem from NCDs worldwide.

Age differentials had significant influence on the prevalence of NCDs. The prevalence rate of NCDs was higher among older people. The findings were similar to those of Gupta et al. 1995; Kumar et al. 1995 and Momin et al. 2012. They reported an increase in the prevalence of coronary heart disease (CHD) and hypertension with the increase in age.

We observed that economically better-off people had more chances of suffering from chronic NCDs. Similar results were observed by Ghosh and Kulkarni (2004) and Dilip (2002).The basic reason may be the differentials in lifestyles of the rich people who usually do more work of sedentary nature where less physical activities were involved compared to the poor people.

The morbidity due to NCDs and educational attainment are negatively associated. People with less education were more likely to report specific morbidities, sickness and overall poor health in India (Ghosh and Arokisamy 2009; Duraiswamy 1998). Choudhury et al., (2009) observed that illiterates were having more chances of suffering from cardiovascular diseases compared to highly educated people. This suggests that better educated people take more precautions against diseases which in turn reduce their morbidity. The recent report from India using 2003 World Health Survey is consistent with the patterns observed in our study. According to the report, respondents who reported to be in bad and very bad health state are 21 percent among the illiterates compared to 5 percent among those with 11 years or higher levels of schooling (World Health Survey 2003).

The separated/divorced/widowed persons are at much higher risks of ailment from NCDs compared to currently married persons is similar to a previous study (Choudhury et al. 2009). This may happen because in absence of their spouses they were to face the various types of problems that come in the way of maintaining and looking after the family which ultimately leads to physical and mental stresses.

The overweight people were having higher risk of suffering from NCDs compared to normal weight or underweight people. Obesity increases the risk of a number of health conditions including hypertensions, adverse lipid concentrations, and type-2 diabetes (National Institute for

Health, 1998).

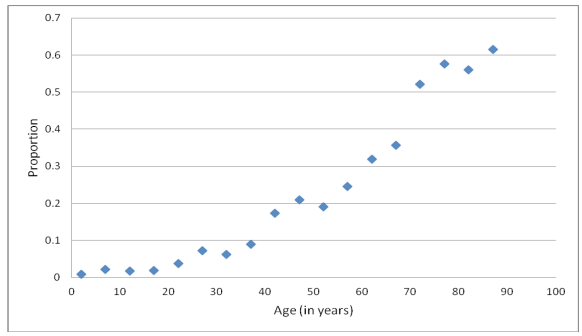
The use of tobacco has significant hazardous impact on the health of a person. Many previous studies at the national as well as international level indicated the hazardous impact of smoking (Jha et al. 2008; Gajalakshmi et al, 2003; Doll et al. 2004). Ischemic heart disease and Stroke are the top two diseases (accounting 11.8 and 9.5 percent of deaths to the total deaths) in low and middle income countries (Doll et al. 2004). Previous clinical studies show that both of these diseases are influenced by active or passive smoking of the individuals (Berry et al, 1989; Yao et al, 2008).

There existed the regional disparities for the prevalence of NCDs. A cluster was found in the Dhansiripar RDB which is situated far away from the township. Possibly, the insufficient and inadequate medical facilities were the reasons for excess risks of morbidity prevalence due to NCDs in those areas situated far away from townships.

CONCLUSION

Major share of morbidity was due to NCDs. Cardiovascular diseases and Diabetes Mellitus were the two major causes of NCDs. A higher prevalence rate of non-communicable diseases is a matter of grave concern for the state. As old aged people are more susceptible to NCDs, especially the persons who are either separated or divorced or widowed, it is obligatory to the state to initiate the developmental and social security programmes more effectively to render services to these target group people. Smoking is a major behavioural cause of NCDs. It affects the active smokers as well as the passive smokers. Thus, as a welfare state massive campaigning programmes require to be organised time to time to create awareness among the masses against the ill effect of smoking. The rural areas situated far away from the townships need more attention of the government to provide better health facilities.

Figure-1: Scatter diagram showing the proportion of persons afflicted by Non-Communicable Diseases (NCDs) in different age groups:



N.B.: superscripts * and ** represents significance at 5% and 10% level of significance respectively.

REFERENCES

Aylin P, Maheswaran R, Wakefield J, Cockings S, Jarup L, Arnold R, Wheeler G and Elliot P (1999) A National Facility for Small Area Disease Mapping and Rapid Initial Assessment of Apparent Disease Clusters Around a Point Source: The U.K. Small Area Health Statistics Unit, Journal of Public Health Medicine, 21(3):289-298 | Berry J, Mead K, Nabel E G, Rocco M B, Cambell S, Fenton T, Mudge G H and Selwyn A P (1989) Effect of smoking on the activity of ischaemic heart disease, JAMA, 261(3):398-402 | Boutayeb A and Boutayeb S (2005) The burden of non-communicable diseases in developing countries, International Journal for Equity in Health, 4:2, Available at http://www.equityhealthj.com/content/4/1/2 | Caselli G, Mesele F and Vallin J (2002) Epidemiological Transition Theory Exceptions, Genus, LVIII(1), 9-51 | Choudhury L, Choudhury A and Deka M (2009) Influence of socio-economic and demographic factors on the risk of chronic diseases in Guwahati – The Premier City of North East India, Demography India, 38(1):85-101 | Dilip T R (2002) Understanding levels of morbidity and hospitalization in Kerala, India, Bulletin of the World Health Organization, 80 (9):746-751 | Dilip T R (2007) Age-Specific Analysis of Reported Morbidity in Kerala, India, World Health and Population, 9(4): 98-108 | Duraisamy P (1998) Morbidity in Tamil Nadu, Economic and Political Weekly, 33(17):982-990 | Doll R, Peto R. Borham J and Sutherland I (2004) Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ, 328(7455):1519 | Gajalakshmi V, Peto R, Kanaka TS, Jha P (2003) Smoking and mortality from tuberculosis and other diseases in India: retrospective study of 43000 adult male deaths and 35000 controls. Lancet, 362(9383):507-15 | Gupta M D, Ramachandran V and Mutatkar R K (2001) Epidemiological profile of India: Historical and contemporary perspectives, J. Biosci 26:437-64 | Gupta R, Prakash H, Majumdar S, Sharma S and Gupta V P (1995) Prevalence of coronary heart disease and coronary risk factors in an urban population of Rajasthan, Indian Heart Journal, 47(4):331-8 | Gupta R, Gupta V P, Sarna M, Bhatnagar S, Thanvi J, Sharma V, Singh A K, Gupta J B and Kaul V (2002) Prevalence of coronary heart disease and risk factors in an urban Indian population: Jaipur Heart Watch-2, Indian Heart Journal, 54(1):59-66 | Gupta R, Prakash H, Gupta V P and Gupta K D (1997) Prevalence and determinants of coronary heart disease in rural population of India. J Clin. Epidemiol, 50(2):203-9 | Ghosh S and Kulkarni P M (2004) Does the pattern of causes of death vary across socio-economic classes. Genus, Vol. LX, No.2, pp.55-81 | Ghosh S and Arokisamy P (2009) Morbidity in India – Trends, Patterns and Differentials. Journal of Health Studies, 2:136-148 | Gomez Rubio V, Ferrandiz J and Lopez A (2003) Detecting Clusters of Diseases with R, Proceedings of the 3rd International Workshop on Distributed Statistical Computing (DSC 2003) March 20-22, Vienna, Austria ISSN 1609-395X Kart Hornik, Friedrich Leisch & Achim Zeleis (eds.) http://www.ci.tuwien.ac.at/conferences/DSC-2003/ | Gwatkin D R and Guilot M (2000) The burden of disease among the global poor: current situation, future trends and implications for strategy, Washington (DC): International Bank for reconstruction and development, World Bank | International Institute for Population Sciences and World Health Organization (2006) Health System Performance assessment, World Health Survey-2003; p-79 | Jha P, Jacob B, Gajalakshmi V, Gupta PC,Dhingra N, Kumar R, Sinha DN, Dikshit RP, Parida DK, Kamadod R, Borharm J and Peto R (2008) A nationally representative case – control study of smoking and death in India, The New Eng J of Med, 358:1137-47 | Joshi R, Cardona M, Iyanger S, Sukumar A, Raju C R, Raju K R, Raju K, Reddy K S, Lopez A and Neal B (2006) Chronic diseases now a leading cause of death in rural India- mortality data from the Andhra Pradesh Rural Health Initiative, Int. J of Epidemiology, 35:1522-1529 | Kumar P, Desai V K and Kosambia J K (1995) Prevalence of hypertension amongst the employees of a mega-industry of south Gujarat. Indian J of Comm. Med, 27:19-25 | Lawrence J F, Philogene G S, Gramling R, Elliot, Coups J and Sinha S (2004) Prevalence of multiple chronic disease risk factors: 2001 national Health interview Survey, American Journal of Preventive medicine, Vol.27, Issue2, Suppl. 1, pp.18-24 | Lowry R, Kann L, Collins J L and Kolbe L J (1996) The Effect of Socioeconomic Status on Chronic Disease Risk Behaviors Among US Adolescents, JAMA, 276(10):792–797 | Momin M H, Desai V K and Kavishwar A B (2012) Study of socio-demographic factors affecting prevalence of hypertension among bank employees of Surat City. Indian J Public Health, 56: 44-48 | Murray C J and Lopez A D (1997) Mortality by cause for eight regions of the world: Global Burden of Disease Study, Lancet, 349(9061):1269-1276 | National Institutes of Health (1998) Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults-The evidence report, Obes Res 6(Suppl 2):51S-209S | Omran A R (1971) The Epidemiological Transition: A theory of the epidemiology of population change, Milbank Memorial Fund Quarterly, 49:509-538 | Olshansky S J and Ault A B (1986) The fourth stage of the epidemiologic transition: the age of delayed degenerative diseases, Millbank Mem Fund Quarterly, 64: 355-91 | Potthoff R F and Whittinghill M (1966a) Testing for homogeneity: II. The Poisson distribution, Biometrica, 53:183-190, In Gomez Rubio V, Ferrandiz J and Lopez A (2003) Detecting Clusters of Diseases with R, Proceedings of 3rd International Workshop on Distributed Statistical Computing (DSC 2003) March 20-22, Vienna, Austria ISSN 1609-395X Kart Hornik, Friedrich Leixch & Achim Zeleis (eds.) | Reddy KS and Yusuf S (1998) Emerging epidemic of cardiovascular disease in developing countries, Circulation,97:596-601 | Reddy K S, Shah B, Varghese C and Ramadoss A (2005) Responding to the threat of chronic diseases in India, Lancet, 66:1744-49 | Sachdeva N L and Datta A (1998) Cross-sectional study of the prevalence of chronic illness in a semi urban community of Pune, Medical Journal Armed Forces India, 45(3):179-82. | Schwabe C W, Riemann H and Franti C E (1977) Epidemiology in veterinary practice, p.303, Philadelphia, Lea & Febiger. | World Health Organisation (WHO) (2003) The World Health Report: Today's Challenges & WHO: Diet, Nutrition and the prevention of chronic diseases, in technical report series 916 Geneva | Yao H, Lam T H, Jiang B, Wang J, Sai X, Fan L, Li X, Qin Y and Hu F B (2008) Passive smoking and risk of peripheral Arterial disease and Iscaemic Stroke in Chinese women who never smoked, Circulation, 118:1519-1520 |