

Full Length Research Paper

Burden of Disease: A Study of Morbidity Profile of the Households of Siliguri Municipal Corporation Area (SMCA), West Bengal, India

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Abstract

Lack of accurate information on cause-specific or age-specific mortality data and unreliable verbal autopsy data of the developing countries, compel researchers depend on morbidity data for evaluation of burden of disease (BOD). Along with the demographic and epidemiologic transition, morbidity pattern of these countries including India is changing dramatically. Present study addresses the morbidity profile of the people of Siliguri Municipal Corporation Area (SMCA) according to the modalities of Global Burden of Disease Study in the light of socio-economic and demographic characteristics, since the region is experiencing substantial population pressure, rapid urbanisation, persistent migration, increasing slums etc. The study is primarily based on self-perception or lay reporting of symptoms and impairments. Multi-stage sampling method and standard technique of prevalence study are adopted for the determination of sample size for cross-sectional survey. Analysis is based on sample size of 1684 persons (i.e. 1033 persons from Darjeeling district area and 651 persons from Jalpaiguri district area) or 400 households. Morbidity prevalence rate per 1000 persons for communicable, non-communicable diseases and injuries are 58.37, 232.78 and 74.82 respectively. Morbidity pattern of the region is dominated by the non-communicable diseases; still a considerable number of people are exposed to a greater risk of being affected by injuries including accidents followed by communicable, maternal and peri-natal related diseases, indicating the region is moving towards advanced phase of epidemiological transition.

Keywords: Burden of disease, Morbidity Prevalence Rate, Epidemiological transition, SMCA

JEL Classification Codes: I12, I18, and I19

Introduction

Modern economists have pointed out that economic development of third-world countries remains a far cry without human development and human development is only possible when everybody enjoys good health. Thus, 'promotion and protection of the health of the people is essential to sustain economic and social development' (UNICEF, 1978). But most of the developed and a number of developing countries are passing through demographic and "epidemiologic transition" (Murray and Lopez, 1996). However, 'Epidemiological transition theory' highlights that during the process of modernization of society, a long-term shift takes place in mortality and disease patterns whereby deadly acute infectious diseases are gradually displaced by chronic, non-infectious, degenerative and man-made diseases emerge as the major form of morbidity and leading cause of death (Omran, 1971). Recent study based on Global Burden of Disease 2004 Update study reveals that the burden of infectious diseases including communicable, maternal, perinatal, and nutritional diseases accounted for 37 percent and non communicable accounted for 53 percent of all deaths in India (Bloom et al., 2013). Four leading chronic diseases in India are cardiovascular diseases (CVDs), diabetes mellitus, chronic obstructive pulmonary disease (COPD) and cancer (Taylor, 2010). In addition, cases of road traffic injuries and deaths are increasing among the 15 to 45 years male youths (Report on causes of deaths in India, 2001-2003, Registrar General of India, Government of India, 2010). It was estimated that intentional and unintentional injuries including accidents will contribute about 17 percent disease burden of the country (Report of NCMH and Health Ministry of Health & Family Welfare, Government of India, 2005). Further, dominance of communicable diseases is higher in rural areas and prevalence of non-communicable diseases is higher in urban areas (Annual Report of Ministry of Health and family Welfare, 2010, Govt. of India). Study also finds that in West Bengal, younger age groups are suffering more from communicable diseases or fevers, respiratory and other infectious and parasitic diseases, on the other hand, aged people are experiencing non-communicable diseases like cardiovascular disease, cancer, tuberculosis, genitourinary and digestive diseases etc. Prevalence of acute diseases is higher among low income groups and chronic diseases are highly prevalent among high income groups (Ghosh and Arokiasamy, 2010). In addition, cancer is a great threat for the state of West Bengal and it

reached at its maximum in 2010 with majority cases were found among the urban people (Chatterjee, 2011). Against this backdrop, the cross sectional survey was done to be familiar with morbidity profile of the people of Siliguri Municipal Corporation Area (SMCA) under West Bengal according to their demographic and socio-economic backgrounds, as the region is experiencing increasing population pressure, rapid urbanization, persistent migration, increasing slums etc. The notable feature of this corporation city is that it spreads over the jurisdiction of two districts such as plain area of Darjeeling district, consisting of 33 wards and north-western part of Jalpaiguri district consisting of 14 wards. Further, socio-economic and demographic characteristics of the people of two these segments are not similar.

Materials and Methods

In order to get systematic and comprehensive analysis of burden of disease, sampled data on different disease episodes were grouped under three broad categories such as Group I representing communicable, maternal, perinatal and nutritional conditions, Group II representing the all major non-communicable diseases and Group III representing intentional and unintentional injuries including accidents according to the modalities of Global Burden of Disease (GBD) 2010 study (Murray and Lopez, 1996). The study primarily considered the self-perceived morbidity, based on lay reporting of symptoms and impairments by individual (Murray and Chen, 1992), and to some extent, disease names as told by the physicians or the medical store sales persons, not on clinically diagnosed.

Sampling strategy and sample size estimation

A multi-stage sampling method was adopted. Through the simple systematic sampling procedure, 14 wards from Darjeeling district area (DRJA) and 6 wards from Jalpaiguri district area (JPGA) under SMCA were selected for the study. Sample size was determined using the standard formula of prevalence study:

$$n = \frac{Q}{P\alpha^2}, \quad \text{----- (1)}$$

Where: n = Sample size to be estimated, P = Prevalence rate of disease among the households (without multiplying 1000), Q = (1-P) and α = Standard error of the estimated prevalence rate (i.e. level of margin for the study). The pilot study on 50 households of DRJA and JPGA under SMCA reveals that the annual prevalence rate of disease for the said two districts area are 0.288 and 0.372 (without the multiplier 1000) respectively. The average size of a household in SMCA was 4.17 (i.e. 4,72,374 /1,13,269) according to Census 2001 and level of margin considered at 0.05 (i.e. $\alpha = 0.05$). Putting all these values in formula (1), we obtained $n = 0.712 / (0.288 * 0.0025) \approx 989$ persons or $989/4.17 \approx 238$ households for DRJA. On the other hand, by applying the same formula, we obtained $n = 0.628 / (0.372 * 0.0025) \approx 675$ persons or $675/4.17 \approx 162$ households for JPGA. Thus, for SMCA as a whole, the required minimum sample size is 1664 (i.e. 989+ 675) persons or 400 (i.e. 238+162) households. But, through field survey, we obtained total 1684 persons (i.e. 1033 persons from DRJA and 651 persons from JPGA) which were considered as sample size for the study.

Data collection

Cross-sectional survey was carried out with the head of the family or with his wife or with any educated member of the family to get the information on type of disease, severity of disease, number of disease episodes, duration of the disease experienced by the each individual member etc. and observed distributions were cross tabulated according to different background characteristics of the respondents.

Data analysis

The measurement of incidence and prevalence rate of disease during the reference period of twelve months (i.e. one year) were done using the standard formula recommended by Expert committee on Health Statistics of the World Health Organisation (WHO).

$$\text{Morbidity Incidence Rate} = \frac{I}{p} \times 1000 \quad \text{----- (2),}$$

$$\text{Morbidity Prevalence Rate} = \frac{C}{p} \times 1000 \quad \text{----- (3),}$$

Where: I = Number of new cases of disease during the 12-month reference period (i.e. one year), C = Total number of spells (in all the four categories) during the same reference period and P = Total number of population exposed to the risk of getting affected by disease during the same reference period. In addition, disability is measured considering the percentage of people experiencing deterrence from normal activities due to physical or mental impairments.

Results

Table 1 reveals that out of 428 disease episodes in DRJA, 19.16 percent are of communicable and maternal related diseases (GI), about 60 percent are of non-communicable diseases (GII) and more than 20 percent are of intentional and unintentional injury (GIII) episodes. Further, morbidity prevalence rate per 1000 persons for GI, GII and GIII category diseases are 79.38, 249.76 and 85.19 respectively. On the other hand, in JPGA, percentage of GI, GII and GII category disease episodes are 35.82, 50 and 14.18 respectively. In addition, morbidity prevalence rate per 1000 persons for those three category disease episodes are 147.47, 205.84 and 58.37 respectively. However, SMCA as a whole (i.e. the combined area), out of total disease episodes, 25.6 percent are of GI diseases,

56.3 percent are of GII diseases and 18.1 percent are of GIII diseases. On the other side, morbidity prevalence rate per 1000 persons in SMCA for GI, GII and GIII category disease episodes are worked out to be 58.37, 232.78 and 74.82 respectively.

But table 2 presents the distribution of morbidity incidence rate and prevalence rate according to gender and place of residence. It is also worked out that incidence rates per 1000 persons in DRJA, JPGA and SMCA, as a whole, are 283, 212.2 and 258.91 respectively, whereas prevalence rates per 1000 persons for those areas were calculated as 414.33, 411.7 and 413.3 respectively. It shows that morbidity incidence rate and prevalence rates are higher for females than the males in all areas.

Table 1: Distribution of disease episodes by category and place of residence

Disease Category	DRJA			JPGA			SMCA		
	n	%	MPR	n	%	MPR	n	%	MPR
GI	82	19.16	79.38	96	35.82	147.47	178	25.6	58.37
II	258	60.28	249.76	134	50	205.84	392	56.3	232.78
GIII	88	20.56	85.19	38	14.18	58.37	126	18.1	74.82
Total	428	100	414.33	268	100	411.67	696	100	413.30

Source: Self-elaboration with survey data, Note: n = Number of Disease Episodes, MPR = Morbidity Prevalence Rate per 1000 persons

Table 2: Distribution Incidence Rates and Prevalence Rates of disease by gender and place of residence

Gender	DRJA		JPGA		SMCA	
	MIR	MPR	MIR	MPR	MIR	MPR
Male	273.1	403.25	204.88	244.03	244.03	400.83
Female	293.8	427.08	248.96	278.78	278.78	429.96
Total	283	414.33	221.2	411.67	258.91	413.30

Source: Self-elaboration with survey data, Note: MIR = Morbidity Incidence Rate per 1000 persons, MPR = Morbidity Prevalence Rate per 1000 persons

Table 3 depicts that morbidity prevalence rate for acute diseases (i.e. 141.34 per 1000 persons) is higher in DRJA and for chronic diseases (i.e. 302.61 per 1000 persons), it is higher in JPGA. But in SMCA, as a whole, this rate for chronic diseases (i.e. 284.44 per 1000 persons) is much higher than that of for acute diseases (i.e. 128.86 per 1000 persons). On the other hand, table 4 highlights that out of total 106 disability cases in SMCA, 6.58 percent are from DRJA, and 5.84 percent are from JPGA. But in SMCA as a whole, out of total disability 106 cases, 0.42 percent are of physically challenged by birth, 2.26 percent are of functionally disabled, 0.06 percent are of mentally challenged, 53.44 percent of temporarily disabled and 0.36 percent are of other type of disability such as hearing impaired, very low eye sight etc. Therefore, data clearly shows that among the disabled persons, a majority of the persons are temporary disabled, followed by functional disabled, and other remaining categories represent more or less percentage.

Table 3: Distribution of total disease episodes by nature of disease and place of residence

Nature of Disease	DRJA			JPGA			SMCA		
	n	%	MPR	n	%	MPR	n	%	MPR
Acute*	146	34.11	141.34	71	26.49	109.06	217	31.18	31.18
Chronic^	282	65.89	272.99	197	73.51	302.61	479	68.82	68.82
Total	428	100	414.33	268	100	411.67	696	100	413.30

Source: Self-elaboration with survey data, Note: *Acute Disease: Suffering for less or equal to 30 days; ^chronic Disease: Suffering for more than 30 days continuously

Table 5 shows that in SMCA, while morbidity prevalence rate for GI category diseases is higher for children below 5 years age (i.e. 175.18 per 1000 persons) but for GII category (i.e. 618. 82 per 1000 persons), and GIII category (i.e. 98.48 per 1000 persons) diseases, it is higher for people aged 61 and above years old. In other words, children have higher morbidity prevalence rate for communicable diseases, aged people are more exposed to non-communicable diseases. Illiterate persons have reported highest (i.e. 239.13 per 1000 persons) and post-graduate persons have reported lowest morbidity prevalence rate (i.e. 5.81 per 1000 persons) for GI category diseases. Further, prevalence of GIII category was lowest (i.e.22.39 per 1000 persons) for small children and highest for post-graduates have prevalence rate (i.e. 104.65 per 1000 persons).

On the other hand, table 6 shows there is no such large variation with regard to morbidity prevalence rates among the different castes in SMCA. However, significant difference is found among the different religious groups. Muslim communities have reported higher prevalence rate for all types of diseases (i.e. 263.57 for GI type, 333.33 for GII type and 170.54 for GIII type diseases) as compared to other religions. Further, it is observed that widower persons reported lowest morbidity rate for GI category diseases, divorcee and widower persons reported comparatively higher morbidity prevalence rate for GII category but other people with different marital status reported more or less similar morbidity prevalence rates for GIII category. The table also reveals that as occupational status

changes morbidity pattern also changes accordingly. Data depicts that while unemployed persons reported lowest (i.e. 21.28 per 1000 persons) and wage earners reported higher prevalence rate (i.e. 153.85 per 1000 persons) for GI category diseases, retired persons have highest prevalence (i.e. 545.45 per 1000 persons) for GII category diseases and self employed have highest prevalence (i.e. 220.78 per 1000 persons) for GIII category diseases compared to other groups.

Table 4: Distribution of different types of disability according to place of residence

Nature of Disability	DRJ District Area	JPG District Area	SMCA
Physically Challenged by birth	5 (0.48)	2 (0.31)	7 (0.42)
Functionally disabled	22 (2.13)	16 (2.46)	38 (2.26)
Mentally Challenged	0 (0.00)	1 (0.15)	1 (0.06)
Temporarily disabled [#]	40 (3.87)	18 (2.76)	58 (3.44)
Others*	4(0.39)	2(0.31)	6 (0.36)
Total	68 (6.58)	38 (5.84)	106 (6.29)

Source: Self-elaboration with survey data, Note: Figures in the parentheses indicate the percentage of the character out of total sampled population, [#]Disabled due to injury, fracture, accidents and other causes or stopped the normal activity due to temporary impairment, * Others category includes hearing impaired, very low eye sight, stammering etc.

In addition, table 7 reveals that households with monthly income less than Rupees. 10,000 reported highest prevalence (i.e. 123.49 per 1000 persons) for GI category diseases, families with monthly income more than Rupees. 50,000 reported highest prevalence rate (i.e. 349. 21per 1000 persons) for GII and for GIII category diseases (i.e. 164.02 per 1000 persons). Though it was generally presumed that BPL (Below Poverty Line) category households have higher morbidity prevalence than the APL (Above Poverty Line) category households but data depicts that APL category households reported higher morbidity prevalence rate (i.e. 413.95 per 1000 persons) as compared to other counterpart (i.e. 410.71 per 1000 persons). However, in SMCA, BPL families have reported higher prevalence rate (i.e 127.98 per 1000 persons) for GI category diseases, while APL families have reported higher prevalence for (i.e. 238.13 per 1000 persons) GII category diseases, but prevalence rate for GIII category diseases is similar for economic classes. Finally, the table shows that small sized households have reported higher morbidity prevalence rate (i.e 419.98 per 1000 persons) for all category diseases than the other counterparts.

Table 5: Distribution of Morbidity Prevalence Rate by category of diseases, gender, age, and education

Characteristics of sample	DRJA	JPGA	SMCA	SMCA		
	Morbidity Prevalence Rate per 1000 persons All Category (GI+ GII+ GIII)			Morbidity Prevalence Rate per 1000 persons GI GII GIII		
Gender						
Male	403.25	339.58	400.83	94.50	225.34	81.00
Female	427.08	435.68	429.96	120.67	242.72	66.57
Age (In Years)						
<5	207.32	327.27	255.47	175.18	51.09	29.20
5-14	149.12	259.26	184.52	59.52	89.29	35.71
15-24	367.47	289.86	324.40	96.51	144.77	83.11
25-44	468.09	589.74	488.66	138.14	261.86	88.66
45-60	423.24	378.38	406.17	77.12	254.5	74.55
61 & Above	762.38	903.23	863.64	83.33	681.82	98.48
Education						
Illiterate	583.33	545.45	565.22	239.13	239.13	86.96
NASA*	283.95	301.89	291.04	201.49	67.16	22.39
Up to Primary level	443.30	500.00	467.21	131.15	262.3	73.77
Primary - Secondary	395.92	390.70	393.48	93.48	232.61	67.39
Secondary-HS*	526.04	298.78	418.99	89.39	248.6	81.01
HS- Graduate	377.98	595.74	441.42	92.05	263.6	85.77
Post Graduate	396.55	321.43	372.09	5.81	209.3	104.65

Source: Self-elaboration with survey data Note: HS= Higher Secondary; * NASA indicates not attaining school age; they cannot be treated as illiterate though their education level is nil. Here, preparatory school qualification was not considered.

Table 6: Distribution of Morbidity Prevalence Rate by category of diseases, caste, religion, marital status and occupation

Characteristics of sample	DRJA	JPGA	SMCA	SMCA		
	Morbidity Prevalence Rate per 1000 persons			Morbidity Prevalence Rate per 1000 persons		
	All Category (GI+ GII+ GIII)			GI	GII	GIII
Caste						
UR*/ General	319.25	400.53	413.00	104	233	76.00
OBC*	486.91	344.63	418.48	105.98	236.41	76.09
SC/ST*	390.89	227.85	408.23	110.76	227.85	69.62
Religion						
Hindu	389.79	371.24	382.49	90.19	224.49	67.81
Muslim	659.34	1026.32	767.44	263.57	333.33	170.54
Jain	363.64	545.45	454.55	227.27	227.27	0.00
Others	500.00	250.00	428.57	142.86	214.29	71.43
Marital Status						
Married	437.50	401.96	423.45	107.56	240.31	75.58
Unmarried	367.65	446.33	394.58	108.32	212.77	73.50
Widow	431.82	288.89	359.55	67.42	224.72	67.42
Divorcee	421.05	500.00	454.55	60.61	303.03	90.91
Widower	500.00	714.29	615.38	23.08	307.69	76.92
Occupation						
Self-employed	543.48	387.10	291.14	64.94	194.81	220.78
Student	353.26	284.36	508.56	88.61	154.43	48.10
Housewife	517.37	493.33	347.83	119.8	320.29	68.46
Service (Govt. & Private)	308.46	641.79	391.9	89.55	223.88	78.36
Business	393.55	428.57	772.73	90.52	241.38	73.28
Retired person	764.71	800.00	512.82	90.91	545.45	136.36
Wage earner & others	500.00	523.81	655.74	153.85	256.41	102.56
Unemployed	333.33	269.23	297.87	21.28	170.21	106.38

Source: Self-elaboration with survey data Note: UR= Unreserved category, OBC = other backward Classes, SC= Schedule caste, ST= Scheduled Tribe.

Table 7: Distribution of Morbidity Prevalence Rate by economic characteristics of the household

Characteristics of sample	DRJA	JPGA	SMCA	SMCA		
	Morbidity Prevalence Rate per 1000 persons			Morbidity Prevalence Rate per 1000 persons		
	All Category (GI+ GII+ GIII)			GI	GII	GIII
Monthly Income (In Rupees)						
≤ 10,000	207.45	312.50	253.01	123.49	102.41	27.11
10,001-20,000	496.73	330.05	388.59	116.85	233.70	38.04
20,001-30,000	408.28	438.10	387.21	97.64	225.59	63.97
30,001-40,000	478.72	554.46	450.62	98.77	250.00	101.85
40,001-50,000	439.02	676.47	545.98	97.70	333.33	114.94
50,000>	479.53	533.56	597.88	84.66	349.21	164.02
Economic Class						
BPL	313.95	404.26	410.71	127.98	211.31	71.43
APL	447.74	413.73	413.95	100.15	238.13	75.67
Household Size						
≤ 4 members	475.74	347.97	419.98	105.94	233.66	80.39
5 ≥ members	257.73	753.25	388.10	104.82	229.46	53.82

Source: Self-elaboration with survey data Note: APL: Above Poverty Line; BPL: Below Poverty Line, Authentication is not verified, categorisation is based on type of ration card holding.

Discussion

Results highlight that while one segment (i.e. Jalpiguri district area) has higher morbidity prevalence rate for communicable and other maternal related diseases, the other segment (i.e. Darjeeling district area) is experiencing higher morbidity prevalence rate for non-communicable diseases and intentional and unintentional injury cases, difference in socio-economic and demographic characteristics of the people of two places may be the reason for this. Higher morbidity prevalence rate for females than the males may be due to the high education level among females, more reporting to the health facilities for pregnancy complications and child birth and others. On the other hand, higher prevalence of non-communicable diseases among the people may be reason for higher morbidity prevalence rate for chronic diseases. The study reveals that as age increases morbidity pattern also changes. Low prevalence rate of infectious or communicable diseases among the educated people may be due to more awareness, consciousness, early perception, knowledge, hygienic living and others. Lowest reporting of GIII category for the children may be due to utmost care taken for them and highest prevalence rate of GIII category among post-graduates may be due to more reporting to health facilities so as to avoid future uncertain consequences for little injury or wound and others. However, may be due to no water-tight division in the society with regard to caste, all castes reported the similar morbidity pattern but higher prevalence rate among Muslim communities could be due to their food habit, living condition, occupation, genetically transmitted diseases etc. Further, disease pattern may also be influenced by marital status of the sick person. Physical or mental disturbance, nobody to care for them, social withdrawal, depression etc are the probable causes of higher morbidity prevalence rate among divorcee and widower persons. Further, because of nature of work, working condition and environment, work load, occupational status and others persons with different occupation are exposed to different types of physical as well as mental health problems. Further, higher morbidity prevalence rate among high income groups may be due to the fact that they do not ignore the minor health problem and report to the doctor or other health facilities because of their high capacity to meet medical expenses or high affordability, wishing to live quality life, over seriousness with disease, able to manage time etc. In addition, poor housing, sanitation, low awareness, unhygienic living etc. could be cited as the higher prevalence rate for GI category diseases among BPL families. On the contrary, sedentary life style, overweight, abdominal obesity, hypertension, over reporting to the health facilities due to affordability etc., may be the reasons for higher prevalence for GII category diseases among APL families. Finally, small sized households can pay more attention on each member, have comparatively higher per capita income, more consciousness etc. than the large sized households, so former category can perceive the disease at early stage and report to the healthcare facilities immediately, thus their reported morbidity prevalence rate is comparatively higher than other counter part.

Conclusion

Though morbidity measurement is considered to have better indicator over the others to evaluate health status or burden of disease of the people of any region, particularly, for developing countries, it has complicated and multifaceted features, which varies across the different demographic and socio-economic characteristics of the people as evident in the present study. Morbidity pattern of Siliguri Municipal Corporation Area (SMCA) is dominated by the non-communicable diseases; still a considerable number of people are exposed to a greater risk of being affected by injuries including accidents followed by communicable, maternal and peri-natal related diseases, indicating the region is moving towards advanced phase of epidemiological transition. In addition, a substantial number of people have different types of disabilities including functional disability. The study found gender disparity with regard to morbidity prevalence rate. Further, study has found direct relationship between morbidity prevalence rates and other factors such as monthly income, economic class and household size of the households. Therefore, considering the burden of disease of the region policy makers, planners, public health authority and other concerned agencies need to formulate strategies so as to make the healthcare services available, accessible and affordable to all the people living in SMCA, which will further facilitate in human capital development and prevent productivity loss, and reduce healthcare burden on families, societies and on government.

Ethics

All the authors read and approved the manuscript and no ethical issues involved.

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