Ischaemic Heart Disease

Ischaemic heart disease (IHD) is the leading cause of death in economically developed countries and is rapidly assuming serious dimensions in developing countries. It is expected to be the single most important cause of death in India by the year 2015 A.D. There is a steep increase in prevalence of IHD in urban areas in India. The prevalence rates were as low as 1.04% (Padmavati, 1962) in Delhi and 1.05% (Mathur, K.S.) in Agra in early 1960's. In 1975, Gupta,S.P. reported prevalence of 3.63% in urban areas of Rohtak. The prevalence of IHD has increased considerably during last decade, especially in urban areas. Although there is increase in prevalence of the disease in rural areas also, but it is not that steep because life style changes have affected people in urban areas more than in rural areas.

The present study used the results of studies carried out in 1990s and upto the year 2002. The research studies were selected for assessment of burden of disease based on following criteria: (1) The information on following parameters should be available from the study; age and sex wise break up of cases and the total study sample, details of sampling design, sample size and place of study; (2) Only those studies were included which have given clear description of diagnostic criteria used in the investigation.

The diagnostic criteria described as follows were considered necessary for selecting the study: (a) history of documented angina or infarction and previously diagnosed CHD, (b) affirmative response to Rose Questionnaire, (c) ECG changes namely Minnesota codes 1-1, 4-1, 5-9, 5-2 or 9-2. As the criteria based on history may result in over diagnosis or under diagnosis because of poor interpretation of symptoms, the diagnosis of IHD was also confirmed on the basis of ECG findings (ST, R, Q wave changes or Q wave changes only).

Observations and results

The studies with comparable diagnostic criteria carried out during 1990s and upto 2002 were used to carry out meta-analysis to obtain weighted average of prevalence rates of IHD in the country. Inverse variance method was used to obtain pooled estimates of prevalence rates from the selected studies. The prevalence rates were combined to obtain pooled estimates by calculating weighted average of prevalence rates from the individual studies.

Thus if P_i, i=1,2….. is the prevalence rate for the ith study and w_i is the weight assigned for the ith study then the weighted prevalence rates is defined $\frac{\sum P_i w_i}{\sum w_i}$ where $w_i = \frac{1}{s^2_i}$.

Thus larger studies, which have smaller standard errors, are given more weight than smaller studies that have larger standard errors. This choice of weights minimizes the variability of the pooled estimate of prevalence rates. This approach is widely applicable, and can be used to combine any estimates that have standard errors available. Meta-analysis was carried out separately for studies in urban areas and in rural areas. Similarly, separate pooled estimates of prevalence rates were obtained for males and females from urban and rural areas.

The data are presented in tables 2 to 4. The pooled estimates of prevalence rates for urban and rural areas were found to be 6.4% and 2.5% respectively. In urban areas, the pooled estimate of prevalence rate was 6.1% for males and 6.7% for females. In rural areas the pooled estimate for prevalence rate was 2.1% for males and 2.7% for females. Age specific prevalence rates of IHD among males and females were obtained by pooling the data of five studies that were included in the present investigation. This was analyzed separately for urban and rural areas. The pooled estimates of age specific prevalence rates derived

from the selected studies are given in table 5. These age and sex specific prevalence rates of the diseases were used as input for DISMOD analysis.

All cause mortality rates and population distribution by age and sex were obtained from publications of Office of Registrar General of India. In the present investigation, IHD specific mortality rates were estimated using MCCD data for urban areas. As regards rural areas, data on mortality are available from survey of cause of death – rural. This survey is carried out by lay field investigators who use a structured questionnaire to obtain information on signs and symptoms and circumstances of death from the family members. The data is tabulated by broad cause groups. It is not expected that this survey would be able to provide disease specific data as per ICD codes. However, the information tabulated on broad cause groups was utilized. According to SCD-rural (1997), 12.1% of total deaths in rural areas are attributable to diseases of circulatory system. According to the MCCD data, 25.1% of total deaths in urban areas are attributable to diseases of the circulatory system. Therefore it was assumed that mortality rates due to IHD (which forms an important disease entity among the diseases of circulatory system) in rural areas are expected to be half of IHD specific mortality rates in urban areas. The age and sex wise mortality rates due to IHD in urban areas were derived from MCCD data. For rural areas, these rates were weighted by a factor of 0.5. The estimation of IHD specific death rates is shown in tables A4 –A5. The estimates of case fatality rates for IHD are given in Appendix A6.

Burden of disease

The DISMOD analysis requires input on at least three parameters. The input was provided on following three parameters: prevalence rates, disease specific mortality rates, case fatality rates. In addition, inputs were also provided on all causes mortality rates and age-sex wise break up of total population. The input data for urban areas are presented in Tables B1 and B2 for males and females respectively. Similarly input data for rural areas are presented in Tables B6 and B7 for males and females respectively. DISMOD analysis generates consistent estimates of various epidemiological parameters. These are presented for IHD in Tables B3 and B4 for males and females in urban areas. For rural areas the consistent estimate of epidemiological parameters obtained using DISMOD analysis are shown in Tables B-8 and B-9 for males and females respectively. These consistent estimators of epidemiological parameters were subsequently used to obtain estimates of YLD, YLL and DALY.

The estimates of YLD, YLL, and DALY are shown in Appendix B5 for urban areas, and in Appendix B10 for rural areas. A summary of indices of burden of diseases for IHD in India is presented in table 6. This table gives prevalence rates per thousand population aged 20+ years, IHD specific mortality per thousand, YLL per hundred thousand and DALY per hundred thousand populations for urban and rural areas. The projections of burden of disease due to IHD in India for the years 1998 and 2004 are given in table 7. This table gives the total number of cases of IHD, total number of YLL and total number of DALY due to IHD in the country. The number of cases of IHD is estimated to be about 22.37 million in India in the year 2004. These consist of 11.67 million cases in urban areas and 10.67 million cases in rural areas. The total number of DALYs attributable to IHD is estimated to be 16 million in India in the year 2004.

Table 2. Meta Analysis of epidemiological studies on Ischemic Heart Disease

Investigator	*Sample Size*	*Age group*	*PR/1000 (Males +females)*
URBAN AREAS			
S.L.Chadha et al (1990)	13724	25-64	77.97
V.Mohan et al (2001)*	1175	25-64	40.00
R.Gupta et al (2002)	1123	20+	81.92
ICMR study (1989-94), Delhi	3019	35-64	76.82
ICMR study (1989-94), Vellore	2649	30-60	40.01
Weighted prevalence rate			**64.37**
RURAL AREAS			
R.Gupta et al (1997)	3148	20+	35.00
S.L.Chadha et al (1990)	3375	25-64	17.48
ICMR study (1989-94) Delhi	2434	35-64	53.41
ICMR study (1989-94), Vellore	4693	30-60	15.13
Weighted prevalence rate			**25.27**

(* Subjects with T- wave changes only were not considered as cases since they may not have coronary artery disease but could have left ventricular hypertrophy or other non-specific causes)

Table 3. Meta Analysis of epidemiological studies on Ischemic Heart Disease among urban population

Investigator	*Sample Size*	*Age group*	*PR/1000*
MALES			
S.L.Chadha et al (1990)	6372	25-64	73.44
V.Mohan et al (2001)	518	25-64	42.47
R.Gupta et al (2002)	550	20+	61.80
ICMR study (1989-94), Delhi	1438	35-64	78.00
ICMR study (1989-94), Vellore	1149	30-60	37.40
Weighted prevalence rates			**60.98**
FEMALES			
S.L.Chadha et al (1990)	7352	25-64	81.88
V.Mohan et al (2001)	657	25-64	38.05
R.Gupta et al (2002)	573	20+	101.20
ICMR study (1989-94), Delhi	1581	35-64	76.00
ICMR study (1989-94), Vellore	1500	30-60	42.00
Weighted prevalence rates			**67.01**

Table 4.Meta Analysis of epidemiological studies on Ischemic Heart Disease among rural population

Investigator	*Sample Size*	*Age group*	*PR/1000*
MALES			
R.Gupta et al (1997)	1982	20+	34.00
S.L.Chadha et al (1990)	1214	25-64	7.41
ICMR study (1989-94), Delhi	1049	35-64	50.00
ICMR study (1989-94), Vellore	2059	30-60	15.10
Weighted prevalence rate			**20.82**
FEMALES			
R.Gupta et al (1997)	1166	20+	37.00
S.L.Chadha et al (1990)	2161	25-64	23.13
ICMR study (1989-94), Delhi	1385	35-64	56.00
ICMR study (1989-94), Vellore	2634	30-60	15.20
Weighted prevalence rate			**27.33**

Figure 1. Weighted average of prevalence rates of IHD in India

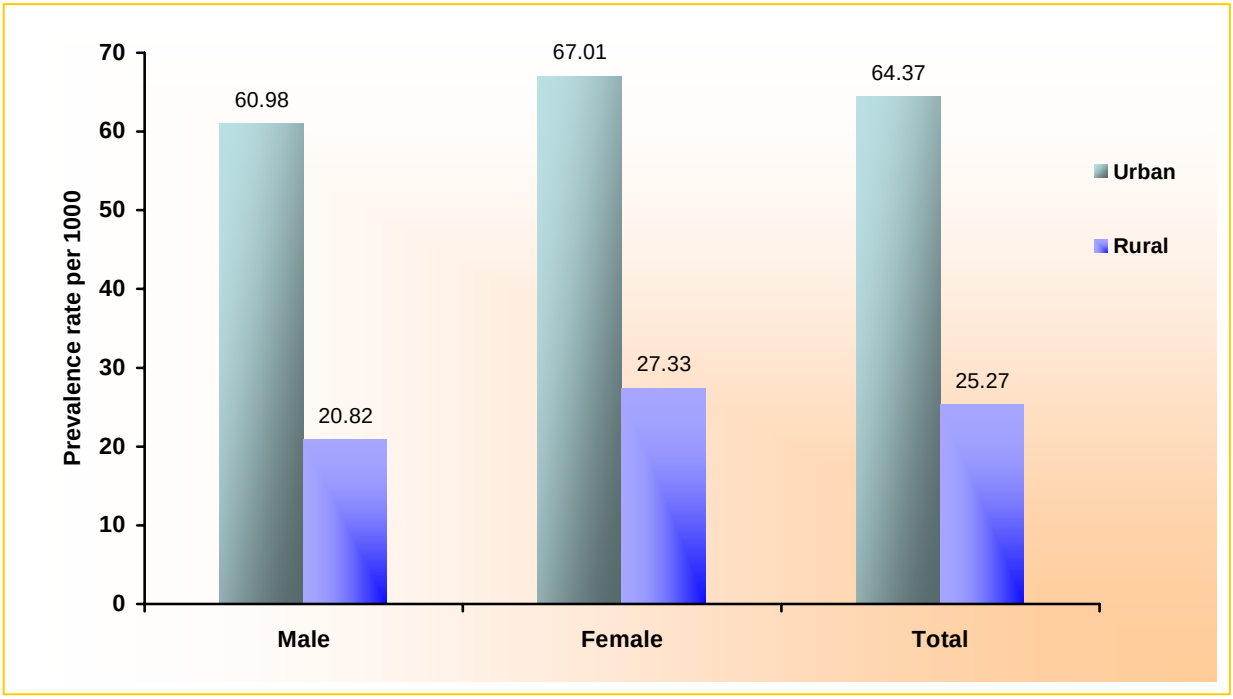

Table 5. Age-specific prevalence rates estimated from the studies selected for DISMOD Analysis

Age group	Urban					
	Male			Female		
	Sample Size	No. of cases	PR/1000	Sample Size	No. of cases	PR/1000
20-24	125	1	8.00	147	1	6.80
25-29	1374	27	19.65	1677	44	26.24
30-34	1584	27	17.05	2091	48	22.96
35-39	1459	63	43.18	1796	87	48.44
40-44	1418	67	47.25	1549	102	65.85
45-49	1093	91	83.26	1234	130	105.35
50-54	1053	98	93.07	1162	130	111.88
55-59	985	160	162.44	1054	161	152.75
60+	835	145	173.65	941	165	175.35
	Rural					
Age group	Male			Female		
	Sample Size	No. of cases	PR/1000	Sample Size	No. of cases	PR/1000
20-24	285	5	17.54	191	2	10.47
25-29	512	7	13.67	624	9	14.42
30-34	888	11	12.39	1302	14	10.75
35-39	1011	19	18.79	1376	22	15.99
40-44	836	15	17.94	1033	24	23.23
45-49	724	15	20.72	954	37	38.78
50-54	675	21	31.11	722	36	49.86
55-59	937	25	26.68	825	42	50.91
60+	591	42	71.07	519	35	67.44

Table 6. Indices for estimation of burden of I.H.D

Indices	Urban	Rural
Prevalence rate/1000 (age +20 years)	64.37	25.27
Death rate/1000	0.8	0.4
YLL / 100,000	728.7	351.5
DALY / 100,000	2703.4	986.2

Prevalence rate (Urban + Rural) = 64.37(0.3) + 25.27(0.7) = 37.0 per 1000

Table 7. Burden of I.H.D in India

Year	1998			2004		
	Urban	Rural	Total	Urban	Rural	Total
No. of cases of I.H.D	9,210,381	9,390,559	18,600,940	11,674,208	10,693,632	22,367,840
No. of deaths due to I.H.D	207,548	256,014	463,562	255,782	298,412	554,194
No. of YLLs	1,991,451	2,470,149	4,461,600	2,329,851	2,622,299	4,952,150
No.of DALYs	7,388,453	6,930,974	14,319,427	8,643,450	7,357,358	16,000,808

Figure 2. Burden of IHD in India (2004)