

Research Article

Burden of cardiovascular diseases in Qatar for main causes from 1990 to 2019

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ABSTRACT

Background: The Cardiovascular Diseases (CVD) burden keeps increasing worldwide remains unclear in many countries of the world including Qatar. The Global Burden of Disease (GBD) 2019 summarized and integrated available data on disease prevalence, incidence, and mortality to produce reliable estimates for cardiovascular burden. A detailed analysis of its time trend profile for Qatar is not available in the literature. In this research paper, relying on the reported data from the Global Burden Diseases Study findings between 1990 and 2019, a detailed analysis of the cardiovascular diseases patterns and their time changing between 1990 and 2019 is presented.

Methods: Available data from the Global Burden of Disease (GBD) for Qatar from 1990 to 2019 in term of prevalence, mortality and disability adjusted Life-years (DALYs) caused by cardiovascular diseases (CVD) were analyzed to find out any prevailing disease pattern from 1990 to 2019. Major causes of CVDs in Qatar were analyzed on a single basis and given a special attention.

Results: In 2019, there were an estimated 95,736.81 cases of CVD (95% UI: 102,748.00 -89,160.69 cases) in Qatar. The prevalence rate increased from 2,694.58 (95% UI: 2,884.82-2,512.50) in 1990 to 3,342.13 per 100,000 (95% UI: 3,586.88- 3,112.56) in 2019 showing an increase of 19%. The number of deaths caused by CVD registered in 2019 were estimated to about 1,121.12 deaths (95% UI: 1,443.15 - 854.75 against 367.58 cases (95% UI: (433.63-308.03) in 1990 while the death rate has decreased to 39.14 per 100,000 (95% UI: 50.38-29.84) in 2019 from an estimated value of 82.58 (95% UI: 97.42- 69.20) in 1990 showing a decrease of 52.6%. Ischemic heart disease was the leading cause of CVD in Qatar, followed by stroke.

Conclusions: CVDs is still a main cause of health loss in Qatar as well as for the rest of the world. The major causes of deaths for CVD diseases in Qatar were found related to Ischemic heart diseases followed by Stroke which represent together more than 80.8% of the total CVD death rates for the year 2019. Compared to the global average, the age standardized DALYs rates in Qatar were higher. Even though a huge progress has been made, a comprehensive approach is required to prevent and alleviate the burden of CVD in Qatar. Regular updates of the GBD study is a useful guide for health professionals and policy makers in their efforts to reducing the overall burden of non-communicable disease and achieving specific global health targets for CVD in Qatar.

Keywords: Cardiovascular disease; burden; Qatar; prevalence, mortality; DALYs.

1. INTRODUCTION:

Cardiovascular diseases (CVDs) are a major concern for health professionals worldwide as they are a leading cause of mortality in the world [1]. They are considered as a major

barrier to sustainable human development and a main contributor to reduced quality of life [2]. The United Nations recognized non-communicable diseases, including CVDs, as a major concern for health globally and developed an ambitious plan to reduce the effect of these diseases worldwide [3]. The Global Burden of Disease (GBD) first report was made public in 1997 [4], it contains the worldwide population data which are updated yearly. The GBD report contains age-, sex-, specific estimated data of mortality and morbidity, risk factor exposure, and a range of health system characteristics for each country from 1990 to the most recent year. GBD apply highly standards and validated approaches to analyze available

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health data sources worldwide and adjust them for major sources of bias.

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels including ischemic heart disease, stroke, heart failure, peripheral arterial disease, and a number of other cardiac and vascular conditions [5, 6]. Ischemic heart disease and stroke accounted for 85.1% of all deaths in the CVD category in 2017 [7]. Understanding global trends of the population's health status and the variations with time of the main causes of deaths and disease is essential to tracking progress towards the sustainable development goals to ensure healthier societies and improve quality of life for all population at all ages [8]. Assessment of these trends requires well-defined objectives and standard measures of population's health to help health professionals and policy makers identify priorities and set plans to address rising challenges and achieving the goals.

Increased awareness regarding non-communicable disease goals globally has expanded efforts worldwide to track and benchmark efforts to reducing CVD and other non-communicable diseases [9, 10]. Several countries have developed their GBD nationally, and their experience can be used as a useful basis to extend this practice to other countries. Several GBD national-specific papers are already available in the open literature [11-13] with some of them focusing on specific diseases [14]. Unfortunately Qatar still does not yet have any national burden of disease initiative, and this work can be considered as the first attempt in this area. Based on GBD 2017, the author has reported an analysis for Qatar and GCC countries in general [15]. The main objectives of this paper are to use the estimates of the GBD data from 1990 to 2019 to provide an updated description of the current state of CVD in Qatar, and to report trends in CVD prevalence, mortality and DALYs from 1990 to 2019. Hoping that it will contribute to set up an initiative to understand CVD burden for current and future needs in the country.

2. METHODS

2.1. GBD Estimation Framework

The CVD burden data employed in this work were extracted from the GBD study for the year 2019. The GBD study comprehensively and systematically quantifies the magnitude of health loss over time due to 315 diseases and injuries 2619 unique sequelae, and 84 risk factors by age, sex, and location for 195 countries, 21 regions, and seven super-regions from 1990 to 2019. A wide range of data sources and methods were used to produce country-specific results for the years 1990 to 2019. Results are updated annually for the entire time series.

2.2. Defining Disease Categories

CVD was estimated overall and separately for the 10 most common global causes of CVD-related death. These causes were ischemic heart disease (IHD), strokes hemorrhagic and other stroke, rheumatic heart disease (RHD), atrial fibrillation, hypertensive heart disease, cardiomyopathy and myocarditis, aortic aneurysm, peripheral arterial disease (PAD). The GBD cause list is a hierarchical list of causes of death as defined by international standards governing the reporting of death certificates.

2.3. Data Sources

Data on CVDs burden were retrieved from the Global Health Data Exchange of the Institute for Health Metrics and Evaluation (IHME) available for each country <http://www.healthdata.org/>. Detailed descriptions of the IHME's data collection methodology is available elsewhere [16, 17]. Although most of the information needed are available from the IHME website, this information needs to be filtered and interpreted in a coherent, consistent way, for its presentation and eventual use.

2.4. Disability-Adjusted Life Years

Disability adjusted life-years (DALYs) is a combination of information related to premature death (years of life lost [YLL]) and that related to disability caused by the condition (years lived with disability [YLD]) to provide a summary measure of health lost due to that condition. YLL was obtained by multiplying observed deaths for a specific age in the year of interest by the age specific reference life expectancy estimated using life table methods. YLD was obtained by multiplying disease prevalence by a health-state-specific disability weight representing a degree of lost functional capacity.

3. RESULTS

The results of this study, including prevalence, mortality, and DALYs, for Qatar from 1990 to 2019 available in the GBD results tool webpage have been exploited and used in this work.

3.1. Prevalence

It was estimated that 95,736.81 prevalent cases of CVD (95% UI: 102,748.00 - 89,160.69) in 2019 were registered in Qatar (Table 1). Out of them 74,690.52 (95% UI: 80,044.07-69,536.15) representing 78.01 % of the total prevalent cases were males while 21.99 % were made of females.

Table 1: Prevalence and prevalence rate of CVD in Qatar from 1990 to 2019.

	1990			2000			2010			2019		
	Male	Female	Both	Male	Female	Both	Male	Female	Both	Male	Female	Both
Prevalence	8,554. 15 (9,188. 38- 7,933. 04)	3,440. 22 (3,707. 74- 3,200. 71)	11,994. 38 (12,84 1.19- 11,183. 86)	14,414. 22 (15,39 4.67- 13,439. 65)	5,521. 75 (5,952. 56- 5,134. 89)	17,935. 97 (21,28 6.81- 18,600. 65)	40,358 .05 (43,60 0.23- 37,309 .62)	10,838. 11 (11,76 6.99- 9,968.9 5)	51,196. 15 (55,18 3.28- 47,425. 02)	74,690 .52 (80,04 4.07- 69,536 .15)	21,046 .29 (23,00 6.03- 19,376 .21)	95,736 .81 (102,7 48.00- 89,160 .69)
Prevalence rate	2,876. 52 (3,089. 79- 2,667. 65)	2,328. 40 (2,509. 47- 2,166. 30)	2,694.5 8 (2,884. 82- 2,512- .50)	3,778.8 5 (4,035. 89- 3,523.3 6)	2,687. 80 (2,897. 50- 2,499. 49)	3,396.9 3 (3,627. 10- 3,169.4 0)	3,082. 11 (3,329. 72- 2,849. 31)	2,558.4 3 (2,777. 70- 2,353.2 6)	2,954.1 1 (3,184. 17- 2,736.5 0)	3,494. 55 (3,745. 02- 3,253. 39)	2,894. 14 (3,163. 63- 2,664. 48)	3,342. 13 (3,586. 88- 3,112. 56)

The prevalence rate of CVD in Qatar varied slightly (Figure 1) for both sexes from its lowest observed average value of 2,694.58 in 1990 to the highest average of 3,396.93 in 2000.

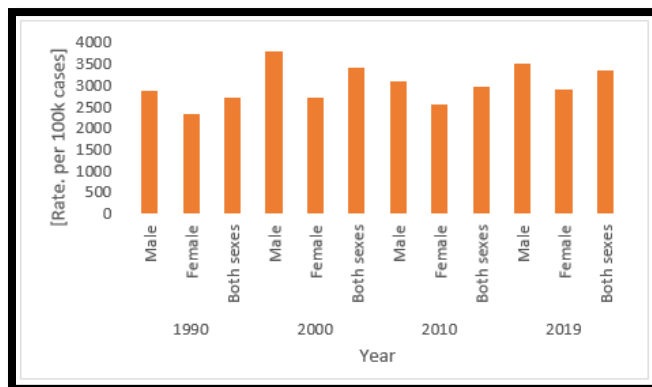


Figure 1: Prevalence rate of CVD for males, females and combined both sexes in Qatar from 1990 to 2019

The major causes prevalence for CVD diseases in Qatar were found related to Ischemic heart diseases followed by stroke as presented in Table 2, together represent about 60 % of the total CVD prevalence rates for the year 2019.

Table 2. All-ages prevalence rate per 100,000 persons for men and women and combined, for all CVD sub-causes, in Qatar 1990 – 2019.

Year	1990		2000		2010		2019	
	Rate/100k	Percentage (%)	Rate/100k	Percentage (%)	Rate/100k	Percentage (%)	Rate/100k	Percentage (%)
Aortic aneurysm								
Atrial fibrillation and flutter	95.43	3.22	125.27	3.35	101.99	3.19	131.98	3.62
Cardiomyopathy and myocarditis	26.79	0.90	33.83	0.90	22.36	0.70	26.77	0.73
Intracerebral hemorrhage	192.43	6.50	203.09	5.43	187.74	5.86	177.16	4.86
Endocarditis	1.67	0.06	1.95	0.05	1.75	0.05	1.99	0.05
Subarachnoid hemorrhage	80.36	2.71	97.46	2.61	86.67	2.71	84.54	2.32
Hypertensive heart disease	40.01	1.35	54.43	1.46	38.35	1.20	44.56	1.22
Ischemic heart disease	1,179.30	39.84	1,545.79	41.32	1,292.83	40.38	1,612.69	44.25
Ischemic stroke	514.43	17.38	654.89	17.51	530.39	16.57	554.58	15.22
Other cardiovascular and circulatory diseases	429.59	14.51	492.6	13.17	494.88	15.46	503.99	13.83
Peripheral artery disease	276.25	9.33	371.75	9.94	288.11	9.00	344.31	9.45
Rheumatic heart disease	26.09	0.88	27.24	0.73	21.19	0.66	21.39	0.59
Non-rheumatic valvular heart disease	97.96	3.31	132.46	3.54	135.51	4.23	140.25	3.85

3.2. Mortality

It was estimated that about 1,121.12 cases of CVD deaths (95% UI: 1,443.15- 854.75 cases) registered in Qatar in 2019 increasing from 367.58 cases of CVD deaths (95% UI: 433.63-308.03) registered in 1990. The death rate of CVD per 100,000 decreased significantly from 82.58 in 1990 to 39.14 per 100,000 persons in 2019 as shown in Figure 1. It was observed that the mortality rate for females was higher than that of males except in year 2000 where the opposite behavior was observed.

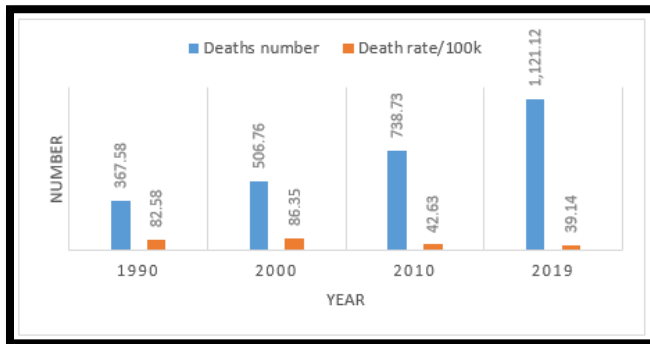


Figure 2: Death and death rate in Qatar from 1990 to 2019.

The mortality rate by causes in 2019 is presented in Figure 3. The highest mortality rate by cause in 2019 was attributed to Ischemic Heart Diseases, 28.98 (95% UI: 37.27 - 22.01) followed intracerebral hemorrhage, 2.7 (95% UI: 3.71- 1.98) and ischemic stroke, 2.44 (95% UI: 3.37-1.85) respectively. The mortality rate for females was higher than that of males in most years because the majority of males in Qatar are young migrants.

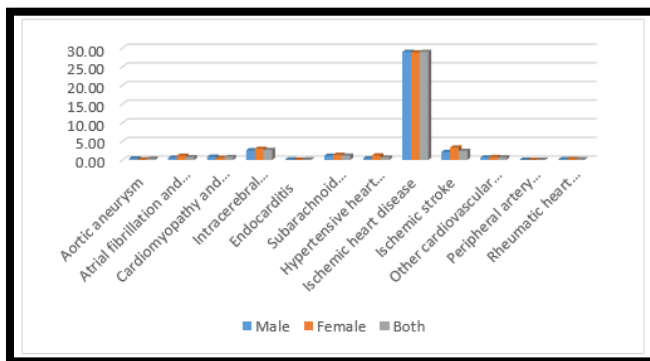


Figure 3: Mortality rate by cause in Qatar for the year 2019.

3.3. DALYs

The number of disability-adjusted life years (DALYs) of CVD for Qatar from 1990 to 2019 is presented in Figure 4. The number of DALYs from CVD increased from 11,716.18 (95% UI: 13,841.92-9,834.34) in 1990 to 38,383.47 (95% UI: 48,462.76-30,259.33) in 2019, making an increase of 69.48%. The DALYs

rate decreased from 2,632.09 (95% UI: 3,109.64 - 2,209.32) In 1990 to 1,339.95 (95% UI: 1,691.81 - 1,056.34) in 2019

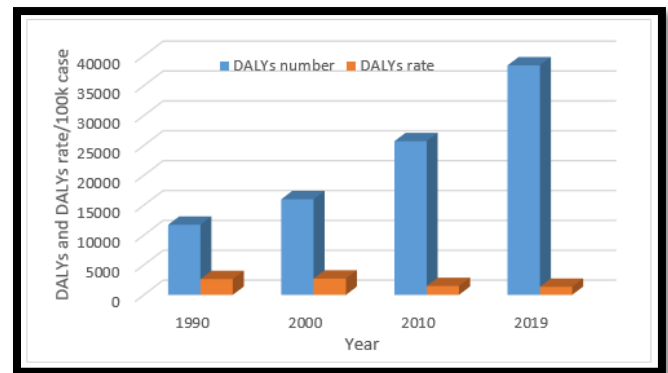


Figure 4: Disability-adjusted life years (DALYs) and DALYs rate of CVD for Qatar from 1990 to 2019

All-ages DALY rate for men and women separately and combined, for all CVD sub causes, in Qatar 1990 to 2019 is shown in Figure 5. It's very clear that the largest DALYs rate percentage is caused by ischemic heart diseases followed by Intracerebral hemorrhage in the second position and strokes in third position.

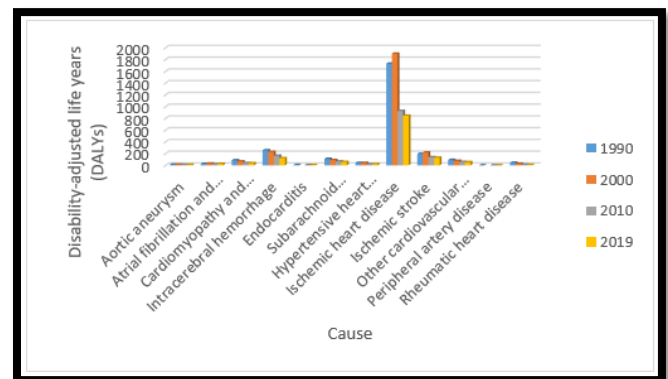


Figure 5: All-ages DALYs rate for all CVD sub causes, in Qatar from 1990 to 2019

4. PREVALENCE AND MORTALITY FOR CCD BY CAUSE GROUPS

The prevalence of all CVD causes amounting to a total of 95474.96 cases in Qatar in 2019. Ischemic Heart Disease (IHD) were 46196.42 which accounted for 48.4 % of the total CVD causes prevalence, followed by Ischemic Stroke (16.6%), other cardiovascular diseases (15.1%), Rheumatic heart disease With 10.3% , Atrial fibrillation and flutter was 4% while Hypertensive heart diseases (1.3%). A graphical representation of all CVD prevalence distribution is shown in Figure 6. IHD and stroke mortality rates are the main cause of CVD deaths in Qatar, supporting the theory of an epidemiological transition for CVD [18, 19].

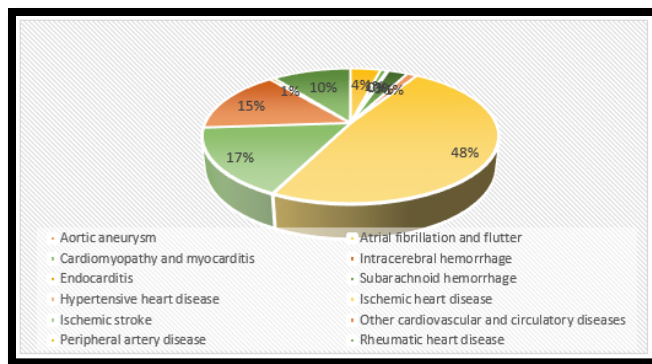


Figure 6: Distribution of Major CVD disease categories in Qatar in 2019.

4.1. Ischemic Heart Disease.

In 2019, IHD was the leading cause of all health loss globally, as well as in Qatar. There were an estimated 46,196.42 prevalent cases of IHD (95% UI: 50,305.42 - 42,120.70cases) in 2019. The IHD prevalence rose from an estimated 1,179.30 cases per 100,000 (95% UI: 1,288.95-1,080.61) in 1990 to an estimated 1,612.69 cases per 100,000 (95% UI: 1,756.14- 1,470.41) in 2019 as shown in Figure 7.

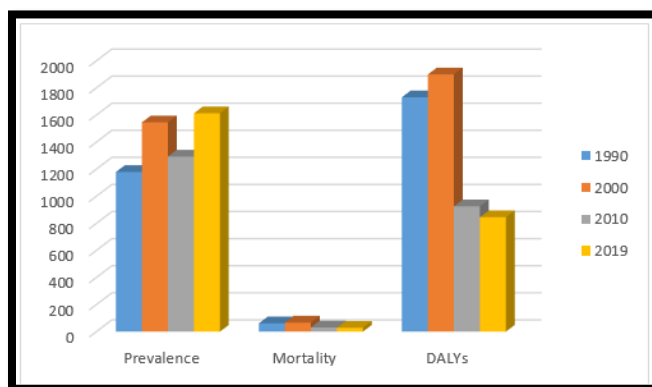


Figure 7: Ischemic heart diseases prevalence, mortality and DALYs in Qatar in from 1990 to 2019

The mortality due to IHD decreased from an estimated 61.47 deaths per 100,000 (95% UI: 73.42 - 50.73 per 100,000) in 1990 to 28.98 per 100,000 (95% UI: 37.27 to 22.01 per 100,000) in 2019. The estimated DALYs decreased steadily over the years in Qatar from 1,730.98 (95% UI: 2,084.30-1,420.08) in 1990 to 845.52 (95% UI: 1,098.51-640.76) in 2019.

4.2. Stroke

In Qatar, ischemic strokes, and hemorrhagic and other strokes - were the second and third-largest CVD causes of DALYs in 2019. Ischemic strokes alone accounted for 9.92 % of total CVD

causes while hemorrhagic and strokes for themselves accounted for another 9.26% as shown in Figure 8 below.

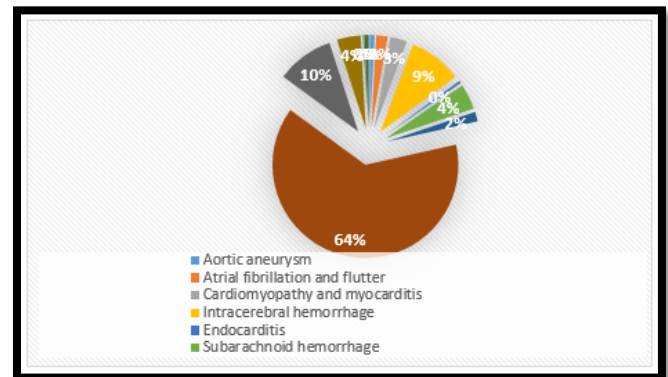


Figure 8: DALYs of important CVD causes in 2019 in Qatar

There were an estimated 6147.9 stroke cases in 2019 out of them 15886.2 ischemic strokes (95% UI: 17,914.11-14,141.41), 84.54 hemorrhagic strokes (95% UI: 99.72- 68.14), and 177.16 prevalent cases of cerebrovascular disease (95% UI: 200.95- 154.28) overall in 2019. A graphical representation of prevalent strokes from 1990 to 2019 is shown in Figure 9.

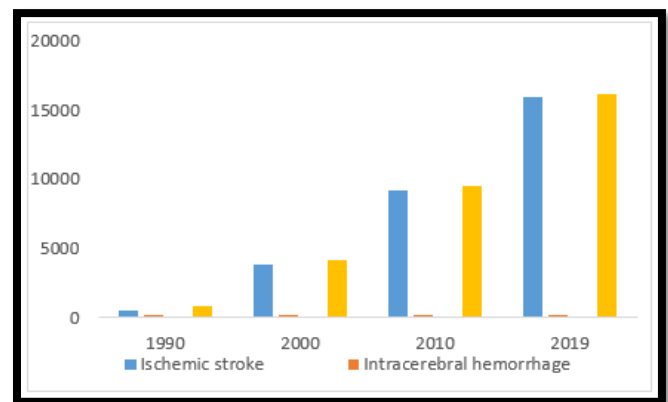


Figure 9: Prevalence of strokes from 1990 to 2019 in Qatar

Among all forms of strokes, the estimated intracerebral hemorrhage mortality rate from 1990 to 2019 dominated Ischemic strokes and other strokes.

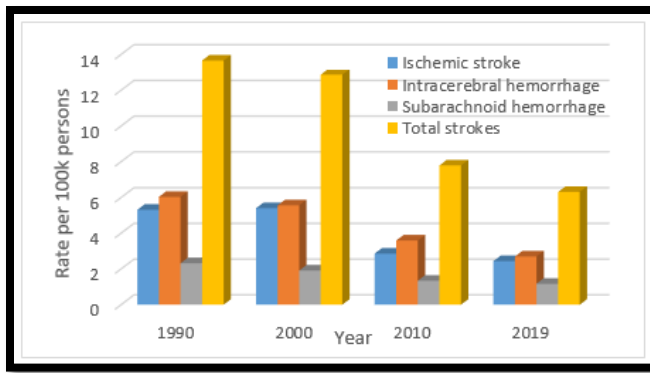


Figure 10: Mortality rate by stroke cause from 1990 to 2019 in Qatar

In general, number of DALYs in Qatar decreased over the years from 1990 to 2019 as shown in Figure 11. In all cases, Ischemic strokes DALYs dominated both intracerebral hemorrhage and Subarachnoid hemorrhage DALYs. In 2019 the DALYs caused by Ischemic strokes 132.34 (95% UI: 160.56-104.38) dominated Intracerebral hemorrhage DALYs estimated to be 122.82 (95% UI: 159.68-95.32) followed by Subarachnoid hemorrhage 58.96(95% UI: 76.52-43.51)

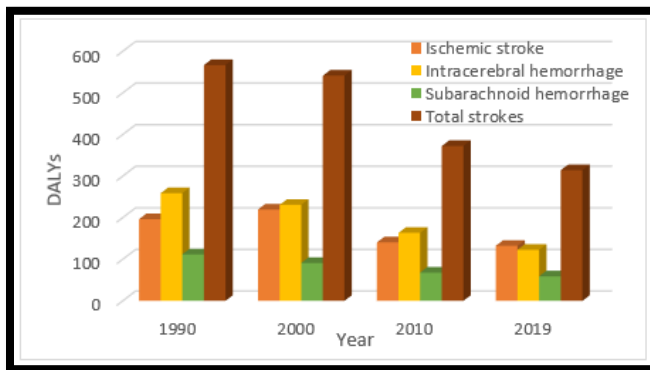


Figure 11: DALYs caused by strokes from 1990 to 2019 in Qatar.

4.3.Rheumatic Heart Disease

RHD was the fourth highest-ranked CVD prevalence in Qatar in 2019. There were a substantial increase of RHD cases from 2862.35 prevalent cases in 1990 to 93137.77 prevalent Cases in 2019 as shown in Figure 12. However, the prevalence rate per 100k cases was relatively varying between 27.24 (95% UI: 32.73 to 22.32 per 100,000) and 21.19 (95% UI: 26.77 to 16.19 per 100,000). Against prevalence rate, mortality rate and DALYs decreased 4 folds from 1990 to 2019. Mortality has decreased from 0.96 (95% UI: 1.74 to 0.56 per 100,000) to 0.21 (95% UI: 0.29 to 0.16 per 100,000), while DALYs decreased from 46.15 (95% UI: 74.13 to 30.84 per 100,000) in 1990 To 10.24 (95% UI: 13.63 to 7.49 per 100,000) in 2019.

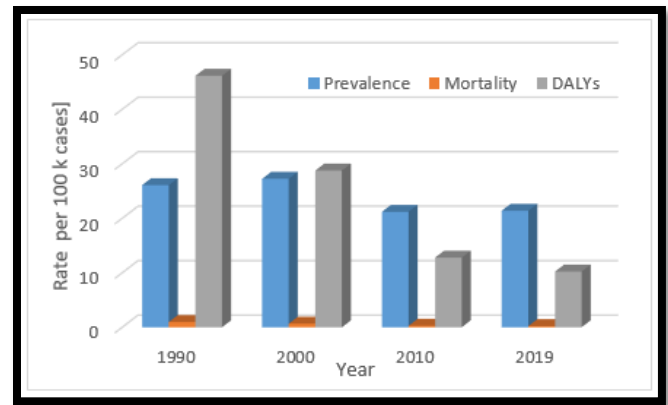


Figure 12: RHD prevalence, mortality and DALYs in Qatar in from 1990 to 2019

4.4.Atrial fibrillation

Atrial fibrillation prevalence ranked fifth as a CVD cause in Qatar in 2019 with around 4% of the total CVD cases. The prevalence rate of atrial fibrillation increased from 95.43 per 100,000 (95% UI: 125.65 to 72.06 per 100,000) in 1990 reaching a rate of 131.98 per 100,000 (95% UI: 172.16 to 97.32 per 100,000) in 2019 as shown in Figure 13. The mortality rate decreased from 1.05 per 100,000 (95% UI: 1.31 to 0.7 per 100,000) in 1990 to 0.74 per 100,000 (95% UI: 0.99 to 0.54 per 100,000) in 2019. However, a higher Atrial fibrillation mortality rate 1.13 per 100,000 (95% UI: per 100,000) was observed in year 2000. DALYs due to atrial fibrillation was fluctuating between the highest values of 33.23 per 100,000 (95% UI: 39.97 to 26.92 per 100,000) observed in 200 and the lowest value of 21.64 per 100,000 (95% UI: 27.13 to 17.16 per 100,000) registered in 2010.

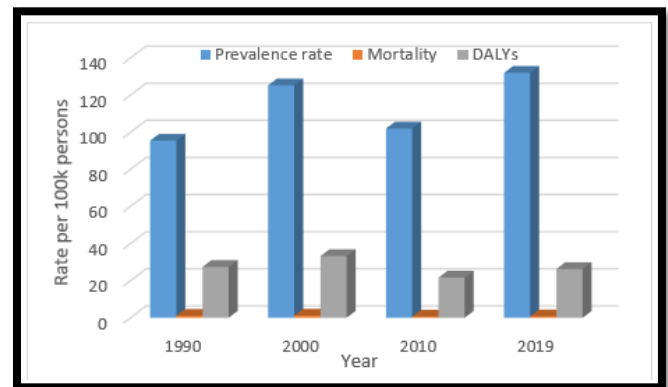


Figure 13: Atrial fibrillation prevalence, mortality and DALYs in Qatar in from 1990 to 2019

4.5. Hypertensive Heart Disease.

Hypertensive heart disease was the fifth-highest ranked CVD cause for DALYs in 2019 in Qatar. There. The prevalence rose from 40.01 per 100,000 (95% UI: 52.05 to 30.57 per 100,000)

in 1990 to 54.43 per 100,000 (95% UI: 72.4 to 40.94 per 100,000) in 2000 to fall to 38.35 per 100,000 (95% UI: 55.05 to 26.65 per 100,000) in 2010 and rise again to 44.56 per 100,000 (95% UI: 62.54 to 30.8 per 100,000) in 2019 as shown in Figure 14. The mortality rate decreased steadily from 1.45 per 100,000 (95% UI: 2 to 1.03 per 100,000) in 1990 to 0.65 per 100,000 (95% UI: 0.9 to 0.45 per 100,000) in 2019. The same pattern was observed for DALYs which decreased from 43.52 per 100,000 (95% UI: 57.74 to 31.33 per 100,000) in 1990 to 22.35 per 100,000 (95% UI: 30.65 to 15.9 per 100,000) in 2019 passing through a lowest value of 21.69 per 100,000 (95% UI: 27.17 to 17.53 per 100,000) registered in 2010.

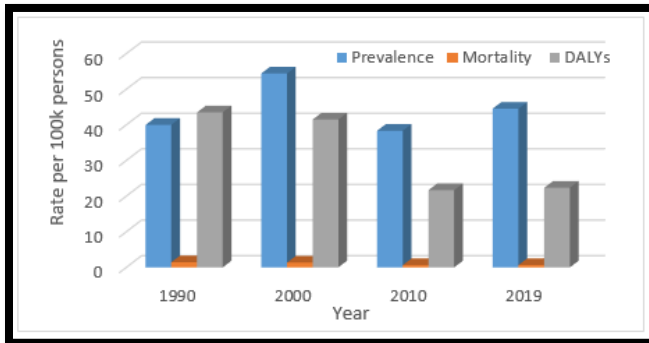


Figure 14: Hypertensive heart disease prevalence, mortality and DALYs in Qatar in from 1990 to 2019

4.6. Cardiomyopathy

Cardiomyopathies and acute myocarditis were the sixth higher-ranked cause of CVD DALYs in Qatar in 2019. Even though it has decreased from 87.64 per 100,000; 95% UI: 117.42 to 61.41 per 100,000) in 1990 to 38.5 per 100,000; 95% UI: 57.09 to 25.89 per 100,000) in 2019 as presented in Figure 15. There was a relatively constant prevalence rate between 1990 and 2019 with 26.79 per 100,000; 95% UI: 36.74 to 19.02 per 100,000) and 26.77 per 100,000; 95% UI: 38.76 to 17.59 per 100,000) respectively. A higher prevalence rate of 33.83 per 100,000; 95% UI: 45.36 to 24.51 per 100,000) was registered in 2000. The mortality rate was as high as 1.54 per 100,000 persons (95% UI: 2.06 to 1.07 per 100,000) in 1990 to decreased steadily to 0.8 per 100,000 persons (95% UI: 1.23 to 0.5 per 100,000) in 2019.

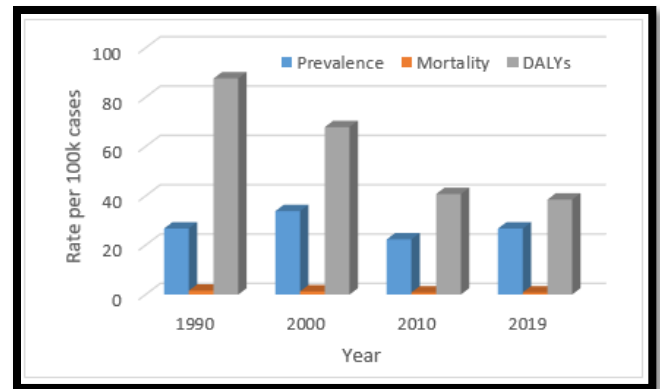


Figure 15: Cardiomyopathy prevalence, mortality and DALYs in Qatar in from 1990 to 2019

4.7. Aortic Aneurysm

Aortic aneurysm was not a leading cause of CVD DALYs in Qatar as it contributed by only 0.85 % Of the total CVDs DALYs in 2019. DALYs due to aortic aneurysm were somehow constant over the las four decades around 12 per 100,000 as shown in Figure xxxx. The mortality rate due to aortic aneurysm had the same pattern with values fluctuating between a highest value of 0.44 per 100,000 (95% UI: per 100,000) registered in 2000 and the lowest valued of 0.33 per 100,000 (95% UI: per 100,000) observed in 2010. Prevalence data for Aortic aneurysm in Qatar is not available.

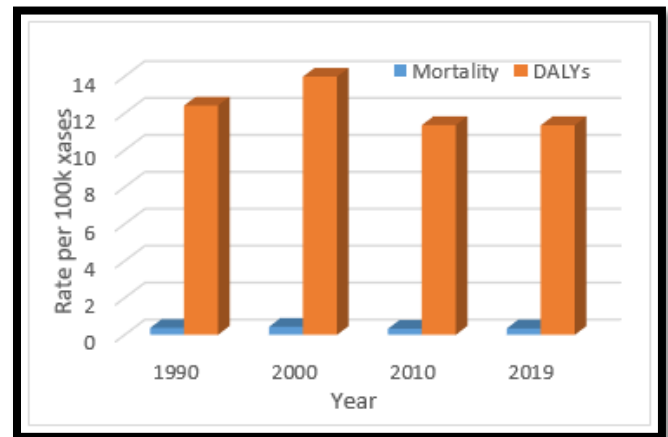


Figure 16: Aortic aneurism mortality and DALYs in Qatar in from 1990 to 2019

4.8. Peripheral Arterial Disease

PAD was among the lowest-ranked CVD cause of DALYs and mortality in Qatar, but accounted for a largest proportion of cases of prevalent CVD as much as 9% of the total prevalence rate in 2019. There were an estimated 1.66 per 100,000 (95% UI: per 100,000) DALYs in 1990 against 1.65 per 100,000 (95% UI: per 100,000) in 2019. The mortality rate was high as 0.06 per 100,000 (95% UI: per 100,000) in 2000 and as low as 0.04

per 100,000 (95% UI: per 100,000) in 2010 as shown in Figure 17. The prevalence rate was also fluctuating between 371.75 per 100,000 (95% UI: per 100,000) in 2000 and the lowest one of 276.25 per 100,000 (95% UI: per 100,000) observed in 1990.

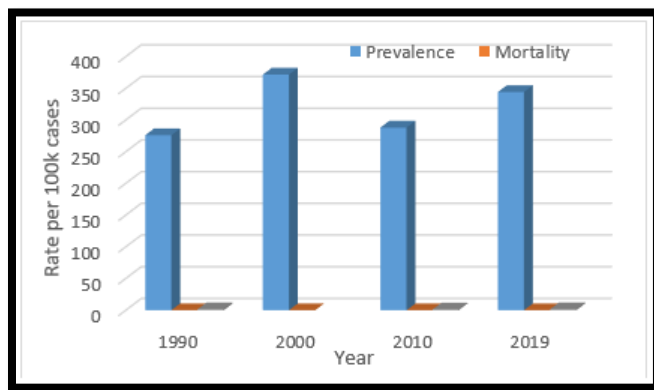


Figure 17: Peripheral arterial disease prevalence, mortality and DALYs in Qatar in from 1990 to 2019

5. CONCLUSION

The GBD study is a very useful platform for tracking the evolution of CVD epidemiology patterns in Qatar. CVD remain a major cause of death in Qatar as well as in all regions of the world. Specific causes of CVD have been analyzed within the broader context of national health system. Ischemic heart diseases and stroke account for the majority of health lost to CVD as they represent together more than 80.8% of the total CVD death rates for the year 2019. Compared to the global average, the DALYs rates in Qatar were higher. Even though a big progress has been made, Qatar should consider further investment in CVD monitoring and surveillance to benchmark the efforts made toward reducing the burden of CVD in the country. Health professionals and policymakers focusing on reducing the overall burden of CVDs disease and achieving specific national health objectives can always use updates of the GBD study as a preliminary guide in their analysis.

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