ORIGINAL ARTICLE

BURDEN OF CARDIOVASCULAR DISEASES IN SOUTH ASIAN REGION FROM 1990 TO 2019: FINDINGS FROM THE GLOBAL BURDEN OF DISEASE STUDY

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Objectives: To evaluate the estimates of burden of cardiovascular diseases (CVD) in South Asian (SA) region from 1990 to 2019 using the Global Burden of Disease (GBD) study.

Methodology: Data for this ecological study was extracted from the Global Health Data Exchange query tool for 30 years from 1990 to 2019. Dataset consisted of prevalence, deaths, and disability-adjusted life years (DALYs) due to CVD summarized as estimated number of cases and rate per 100 thousand individuals for Pakistan, India, Bangladesh, Nepal, and Bhutan and South Asian region.

Results: An increasing trend has been noticed in overall prevalence rate and death rate of CVD in the SA region in the past 30-years from 1990 to 2019. A relative increase of 49.6% was noted in the prevalence rate of CVD per 100,000 population with 3304.2 and 4944.1 cases per 100,000 in the year 1990 and 2019, respectively. Similarly, a relative increase of 30.3% was noted in mortality rate due to CVD with 139.8 and 182.1 deaths per 100,000 in the year 1990 and 2019, respectively. Ischemic heart disease (IHD) remained the highest contributor with 56.51% (1857.9×1000 cases) share to the regional mortalities followed by stroke with 29.77% (978.9×1000 cases).

Conclusion: SA region is experiencing and increasing trend in prevalence, deaths, and DALYs due to CVD. IHD and stroke remained the main contributors to the regional burden of CVD followed by stroke. Targeted preventive measures are required involving all the stakeholders from community to policymakers.

Keywords: South Asia, burden, cardiovascular diseases, GBD

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INTRODUCTION

The landscape of global burden of disease has changed to non-communicable diseases (NCDs) from communicable diseases, perinatal and maternal causes, over the last two decades with cardiovascular diseases (CVDs) being the main contributor to the worldwide mortalities and morbidities.[1] This epidemiological transition can be attributed to the socio-economic development and tendency of urbanization.[2] According the Global Atlas of CVD, in 2016 ischemic heart disease (IHD) was the main contributors to the total global CVD burden, with percentage share of 49% and 174 million disability-adjusted life years (DALYs), followed by stroke at 33% and 116 million DALYs.[1]

Each of the individual population segments of the world are unique in terms of health burden, however, CVD remains a global health challenge. Distribution of CVD greatly varies from one part of the world to other depending on economics, prevalence of various risk factors, ethnicity, and cultural aspects.[3] South Asians (SA), consisted of nearly 1/4th of the total world population, are at an increased risk of atherosclerotic cardiovascular disease (ASCVD).[3-5] A rapid transition has been witnessed in this region in last couple of decades in various domains, such as economic, environmental, epidemiological, and demographic. These coupled with sedentary lifestyle, unhealthy calories rich dietary patterns, use of tobacco and smoking, and high rates of stress associated behaviors have put this population segment at increased risk of CVD.[6] SA population, mainly consisted of low- and middle-income countries, are also believed to develop coronary artery diseases at much younger age compared to other regions.[7] It has been reported that various pre-disposing CVD risk factors, such as metabolic syndrome (MetS), diabetes mellitus (DM), and obesity, disproportionally affect individuals from SA.[8] Numerous studies have confirmed the various underlying physiological and genetic factors attributable to increased risk of CVD

and predisposing risk factors in South Asian descents which included environmental variations, biological predisposition, and composition of body structure.[7]

Understanding of the underlying disease patterns and reliable projections are vital to combat the growing burden CVD in this region. Therefore, the aim of this study was to evaluate the estimates of the burden of cardiovascular diseases in the South Asian region from 1990 to 2019 using the Global Burden of Disease (GBD) study.

METHODOLOGY

Data for this ecological study was extracted from the Global Health Data Exchange query tool.[9] The GBD study categories Pakistan, India, Bangladesh, Nepal, and Bhutan as South Asian region.

Dataset consisted of prevalence, deaths, and DALYs (disability-adjusted life years) caused by cardiovascular diseases summarized as estimated number of cases and rate per 100 thousand individuals for 30 years from 1990 to 2019. Data were further segregated by gender, age, and by the type of CVD, such as ischemic heart disease (IHD), stroke, rheumatic heart disease (RHD), peripheral artery disease (PAD), atrial fibrillation (AF) and flutter, hypertensive heart disease, non-rheumatic valvular heart disease (VHD), aortic aneurysm, endocarditis, cardiomyopathy and myocarditis, and other cardiovascular and circulatory diseases as categorized by the Institute of Health Metrics and Evaluation (IHME). A detailed methodology of assessment and estimation methods used by the GBD study are reported elsewhere.[10]

Analysis of data were performed using IBM SPSS version 21 and R-programming software (R software Corp LP. USA, 151 version 4.3.2). Insights from GBD study regarding prevalence, deaths, and DALYs of CVD for SA region are summarized in tables and figures. Percentage change (%Δ) in 30-years was calculated at overall level as well as at country, gender, age, and cause level taking 1990 as benchmark. We also performed Poisson regression analysis to assess the 30-years trend in prevalence, deaths, and DALYs of CVD for SA region at overall and country level. Incidence rate ratio (IRR) along with 95% confidence interval was reported as an indicator of per year percentage change.

RESULTS

An increasing trend has been noticed in overall prevalence rate and death rate of cardiovascular diseases in the SA region in the past 30-years from 1990 to 2019 (Figure 1). A relative increase of 49.6% was noted in the prevalence rate of CVD per 100 thousand population with 3304.2 cases per 100 thousand in the year 1990 and 4944.1 cases per 100 thousand in the year 2019. Similarly, a relative increase of 30.3% was noted in mortality rate due to CVD with 139.8 and 182.1 deaths per 100 thousand in the year 1990 and 2019, respectively. IHD was the leading cause with prevalence and death rate of 1522.1 and 68.7 cases per 100 thousand individuals (Table 1).

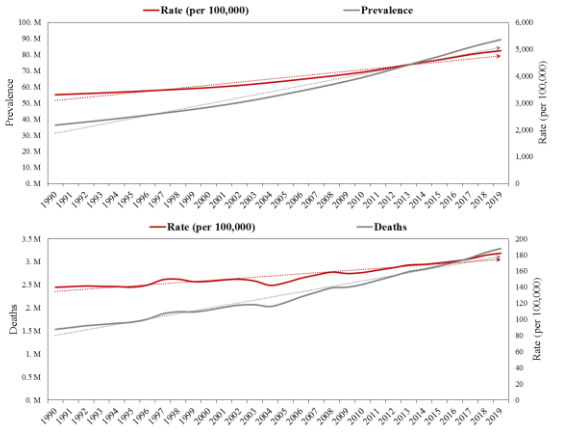

Figure 1: Thirty years trend of prevalence and mortality rate (per 100,000) of cardiovascular diseases for South Asian region

Upward trend in the prevalence of CVD has been witnessed for both gender and most of the countries of the SA region in the past 30 years with the exception of Pakistan, where a relative change of only 3.6% was observed as against the highest increase of 81.0% for Bangladesh. In the analysis of country wise contribution to the regional burden of CVD prevalence for the year 2019, India has the highest share of 79.7% (71130.3×1000 cases) owing to its largest population in the region, followed by Pakistan with 9.67% (8628.2×1000 cases), Bangladesh with 9.24% (8242.7×1000 cases), Nepal with 1.36% (1214.6×1000 cases), and Bhutan with 0.04% (34.3×1000 cases), as shown in Table 1.

Overall mortality rate showed an increasing trend over the past 30-years (Figure 1) with a relative increase of 30.3% in mortality rate per 100 thousand. In contradiction to other countries of the region, Pakistan showed negative growth in death rate per 100 thousand in the years 2019 as compared to 1990 with relative change of -0.4%, as shown in Table 2.

Similarly, the death rate per 100 thousand due to RHD also showed a relative change of -23.8%. IHD remained the heights contributor with 56.51% (1857.9×1000 cases) share to the regional mortalities due to CVD followed by stroke with 29.77% (978.9×1000 cases), RHD with 4.74% (156×1000 cases), and hypertensive heart disease with 4.45% (146.3×1000 cases), as presented in Table 2.

DALYs due to CVD for the SA region are summarized in Table 3. The overall number of DALYs increased by 15.1% from 4018.0 in the year 1990 to 4622.7 DALYs per 100 thousand individuals in the year 2019 (Table 3).

A significant per year percentage change has been observed in prevalence, deaths, and DALYs due to CVD in SA with IRR of 1.015 [95% CI: 1.014-1.016], 1.009 [95% CI: 1.008-1.010], and 1.005 [95% CI: 1.004-1.005], respectively. Contrary to other countries of the region, for Pakistan, there was no significant trend in prevalence and DALYs rate per 100,000, while, there was significantly decreasing trend in mortality rate due to CVD per 100 thousand individuals in Pakistan, as presented in Table 4.

Table 1: Prevalence of cardiovascular diseases for South Asian region from 1990 – 2019

	1990	1995	2000	2005	2015	2019	30-years %Δ
Prevalence rate per 100,000 (×1000 cases)							
South Asia	3304.2 (36268.1)	3422.1 (41327.3)	3569.2 (47353.6)	3816.6 (55533.6)	4605.4 (78904)	4944.1 (89250.1)	49.6%
Country							
Pakistan	3717.5 (4194.7)	3632.1 (4585.1)	3649 (5188.3)	3615.3 (5834.7)	3703.7 (7618)	3850.8 (8628.2)	3.6%
India	3318.7 (28394.6)	3480 (32695.2)	3629.7 (37457.9)	3905.5 (44164.8)	4765.6 (63126.2)	5114.7 (71130.3)	54.1%
Bangladesh	2859.9 (3118.9)	2853.1 (3412.1)	3103.1 (3969.3)	3427.6 (4667.8)	4595.3 (7031.7)	5175.6 (8242.7)	81.0%
Nepal	2783.2 (543.7)	2839.9 (616.8)	2988.3 (716.8)	3241.2 (842.2)	3752.2 (1096.7)	3993.3 (1214.6)	43.5%
Bhutan	2643.9 (16.2)	3019.4 (18.1)	3271.2 (21.2)	3590.9 (24.1)	4106.5 (31.3)	4545 (34.3)	71.9%
Gender							
Male	3411.5 (19467.5)	3527.2 (22145.4)	3654.1 (25131.6)	3913.8 (29387.2)	4738.9 (41521.9)	5066.7 (46689.7)	48.5%
Female	3188 (16800.6)	3308.2 (19181.9)	3477.9 (22222.1)	3712.9 (26146.4)	4465.6 (37382.1)	4816.1 (42560.4)	51.1%
Age							
Under 5	65.3 (105.6)	63.2 (105.2)	64.1 (110.1)	64.2 (112.3)	80 (136.2)	71.4 (117.4)	9.4%
5-14 years	404 (1119.9)	366.7 (1109.9)	367.7 (1173)	368.1 (1234)	516.7 (1840.6)	449.4 (1583.4)	11.2%
15-49 years	2069.2 (10952.6)	2052 (12157.7)	2083.7 (13988.3)	2112.5 (15869.8)	2178.4 (19862.1)	2223.7 (21662.3)	7.5%
50-69 years	14268 (15328.3)	14708.3 (17782.7)	14780.8 (19809)	14686.2 (22814.2)	15021.7 (32500.4)	15118.7 (37066.6)	6.0%
70+ years	40010.6 (8761.7)	40442.2 (10171.8)	40170.2 (12273.3)	40577.7 (15503.3)	41867.1 (24564.7)	41693.7 (28820.4)	4.2%
Causes							
Ischemic heart disease	1522.1 (16706.4)	1615.1 (19505.2)	1689.5 (22415.5)	1835.6 (26709)	2382 (40810.2)	2581.1 (46593.5)	69.6%
Stroke	529.8 (5815.2)	520.2 (6282.4)	534.9 (7096.3)	551 (8017.7)	639.2 (10951.4)	708.2 (12784.1)	33.7%
Rheumatic heart disease	583.9 (6409)	585.3 (7068.7)	604.3 (8017.3)	639.3 (9302.3)	685.3 (11740.9)	674.1 (12168.7)	15.4%
Peripheral artery disease	411.3 (4514.9)	441 (5326.1)	464.9 (6167.8)	506 (7362.2)	605.8 (10379.3)	665 (12004.5)	61.7%
Atrial fibrillation and flutter	311.5 (3418.9)	327.1 (3950.1)	349.5 (4637)	381.8 (5555.4)	482.1 (8259.9)	535.3 (9662.8)	71.8%
Hypertensive heart disease	39.4 (432.6)	41.6 (502.8)	44.2 (586.8)	48.7 (708.5)	64.5 (1104.8)	72.3 (1305.1)	83.5%
Non-rheumatic valvular heart disease	5.1 (56.1)	5.5 (66.9)	5.9 (78.4)	6.5 (94.9)	9 (154)	9.9 (179)	94.0%
Endocarditis	0.7 (8)	0.8 (9.1)	0.8 (10.5)	0.9 (12.6)	1.1 (19.1)	1.3 (22.9)	75.1%

Cardiomyopathy and myocarditis	0.4 (4.2)	0.4 (4.9)	0.4 (5.8)	0.5 (7)	0.6 (11)	0.7 (13.2)	93.5%
Aortic aneurysm	NA	NA	NA	NA	NA	NA	-
Other cardiovascular and circulatory diseases	212.8 (2335.2)	219 (2645.2)	225.2 (2987.5)	233.9 (3403.5)	250.8 (4296.3)	263 (4748)	23.6%

NA=not available, Δ=relative change

Table 2: Deaths due to cardiovascular diseases in South Asian region from 1990 – 2019

	1990	1995	2000	2005	2015	2019	30-years %Δ
Mortality rate per 100,000 (×1000 cases)							
South Asia	139.8 (1534.8)	140 (1690.9)	147.3 (1953.9)	145.7 (2120)	170.1 (2914.1)	182.1 (3288)	30.3%
Country							
Pakistan	152.9 (172.5)	169.1 (213.5)	167.8 (238.6)	161.4 (260.6)	152.6 (314)	152.2 (341.1)	-0.4%
India	140.5 (1201.8)	140.1 (1316.3)	148.2 (1529.2)	143.4 (1621.4)	172.8 (2289.1)	185.1 (2574.4)	31.8%
Bangladesh	126.8 (138.3)	114.6 (137.1)	125.4 (160.4)	153.8 (209.4)	175.7 (268.9)	203.9 (324.8)	60.9%
Nepal	111.1 (21.7)	107.6 (23.4)	103.5 (24.8)	107 (27.8)	140.7 (41.1)	152.9 (46.5)	37.6%
Bhutan	94.2 (0.6)	110.9 (0.7)	117.1 (0.8)	127.9 (0.9)	144.8 (1.1)	160.2 (1.2)	70.0%
Gender							
Male	157.4 (898.3)	157.8 (990.7)	164.9 (1134.3)	164.5 (1235.3)	186 (1629.6)	198.6 (1829.7)	26.1%
Female	120.8 (636.5)	120.8 (700.2)	128.3 (819.5)	125.6 (884.7)	153.4 (1284.5)	165 (1458.3)	36.6%
Age							
Under 5	5.2 (8.5)	4.6 (7.6)	3.7 (6.3)	3.1 (5.5)	2.6 (4.5)	2.1 (3.4)	-60.5%
5-14 years	2.2 (6.1)	2.1 (6.3)	2.1 (6.7)	1.9 (6.3)	1.5 (5.2)	1.4 (4.8)	-37.3%
15-49 years	46.1 (243.8)	44.9 (266.2)	46.7 (313.5)	43.2 (324.2)	40.4 (368.2)	40.2 (391.7)	-12.7%
50-69 years	634.9 (682.1)	618.4 (747.6)	608.9 (816)	542.2 (842.2)	543.8 (1176.5)	516 (1265.1)	-18.7%
70+ years	2714 (594.3)	2636.9 (663.2)	2655.7 (811.4)	2465.2 (941.9)	2317.7 (1359.8)	2347.8 (1622.9)	-13.5%
Causes							
Ischemic heart disease	68.7 (754.5)	69.8 (843.3)	74.4 (987.6)	75.5 (1098.3)	95.5 (1636.8)	102.9 (1857.9)	49.7%
Stroke	47.7 (523.9)	47.3 (570.9)	49.3 (653.8)	48.1 (700.2)	50.9 (871.4)	54.2 (978.9)	13.6%
Rheumatic heart disease	11.3 (124.4)	10.9 (132)	11 (145.8)	9.6 (139.8)	8.9 (153)	8.6 (156)	-23.8%
Peripheral artery disease	0.1 (0.5)	0.1 (0.7)	0.1 (0.9)	0.1 (1.2)	0.1 (2.3)	0.2 (3)	227.8%
Atrial fibrillation and flutter	0.8 (8.8)	0.9 (10.4)	1 (12.8)	1.1 (15.8)	1.6 (28.2)	2 (36.6)	154.4%
Hypertensive heart disease	6.6 (72.8)	6.5 (78.8)	6.8 (90.2)	6.6 (96.4)	7.5 (128)	8.1 (146.3)	22.1%
Non-rheumatic valvular heart disease	0.5 (5.6)	0.5 (6.3)	0.6 (7.3)	0.6 (8.2)	0.7 (12)	0.8 (14.3)	55.1%
Endocarditis	0.3 (3.8)	0.4 (4.2)	0.4 (5)	0.4 (5.5)	0.4 (7.6)	0.5 (8.8)	40.9%
Cardiomyopathy and myocarditis	0.4 (3.9)	0.4 (4.3)	0.4 (4.8)	0.4 (5.3)	0.4 (7)	0.4 (8)	26.1%
Aortic aneurysm	0.7 (7.2)	0.7 (8.2)	0.7 (9.8)	0.8 (11.3)	1 (17.2)	1.2 (20.8)	76.8%
Other cardiovascular and circulatory diseases	2.7 (29.6)	2.6 (31.8)	2.7 (35.9)	2.6 (38.1)	2.9 (50.5)	3.2 (57.4)	18.0%

Δ*=relative change*

Table 3: Disability-adjusted life years (DALYs) due to cardiovascular diseases in South Asian region from 1990 – 2019

	1990	1995	2000	2005	2015	2019	30-years %Δ
Disability-adjusted life years (DALYs) rate per 100,000 (×1000 DALYs)							
South Asia	4018 (44102.2)	3982.7 (48098.5)	4127.8 (54764.6)	3993 (58100.3)	4451.4 (76265.9)	4622.7 (83449.2)	15.1%
Country							
Pakistan	4007.9 (4522.3)	4593.1 (5798.1)	4724.9 (6717.9)	4644.4 (7495.5)	4463.1 (9180)	4417.9 (9898.8)	10.2%
India	4111.1 (35174)	4032.1 (37882.8)	4181.8 (43156.3)	3938.1 (44532.8)	4488.9 (59460.8)	4670 (64946.5)	13.6%

Bangladesh	3446.3 (3758.3)	3127.1 (3739.8)	3282.5 (4198.7)	3913.8 (5330.1)	4312.1 (6598.3)	4691.7 (7472)	36.1%
Nepal	3226.6 (630.4)	3033.5 (658.9)	2797 (671)	2771 (720)	3424.6 (1000.9)	3631.2 (1104.5)	12.5%
Bhutan	2796.4 (17.1)	3148 (18.8)	3187.2 (20.7)	3266.1 (21.9)	3393.4 (25.9)	3649.4 (27.5)	30.5%
Gender							
Male	4547.6 (25950.3)	4524.9 (28409.2)	4699.6 (32322.8)	4607.9 (34599)	5019 (43976.4)	5218 (48083.1)	14.7%
Female	3444.4 (18151.8)	3395.7 (19689.3)	3512.3 (22441.8)	3337.3 (23501.3)	3857.3 (32289.6)	4002 (35366.1)	16.2%
Age							
Under 5	465.3 (752.7)	405.3 (674.9)	330.2 (567.4)	282.5 (494.4)	237.9 (405.2)	190.3 (312.9)	-59.1%
5-14 years	208.5 (578)	196.7 (595.4)	197.9 (631.3)	180.6 (605.5)	155.7 (554.4)	145.8 (513.9)	-30.1%
15-49 years	2460.8 (13025.3)	2403 (14237)	2502.5 (16799.4)	2313.8 (17382.3)	2129.9 (19419.4)	2133.1 (20779.4)	-13.3%
50-69 years	19102.8 (20522.4)	18505.1 (22373)	18096.9 (24253.2)	16183.8 (25140.7)	16526.8 (35756.7)	15576.8 (38189.8)	-18.5%
70+ years	42120.8 (9223.8)	40626.8 (10218.2)	40955.9 (12513.3)	37892.4 (14477.3)	34308.9 (20130.1)	34218.5 (23653.3)	-18.8%
Causes							
Ischemic heart disease	1910.6 (20971.4)	1926.6 (23266.7)	2034.9 (26997.1)	2018.5 (29370.7)	2433.8 (41698.7)	2549.6 (46024.7)	33.4%
Stroke	1289.9 (14157.8)	1263.2 (15255.5)	1290 (17114.9)	1235.8 (17981.4)	1288.7 (22078.6)	1336.1 (24119.3)	3.6%
Rheumatic heart disease	464.2 (5095.4)	444.3 (5365.7)	444.1 (5891.9)	386.6 (5625.8)	336.8 (5770.4)	318.8 (5755.4)	-31.3%
Peripheral artery disease	3 (33.1)	3.3 (39.5)	3.6 (47.3)	4 (58.4)	5.3 (90.3)	6 (107.8)	98.2%
Atrial fibrillation and flutter	37.1 (407.5)	39.1 (472.5)	42.4 (562.2)	46.4 (675.4)	61.3 (1050.4)	69.7 (1257.6)	87.7%
Hypertensive heart disease	153.4 (1684.2)	149.6 (1806.3)	153.2 (2032.4)	146.6 (2132.6)	158.6 (2716.5)	166.3 (3002.4)	8.4%
Non-rheumatic valvular heart disease	14 (153.8)	14.1 (170.5)	14.9 (197)	14.8 (215.4)	17.1 (293.4)	18.7 (338)	33.6%
Endocarditis	13.7 (150.6)	13.7 (165.9)	14.3 (189.7)	14 (203.7)	15.1 (258.3)	15.9 (287.1)	15.9%
Cardiomyopathy and myocarditis	13.2 (145.3)	13.1 (157.8)	13.2 (175)	13 (189.4)	13.5 (231.7)	14 (253.4)	6.0%
Aortic aneurysm	16.2 (177.8)	16.7 (201.7)	18 (239.4)	18.6 (270.7)	23 (394.5)	25.8 (465.9)	59.4%
Other cardiovascular and circulatory diseases	102.5 (1125.2)	99.1 (1196.3)	99.3 (1317.5)	94.6 (1376.8)	98.2 (1683.2)	101.8 (1837.6)	-0.7%

Δ=*relative change*

Table 4: Incidence rate ratio of prevalence, deaths, and disability-adjusted life years (DALYs) of cardiovascular diseases in South Asian region

	Incidence rate ratio (IRR)	95% confidence interval		P-value
		Lower limit	Upper limit	
Prevalence rate per 100,000				
South Asia	1.015	1.014	1.016	<0.001
Pakistan	1.001	1.000	1.002	0.145
India	1.016	1.015	1.017	<0.001
Bangladesh	1.023	1.021	1.025	<0.001
Nepal	1.014	1.013	1.014	<0.001
Bhutan	1.017	1.016	1.017	<0.001
Mortality rate per 100,000				
South Asia	1.009	1.008	1.010	<0.001
Pakistan	0.997	0.995	0.999	<0.001
India	1.009	1.008	1.010	<0.001
Bangladesh	1.022	1.019	1.024	<0.001
Nepal	1.013	1.010	1.016	<0.001
Bhutan	1.015	1.014	1.016	<0.001
Disability-adjusted life years (DALYs) rate per 100,000				
South Asia	1.005	1.004	1.005	<0.001
Pakistan	1.001	0.998	1.003	0.625
India	1.004	1.003	1.005	<0.001
Bangladesh	1.016	1.014	1.018	<0.001

Nepal	1.005	1.002	1.009	0.001
Bhutan	1.006	1.002	1.009	0.001

DISCUSSION

In this study we summarized findings of the GBD study regarding the burden of CVD in SA region and five countries of it for the duration of 30 years from 1990 to 2019. An aggregate impression is that there is an increasing trend in prevalence, deaths and DALYs due to CVD over the past 30-years in this region and its countries, except for Pakistan. In contrary to other countries in the region, prevalence and DALYs due to CVD remained steady, while there was a significant decline in deaths due to CVD in Pakistan. Owing to the largest population share, India had the highest contribution to the regional burden of CVD. IHD followed by stroke remained leading causes of deaths and DALYs due to CVD.

These observations are particularly concerning for the 1/4th of the world population. Various author studies have also reported an increase in years of life lost (age adjusted) due to CVD, in contrary to most regions of the world with declining trends.[6] CVD prevention and treatment remained a challenging task in this region due to diverse cultural, economic, and ethnic landscapes. Understanding of the magnitude of problem is crucial to orient efforts towards policy making and strategy to combat the CVD epidemic in this region.[12] According to estimates of GBD study, around 35% of the total deaths in Asia are due to CVD making up a total of 10.8 million deaths.[9] Changes in the demographic landscape has a key role in increasing CVD burden in this region along with changing lifestyles, living environments, socioeconomics, urbanization, policies towards prevention of CVD, available facilities for the treatment and prevention of diseases, and identification and management of predisposing risk factors of CVD.[13,14] In addition, it is well recognized that various conventional risk factors of CVD, such as metabolic syndrome, diabetes, hypertension, and obesity, disproportionally affect individuals from SA.[8]

Dietary factors also plays a very vital role in the development and progression of CVD and its risk factors, with the globalization and urbanization a transition has been also noticed from traditional Asian diet to westernized dietary patterns in some parts of Asia.[15] A pattern of decrease in consumption of legumes and grains and increase in consumption of animal source food, oils and fats, sodium, and sugar or sugar based products and beverages leads this population to increased risk of CVD and its associated risk factors.[16] Smoking and use of tobacco products, a well-recognized risk factor with 1.68 times higher risk of fatal CVD events compared to nonsmokers, is also remained highly prevalent in this region.[16,17] Obesity is another lifestyle related risk factor usually consequent of sedentary lifestyle and unhealthy eating habits, age-standardized prevalence in South Asia is ranging from 3.9% (in India) to 8.6% (in Pakistan).[12] Most prevalent risk factor for CVD remain hypertension with the prevalence as high as 30.5% among South Asian countries.[12] Recent evidence form the region revealed sub-optimal management, control, and awareness regarding hypertension in this population.[18] Two of the main countries of the South Asian region, Pakistan and India, are among the top ten countries with largest share to the global burden of deaths attributable to high blood glucose.[19] Diabetes is associated with 2.57 times higher risk of IHD and 2.15 times higher risk of stroke.[20] Among other risk factors of CVD, lipid disorders, dyslipidemia, metabolic syndrome, and population aging are attributable to the increasing trends of CVD in South Asian Region.[12,21]

Even though this was the most extensive data for SA region from an extensive epidemiological GBD study with technically sound analytical methods for a period of 30-years from 1990 to 2019, it still may have certain limitations. The GBD estimates are based on the existing literature, hence, considering the limited research facilities in this region, the data used by GBD methodology may be erroneous in the first place. Therefore, any contradicting results need to be further verified with firsthand experience and data.

CONCLUSION

In conclusion, the SA region is experiencing an increasing trend in prevalence, deaths, and DALYs due to CVD. IHD and stroke remained the main contributors to the regional burden of CVD, while RHD is on decline over the past 30-years. Targeted preventive strategies are required involving all the stakeholders from community to policymakers. Various large scale mass level initiatives are required such as health literacy, population screening for the identification of vulnerable segments, and timely diagnosis and management of predisposing risk factors along with promoting active lifestyle and cardio-protective dietary patterns.

AUTHORS' CONTRIBUTION:

AR and MK: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. SA, AWK, HM, IT, KT, ZUR: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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