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Changing pattern of causes of death statistics in urban population of Rajasthan: An analysis of MCCD data

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Abstract

Cause of death information is an important planning tool for health services. The curve of cause-of-death profile reflect picture of mortality and health circumstances of a country as it postulates that causes of death are different at different transition phases and in different age-sex groups of the population. In India, only a few studies had been carried out to understand the dynamics of causes of death. This study attempts to measure mortality trends by different causes of death for urban population of Rajasthan by using medical certification of cause of death (MCCD) data for 1990-2014 by calculating proportion of leading causes of death to total deaths by age and sex for all these years. Results showed that there had been changes in the pattern of causes of death and age pattern of mortality. Diseases of circulatory system and diseases of the digestive system were the leading causes of death accounting for 20.6% and 3.9% share which were below the national average of 31.6% and 4.4% respectively. The proportion of deaths due to certain conditions originating in the perinatal period; certain infectious and parasitic diseases; and diseases of the respiratory system were very high (16.8%, 18.4% and 10.3% respectively) in comparison with national averages (7.2%, 11.9% and 7.8% respectively) which showed that epidemiological transition in urban population of Rajasthan is slower than that in whole India. The findings necessitates investigating the health and mortality conditions of the state's population in detail and suggesting appropriate health policies to bring improvement in morbidity condition and order to control disease burden and to promote healthy ageing.

Keywords: Cause of death, MCCD, mortality trend, proportion of leading causes of death, epidemiological transition

Introduction

Cause of death statistics is important and widely used for a number of purposes, viz., in explaining trends and differentials in overall mortality, in prioritizing health action and allocation of resources, in designing intervention strategies, and in assessing and monitoring public health problems and programmes. Deaths caused by medically certified diseases help in understanding the burden of death in a region and the time periods in respect of such deaths define epidemiological transition.

Nations devote considerable resources for collecting, collating, and analyzing various types of cause of death data. Global cause of death assessments are usually characterised by four dimensions: universe of raw data identified and examined; efforts to improve the quality of data, statistical modelling strategy and whether summation of all cause of death rate equals to overall cause-specific death rate (Lozano *et al.*, 2012) [7].

In India, only a few studies had been carried out to understand the dynamics of causes of death. This calls for examination of changes in the pattern of causes of death and age pattern of mortality to see the epidemiological transition in a country. It demands good quality data on health situation of its population. India does not have good quality data on health situation of its population particularly the rural population which constitutes three-fourth of its total population. There is Medical Certification of Cause of Death (MCCD) scheme for obtaining authentic and scientific information regarding causes of death which is however limited to urban population only.

Rajasthan is the focus of this study for several reasons. It is the eighth most populated state of India with approximately 5.6% (about 68 million as of 2011 census) of the total population and largest state in terms of area. Sex ratio in Rajasthan is 926 females per 1000

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males (RGI, 2011) [12]. Fertility is falling as Total Fertility Rate (TFR) reduced from 6.3 in 1972 to 2.8 in 2014. CBR declined from 42.4 in 1972 to 25 in 2014. Natural growth is also declining but at a very low pace. In a period of about 41 years the growth has come down from 25.6 to 19.3. Infant mortality rate has declined from 123 in 1972 to 46 in 2014. Crude Death Rate (CDR) has also declined from 16.8 in 1972 to 6.4 in 2014 (RGI, 2009, 2014) [11, 8, 9, 13]. Life expectancies have risen from a low of 48.4 years in 1970-75 to a high of 67.7 years in 2010-14. The increase in the average life of a male (16.3 years) was, however, slower than that of a female (22.7 years) (RGI, 2016a) [14].

In the light of above, an attempt has been made to estimate the changes in the pattern of causes of death between 1990 and 2014 and their relative contribution in different age groups of urban population of Rajasthan by calculating percentage of major cause of death to total deaths by age and sex for all these years using MCCD data.

Data and Methods

The Medical Certification of Cause of Death (MCCD) reports for the year 1990 to 2014 is the main data source used in the study, as from 1990 the death estimates are classified according to sex in MCCD (RGI, 1990-2014). Data derived from MCCD is tabulated in conformity with International Classification of Diseases (ICD) - Tenth Revision (1993) since 1999 report (WHO, 1993) [16]. Medically certified cause of death data are being tabulated as per the National List (ICD –10, modified according to Indian condition). The underlying cause of death is taken into account while tabulating the cause-specific mortality (RGI, 1995) [10]. Since MCCD essentially implements the ICD coding and guidelines, the design of the system is considered satisfactory. MCCD data for the year 1990 to 1998 was collected according to ICD-9 classification and ICD-10 classification from 1999 onward. In order to make

data comparable for both time durations, all cause of death groups have been combined into nine leading causes of death groups in the following age groups – below 1 year, 1-4 years, 5-14 years, 15-24 years, 25-64 years, 65 years and above. More details could be found at other places (Gulati, 2015) [2].

While compiling MCCD data, it was observed that there were a large number of deaths under the head ‘NS’ (age not stated) in each cause of death group. These deaths were redistributed in all age groups in proportion of cause of death to total medically certified deaths. This was done for all these years for all causes of death by age and sex.

Results

Percentage contribution of leading cause of death in different age groups in urban population of Rajasthan have been calculated and presented in tables 1 to 6. Tables 1 and 2 present the main causes of infant and child deaths during the period from 1990 to 2014.

The results reveal that “certain conditions originating in the perinatal period” contributed to 41.5% share of male infant deaths in 1990, rose to 74.6% in 2014. The second leading cause of deaths was “certain infectious and parasitic diseases” which contributed to 16.3% share in 1990, declined to 6.7% in 2014. The third leading cause of death was “diseases of the respiratory system” with a contribution of 12.8% in 1990, declined to 3.7% in 2014.

In case of female infants, “certain conditions originating in the perinatal period” contributed to 41.7% share in 1990, rose to 76% in 2014. The second leading cause of death was “certain infectious and parasitic diseases” which contributed to 13.1% share in 1990, declined to 5.2% in 2014. The third leading cause of death was “diseases of the respiratory system” with a contribution of 12% in 2002, declined to 3.6% in 2014 (Table 1).

Table 1: Percentage contribution of leading causes of death among infants in below 1 year age in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Certain conditions originating in the perinatal period	41.5	44.8	47.4	58.9	71.0	87.0	74.6	41.7	45.3	49.4	67.4	69.2	90.2	76.0
Certain infectious and parasitic diseases	16.3	11.9	11.3	18.2	8.8	2.7	6.7	13.1	13.5	11.2	17.6	5.9	1.8	5.2
Diseases of the respiratory system	12.8	17.7	14.1	2.4	11.2	2.5	3.7	12.0	18.2	16.4	1.3	15.6	2.9	3.6
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	7.7	8.5	9.7	0.7	1.8	0.6	3.2	10.2	8.5	8.0	0.4	2.2	0.8	4.4
Diseases of the circulatory system	5.9	4.8	3.3	12.8	1.8	4.3	2.9	9.1	3.1	2.9	9.6	1.6	2.9	2.7
Injury, poisoning and certain other consequences of external causes	3.8	1.1	2.3	2.9	0.7	0.0	1.2	3.6	0.9	2.8	1.8	0.6	0.0	1.3
Diseases of the digestive system	1.1	2.1	1.9	0.2	0.2	0.4	1.1	0.9	1.9	1.2	0.1	0.2	0.0	0.6
Neoplasms	0.7	0.0	0.2	0.1	0.2	0.4	1.3	0.5	0.1	0.1	0.1	0.1	0.2	1.6
Others	10.2	9.1	9.8	3.8	4.3	2.1	5.3	8.9	8.5	8.0	1.7	4.6	1.2	4.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

Table 2: Percentage contribution of leading causes of death among children in 1-4 years age group in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Certain infectious and parasitic diseases	24.2	26.2	16.5	21.3	12.3	13.3	26.0	23.4	25.2	21.0	21.3	14.6	10.7	31.9
Injury, poisoning and certain other consequences of external causes	14.0	8.8	11.4	13.1	10.2	17.9	16.6	8.5	10.6	13.2	14.9	8.7	8.5	8.7
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	12.4	15.7	34.6	6.0	12.1	8.5	7.9	20.5	19.4	20.1	5.7	10.8	10.7	8.5
Diseases of the circulatory system	10.5	2.2	1.9	26.9	8.3	25.9	6.9	10.0	2.0	3.6	25.7	8.1	35.9	8.9
Diseases of the respiratory system	9.7	24.3	12.6	9.4	24.5	15.1	13.6	12.1	20.8	17.9	11.9	23.8	14.3	12.5
Diseases of the digestive system	3.7	3.9	3.2	4.2	0.5	7.0	3.7	5.4	5.0	4.3	3.6	0.5	4.0	3.2
Neoplasms	0.7	0.6	0.2	0.4	1.1	0.2	2.5	0.0	0.9	0.4	0.2	0.4	3.3	0.8
Certain conditions originating in the perinatal period	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	11.7
Others	24.8	18.3	19.6	18.7	31.0	12.1	14.1	20.1	16.1	19.5	16.7	33.1	12.6	13.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

In case of male children in 1-4 years age group, “certain infectious and parasitic diseases” contributed to 24.2% share in 1990, rose to 26% in 2014. The second leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 14% share in 1990, rose to 16.6% in 2014.

In case of female children, “certain infectious and parasitic diseases” was the leading cause of death which contributed to 23.4% share in 1990, rose to 31.9% in 2014. The second

leading cause of death was “diseases of the respiratory system” which contributed to 12.1% share in 1990, rose to 12.5% in 2014.

In the year 2014, “certain infectious and parasitic diseases” was the leading cause of death of both male and female children with share of 26% and 31.9% respectively (Table 2).

Table 3: Percentage contribution of leading causes of death among children in 5-14 years age group in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Certain infectious and parasitic diseases	19.1	26.3	20.3	16.8	19.9	37.6	25.9	19.3	27.9	22.4	18.1	18.3	12.7	27.0
Diseases of the circulatory system	17.1	6.6	5.0	22.0	13.9	16.9	9.1	13.4	5.9	4.1	21.6	9.1	4.7	13.5
Injury, poisoning and certain other consequences of external causes	15.5	15.3	24.9	16.0	17.7	3.1	27.1	12.6	19.3	17.7	16.0	11.2	1.3	14.2
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	12.0	16.5	16.5	11.0	14.7	8.6	9.1	14.7	18.2	18.3	10.1	17.1	67.5	8.9
Diseases of the respiratory system	5.7	8.3	7.8	10.1	10.8	16.0	7.2	6.5	7.5	7.7	11.2	10.9	6.0	6.7
Diseases of the digestive system	4.4	5.7	4.8	6.4	1.3	1.5	2.6	3.7	5.5	4.8	5.4	3.0	0.2	3.6
Neoplasms	0.7	1.2	1.3	1.8	2.2	4.0	2.6	1.1	0.6	0.7	1.6	0.9	1.7	3.6
Certain conditions originating in the perinatal period	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Others	25.5	20.1	19.4	15.9	19.5	12.3	13.6	28.7	15.1	24.3	16.0	29.5	5.9	18.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

Table 3 shows the percentage contribution of the leading cause of death in children in 5-14 years age group. In male children, the leading cause of death was “certain infectious and parasitic diseases” which contributed to 19.1% share in 1990, rose to 25.9% in 2014. “Diseases of the circulatory system” contributed to 17.1% share in 1990, declined to 9.1% in 2014. The third leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed 15.5% share in 1990, rose to 27.1% in 2014.

In case of female children, “certain infectious and parasitic diseases” was the leading cause of death with contribution

of 19.3% share in 1990, rose to 27% in 2014. The second leading cause of death was “diseases of the circulatory system” which contributed to 13.4% share in 1990, rose to 13.5% in 2014. The third leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 12.6% share in 1990, rose to 14.2% in 2014.

In the year 2014, “certain infectious and parasitic diseases” was the leading cause of death of both male and female children with share of 25.9% and 27% respectively (Table 3).

Table 4: Percentage contribution of leading causes of death among youth in 15-24 years age group in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Injury, poisoning and certain other consequences of external causes	22.4	35.8	44.5	18.3	33.5	8.5	32.0	17.0	25.9	35.1	19.6	26.5	7.0	26.1
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	19.8	15.0	14.6	10.0	13.1	10.4	7.2	20.8	19.1	14.3	8.9	14.4	10.7	4.9
Certain infectious and parasitic diseases	15.7	25.4	19.6	15.0	20.6	32.1	23.3	18.6	24.1	20.8	16.4	19.4	36.4	22.8
Diseases of the circulatory system	15.5	6.1	5.5	18.8	14.6	25.0	12.2	11.9	8.6	7.3	21.7	15.4	20.9	11.5
Diseases of the digestive system	6.5	4.9	3.8	8.5	3.1	1.8	5.4	8.2	5.0	5.1	5.0	3.4	1.4	4.0
Diseases of the respiratory system	2.5	3.2	3.1	9.9	4.4	8.2	6.8	2.9	2.1	2.9	8.6	4.8	10.5	9.7
Neoplasms	1.6	0.8	0.6	3.4	1.2	4.5	2.7	0.3	0.4	0.8	3.7	0.6	1.1	2.2
Certain conditions originating in the perinatal period	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Others	16.0	8.8	8.3	16.1	9.5	9.5	10.2	20.3	14.8	13.7	16.1	15.5	12.0	18.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

Table 4 shows the percentage contribution of main cause of death in youth population in 15-24 years age group. In male youth, the leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 22.4% share in 1990, rose to 32% in 2014. The second leading cause of death was “certain infectious and parasitic diseases” which contributed to 15.7% deaths in 1990, rose to 23.3% in 2014. The third leading cause of death was “diseases of the circulatory system” which contributed to 15.5% deaths in 1990, declined to 12.2% in 2014.

In female youth, “certain infectious and parasitic diseases” contributed to 18.6% share in 1990, rose to 22.8% in 2014. The second leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 17% share in 1990, rose to 26.1% in 2014. The third leading cause of death was “diseases of the circulatory system” which contributed to 11.9% deaths in 1990, declined to 11.5% in 2014.

In the year 2014, “injury, poisoning and certain other consequences of external causes” emerged as the leading cause of death of both male (32%) and female (26.1%)

youths followed by “certain infectious and parasitic diseases” with share of 23.3% and 22.8% respectively (Table 4).

Table 5 illustrates the main cause of death in adults in 25-64 years age group. “Diseases of the circulatory system” contributed to 24.8% share of adult male deaths in 1990, declined to 22.8% in 2014. The second leading cause of death was “certain infectious and parasitic diseases” with a share of 16.7% in 1990, rose to 23.5% in 2014. The third leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 15.3% deaths in 1990, declined to 15% in 2014.

“Certain infectious and parasitic diseases” contributed to 18.1% share of adult female deaths in 1990, rose to 20.6% in 2014. The second leading cause of death was “diseases of the circulatory system” with a share of 18% in 1990, rose to 25.4% in 2014. The third leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 12.7% deaths in 1990, rose to 13.1% in 2014 (Table 5).

Table 5: Percentage contribution of leading causes of death among adults in 25-64 years age group in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Diseases of the circulatory system	24.8	18.6	15.6	23.1	25.2	23.1	22.8	18.0	16.5	15.7	27.1	26.0	25.7	25.4
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	22.3	15.9	14.6	10.0	8.8	7.3	6.9	24.0	20.3	17.2	7.0	10.8	7.5	6.4
Certain infectious and parasitic diseases	16.7	24.4	21.5	14.6	19.7	26.5	23.5	18.1	23.5	19.5	16.0	17.3	24.2	20.6
Injury, poisoning and certain other consequences of external causes	15.3	18.3	27.0	18.2	20.6	15.8	15.0	12.7	15.0	21.3	15.6	18.4	5.4	13.1
Diseases of the digestive system	6.3	7.5	6.2	5.7	4.3	4.6	6.4	6.4	5.7	5.2	3.9	2.8	1.8	3.9
Diseases of the respiratory system	2.7	4.1	4.2	9.1	10.6	10.0	11.6	3.1	3.4	4.3	8.7	7.5	9.9	9.5
Neoplasms	1.1	2.5	3.3	3.7	2.1	3.6	4.4	1.0	3.2	3.2	6.1	3.9	3.3	6.5
Certain conditions originating in the perinatal period	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Others	10.8	8.7	7.6	15.6	8.7	9.1	9.3	16.7	12.4	13.6	15.6	13.3	22.2	14.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

Table 6: Percentage contribution of leading causes of death among elderly in 65 years and above age group in urban population of Rajasthan (1990-2014)

Leading causes of death groups	Male							Female						
	1990	1994	1998	2002	2006	2010	2014	1990	1994	1998	2002	2006	2010	2014
Diseases of the circulatory system	29.1	36.8	35.4	40.3	44.0	36.1	34.3	30.1	40.4	32.3	45.8	50.4	41.7	41.9
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	19.9	15.7	14.1	7.8	8.9	4.2	5.1	22.2	15.9	29.6	7.1	10.4	3.7	4.4
Injury, poisoning and certain other consequences of external causes	16.4	7.2	13.8	15.3	4.4	5.1	5.1	14.1	8.1	12.7	15.9	4.3	3.3	4.9
Certain infectious and parasitic diseases	10.3	15.5	11.7	12.0	10.8	14.9	19.3	8.9	12.8	7.2	10.5	9.5	16.0	16.5
Diseases of the digestive system	4.9	4.4	4.8	3.0	2.6	3.6	3.3	6.1	5.0	2.9	1.9	1.9	1.6	2.9
Diseases of the respiratory system	4.2	5.8	6.3	7.8	16.8	19.1	18.3	5.8	4.6	4.9	7.3	8.3	14.0	12.2
Neoplasms	0.9	4.3	4.0	2.4	2.3	4.4	3.5	0.3	2.4	2.2	2.2	3.1	3.8	3.2
Certain conditions originating in the perinatal period	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Others	14.3	10.3	9.9	11.4	10.2	12.6	10.9	12.5	10.8	8.2	9.3	12.1	15.9	13.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: RGI, 1990-2014)

Table 6 provides data on leading cause of death in elderly population in 65 years and above age group. “Diseases of the circulatory system” contributed to 29.1% share of elderly male deaths in 1990, rose to 34.3% in 2014. The second leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 16.4% share in 1990, declined to 5.1% in 2014. The third leading cause of death was “certain infectious and parasitic diseases” which contributed to 10.3% deaths in 1990, rose to 19.3% in 2014. “Diseases of the circulatory system” contributed to 30.1% share of elderly female deaths in 1990, rose to 41.9% in 2014. The second leading cause of death was “injury, poisoning and certain other consequences of external causes” which contributed to 14.1% share in 1990, declined to 4.9% in 2014. The third leading cause of death was

“certain infectious and parasitic diseases” which contributed to 8.9% deaths in 1990, rose to 16.5% in 2014 (Table 6).

Changes in the Age Pattern of Mortality (1991–2014)

Changes in the age pattern of mortality over time are better understood in terms of distribution of age at death and are crucial in understanding the feature of mortality transition. Table 7 shows the share of deaths as per broad age groups in Rajasthan population. The percentage share of death in the below 14 years age group was 48.1% in 1991, stood at 21.6% in the year 2014. The death share of middle-age category (15–59 years) increased from 24.2% in 1991 to 30% in 2014. The share of death for the age group 60 years and above was 27.6% in 1991, increased substantially to 48.4% in the year 2014 (RGI, 1991-2014) [9].

Table 7: Percentage Share of Deaths to Total Deaths by Age in Rajasthan (1991-2014)

Age (in years)	Year						
	1991	1994	1998	2002	2006	2010	2014
Below 1	27.2	31.5	29.9	30.9	27.2	21.8	17.5
1-4	14.9	7.4	9.9	6.8	8.9	4.8	1.7
5-14	6.0	2.3	3.9	3.3	5.6	3.4	2.4
15-59	24.2	26.4	22.4	24.7	24.8	25.9	30.0
60+	27.6	32.4	34.0	34.2	33.4	44.2	48.4
Total	99.9	100.0	100.1	99.9	99.9	100.1	100.0

(Source: RGI, 1991-2014)

A further break-up of the below 14 years age group shows that infant deaths share reduced from 27.2% in 1991 to 17.5% in the year 2014. The child death share fell from 14.9% to 1.7%; and share in the 5–14 years category fell from 6% to 2.4% in that period. The overall reduction in below 14 years mortality during the period was 55%, with the fall being 89% in the age group 1–4 years, 36% in those below 1 year and 60% in children between 5-14 years. For the same period, there was 23% increase in mortality in the group 15–59 year adult population. Mortality in the oldest age group of 60 years and above increased by 75% (RGI, 1991-2014) [9]. The changes in the distribution of age at death display the progression of mortality transition and its consequence on epidemiological transition.

There had been greater contribution of infant and child deaths in the total number of deaths in Rajasthan population. In 1991, about one fourth of all deaths were due to infant deaths (27.2%). This share declined to 17.5% in 2014. The

contribution of child mortality in 1-4 years age group was 14.9% in 1991. In 2014, this share came down sharply to 1.7%. The share of death in 5-14 years age group was 6% during 1991 which declined to 2.4% in 2014. The contribution of the deaths of 15-59 years age group was 24.2% in 1991, rose to 30% in 2014. About one-fourth (27.6%) of all deaths belonged to the aged population in 1991 and this share had sharply increased to the level that now every second death is an aged person in Rajasthan (RGI, 1991-2014) [9].

Discussion

This study examined the changes in the pattern of causes and death vis-as-vis in the age pattern of mortality which unravelled the progress of epidemiological transition in urban population of Rajasthan. “Certain conditions originating in the perinatal period” were the leading cause of death of both male and female infants during 1990-2014.

“Certain infectious and parasitic diseases” were the leading cause of death of male and female children of 1-4 years age group in 1990, 1994, 1998 and 2014. “Diseases of the circulatory system” were the leading cause of death of both male and female children in 2002 and 2010 and “diseases of the respiratory system” in 2006. “Certain infectious and parasitic diseases” were the leading cause of death of male children of 5-14 years age group in 1990, 1994, 2006, 2010 and 2014. “Injury, poisoning and certain other consequences of external causes” were the leading cause of death in 1998 and “diseases of the circulatory system” in 2002. “Certain infectious and parasitic diseases” were the leading cause of death of female children of 5-14 years age group in 1990, 1994, 1998, 2006, 2010 and 2014 and “diseases of the circulatory system” in 2002. “Injury, poisoning and certain other consequences of external causes” were the leading cause of death of male youth of 15-24 years age group in 1990, 1994, 1998, 2006 and 2014 and “diseases of the circulatory system” in 2002 and “certain infectious and parasitic diseases” in 2010. “Certain infectious and parasitic diseases” were the leading cause of death of female youth of 15-24 years age group in 1990 and 2010 and “injury, poisoning and certain other consequences of external causes” in 1994, 1998, 2006 and 2014 and “diseases of the circulatory system” in 2002. “Diseases of the circulatory system” were the leading cause of death of male adults of 25-64 years age group in 1990, 2002 and 2006 and “certain infectious and parasitic diseases” in 1994, 2010 and 2014 and “injury, poisoning and certain other consequences of external causes” in 1998. “Certain infectious and parasitic diseases” were the leading cause of death of female adults of 25-64 years age group in 1990 and 1994 and “injury, poisoning and certain other consequences of external causes” in 1998 and “diseases of the circulatory system” in 2002, 2006, 2010 and 2014. In the elderly population in 65 years and above age group, “diseases of the circulatory system” was the leading cause of death of both male and female during 1990-2014.

It appears from the data that “certain infectious and parasitic disease”, “diseases of the circulatory system”, “diseases of the respiratory system”, “diseases of the digestive system” and “injury, poisoning and certain other consequences of external causes” were the most contributory causes of death groups in urban Rajasthan’s mortality. Except for respiratory diseases and certain infectious diseases, these groups belong to non-communicable diseases. “Diseases of the respiratory system” includes both communicable and non-communicable diseases. “Certain infectious and parasitic diseases” mostly includes communicable diseases. “Injury, poisoning and certain other consequences of external causes” is often called an external cause of mortality.

“Diseases of the circulatory system”, which contributed to 17.5% of overall mortality in 1990, contributed to 20.6% in 2014 and become the first leading cause of mortality. “Certain infectious and parasitic diseases” which was the next important in 1990 and contributed 16.5% mortality remained the second leading cause of mortality with contribution of 18.4% in 2014. The share of respiratory deaths to overall mortality increased from 6.2% in 1990 to 10.3% in 2014; share of neoplasms increased from 0.9% to 3.6%; endocrine, nutritional and metabolic diseases from 1.9% to 2.4%; diseases of the genitourinary system from 1.6% to 2.9%; and certain conditions originating in the

perinatal period from 9.4% to 16.8%. The share of digestive deaths decreased from 4.7% in 1990 to 3.9% in 2010; injury, poisoning and certain other consequences of external causes from 12.5% to 10.6%, diseases of the nervous system from 7.7% to 1.8%, diseases of blood and blood forming organs and certain disorders involving the immune mechanism from 3.7% to 1.5% (RGI, 1990-2014).

Diseases of circulatory system and diseases of the digestive system were the leading causes of death accounting for 20.6% and 3.9% share which were below the national average of 31.6% and 4.4% respectively. The proportions of deaths due to certain conditions originating in the perinatal period; certain infectious and parasitic diseases; and diseases of the respiratory system were very high (16.8%, 18.4% and 10.3% respectively) in comparison with national averages (7.2%, 11.9% and 7.8% respectively) which showed that epidemiological transition in urban population of Rajasthan is slower than that in whole India. Further, non-communicable diseases are increasing but communicable diseases in the form of infectious and parasitic diseases and respiratory diseases have still retained a significant position in the mortality pattern. Thus, it bears the double burden of disease specific mortality. Other studies undertaken in developing countries had reported similar findings (Borkar, 2015; Gulati 2016; Gulliford, 2003; Huynen *et al.*, 2005; Karar *et al.*, 2009; Lozano *et al.*, 2012) [1-7]

Though the results of the study may not be generalized to whole of Rajasthan because close to 75% of the population lives in villages but in the absence of quality cause of death data these results can become inputs for predicting current and future health care needs and possible changes in national health policy agenda and strengthening existing health system.

Conclusion

The findings calls for investigating the health and mortality conditions of the state’s population in detail and suggesting appropriate health policies to bring improvement in the morbidity conditions. The state has to fight back with preventable infectious diseases on the one hand and a growing prevalence of non-communicable diseases on the other. The double burden of disease pose challenges in improving the overall health status of the population and necessitates a comprehensive policy and action plan to prevent and control this burden and promote healthy ageing.

Limitations of the Study

The scheme of MCCD has been functioning at different levels of efficiency in various States/UTs. For whole India, the percentage of medically certified deaths to total registered deaths during 2014 was 20.5 and for Rajasthan it was 13.1 (RGI, 2016b) [15].

The missing deaths or deaths that physicians were unable to code are classified under the cause of death group “symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified” in MCCD reports. Rajasthan reported a good percentage of deaths in this group in both male and female in all age groups during the period under report. Thus, individual errors in medical certification cannot be ignored completely.

The cause of death profile of a population is dependent on changes in the health system, socio-economic and cultural factors, and political commitments which are not addressed in this study.

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