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Worldwide Epidemiology of Atrial Fibrillation: A Global Burden of Disease 2010 Study

Sumeet S. Chugh, MD[1], **Rasmus Havmoeller, MD, PhD**[1,2], **Kumar Narayanan, MD**[1], **David Singh, MD**[1], **Michiel Rienstra, MD, PhD**[3], **Emelia J. Benjamin, MD, ScM**[4], **Richard F. Gillum, MD**[5], **Young-Hoon Kim, MD**[6], **John H. McAnulty Jr., MD**[7], **Zhi-Jie Zheng, MD, PhD**[8], **Mohammad H. Forouzanfar, MD**[9], **Mohsen Naghavi, MD**[9], **George A. Mensah, MD**[8], **Majid Ezzati, PhD**[10], and **Christopher J. L. Murray, MD**[9]

[1]Cedars Sinai Heart Institute, Los Angeles CA [2]Karolinska Institute, Stockholm, Sweden [3]University of Groningen, University Medical Center Groningen, The Netherlands [4]The Framingham Heart Study and Boston University School of Medicine and Public Health [5]Dept of Medicine, Howard University College of Medicine, Washington, DC [6]Korea University College of Medicine, Seoul, Republic of Korea [7]Legacy Good Samaritan Medical Center, Portland, OR [8]National Heart, Lung, and Blood Institute, Bethesda, MD [9]Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA [10]Harvard School of Public Health, Boston, MA

Abstract

Background—The global burden of atrial fibrillation (AF) is unknown.

Methods and Results—We systematically reviewed population-based studies of AF published 1980–2010, from the 21 Global Burden of Disease (GBD) regions to estimate global/regional prevalence, incidence, as well as morbidity and mortality related to AF (DisModMR software). Of 377 potential studies identified, 184 met pre-specified eligibility criteria. The estimated number of individuals with AF globally in 2010 was 33·5 million [(20·9 million males (UI, 19·5–22·2 million) and 12·6 million females (UI, 12·0–13·7 million)]. Burden associated with AF, measured as disability adjusted life-years (DALYs), increased by 18·8% (UI, 15·8–19·3) in males and 18·9% (UI, 15·8–23·5) in females, from 1990 to 2010. In 1990, the estimated age-adjusted prevalence rates of AF (per 100,000 population) were 569·5 in males [95% uncertainty interval (UI), 532·8–612·7] and 359·9 in females (UI, 334·7–392·6); the estimated age-adjusted incidence rates were 60·7/100,000 person-years in males (UI, 49·2–78·5) and 43·8 in females (UI, 35·9–55·0). In 2010 the prevalence rate increased to 596·2 (UI, 558·4–636·7) in males and 373·1 (UI, 347·9–402·2) in females; incidence rate increased to 77·5 (UI, 65·2–95·4) in males and 59·5 (UI, 49·9–74·9) in females. Mortality associated with AF was higher in females, and increased by 2-fold (UI, 2·0–2·2) and 1·9-fold (UI, 1·8–2·0) in males and females, respectively, from 1990 to 2010.

Address for Correspondence: Sumeet S. Chugh MD, The Heart Institute, AHSP Suite A3300, Cedars-Sinai Medical Center, 127 S San Vicente Blvd, Los Angeles, CA 90048, Tel: 310-423-3300, Fax: 310-423-3522, sumeet.chugh@cshs.org.

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Conclusions—These findings provide evidence of progressive increases in overall burden, incidence, prevalence and AF-associated mortality between 1990–2010. Systematic, global surveillance of AF is required to better direct prevention and treatment strategies.

Keywords

atrial fibrillation; epidemiology; incidence; burden; prevalence; global

Atrial fibrillation (AF) is the most common arrhythmia of clinical significance.[1] In adjusted models, AF is associated with increased morbidity, especially stroke and heart failure, as well as increased mortality.[2–5] AF constitutes a significant public health problem, and estimates suggest that this condition accounts for 1% of the National Health Service budget in the United Kingdom[6] and $16–26 billion of annual US expenses.[7, 8]

Several regional studies suggest rising prevalence and incidence of AF.[9–13] These secular trends may in part be explained by the demographic transition to an inverted age pyramid, as frequency of AF increases with advancing age. Others have demonstrated an increase in AF incidence after age-adjustment, which is probably a reflection of comorbidities and cardiovascular risk factors in addition to other factors such as lifestyle changes.[14, 15] In the United States, it is estimated that the number of adults with AF would more than double by the year 2050;[16] even higher increases have been predicted.[14]

In view of the emergence of AF as a ‘growing epidemic’,[15, 17] an assessment of the global burden of AF is warranted. We therefore conducted a comparative assessment of the burden of AF across defined time periods based on available epidemiological data from the 21 Global Burden of Disease (GBD) regions.

Methods

The Global Burden of Disease Study

Our analysis was performed within the framework of the latest GBD, Injuries, and Risk Factors Study (GBD 2010 Study).[18] The GBD 2010 Study is a collaborative effort led by a consortium that includes Harvard University, the Institute for Health Metrics and Evaluation at the University of Washington, Johns Hopkins University, the University of Queensland, the University of Tokyo, Imperial College London, and the World Health Organization. It follows on the original GBD 1990 Study commissioned by the World Bank in 1991 and aims to systematically assess global data on all diseases and injuries. GBD 2010 provides a common instrument for assessing mortality as well as morbidity. The goal was to provide comparable estimates at different time periods, with analysis of secular trends. Detailed information about the data, techniques and methods for estimation of different disease parameters have been published elsewhere.[19–21]

Search Strategy and Data Sources

As a subcommittee of the GBD 2010 Committee on Cardiovascular Disease and following the GBD 2010 protocol, the GBD Arrhythmias Panel performed a systematic review of the available literature (Appendix 1) to identify epidemiological studies of AF (1980–2010) that

were population-based. For the initial identification of published studies we used the following search terms: “atrial fibrillation”, “atrial flutter”, “epidemiology”, “incidence”, “prevalence”, “mortality”, and “case fatality rate”. MEDLINE, EMBASE and LILACS were queried for studies published between 1980 and 2010 (for LILACS the time period was 1982–2010). There were no restrictions based on language of publication. Details of the search are outlined in Appendix 2. The initial search (Phase 1) generated abstracts that were reviewed (Phase 2) based on pre-specified inclusion and exclusion criteria (Appendix 3). Whereas all studies on AF epidemiology in the general population were included, studies that were conducted on selected clinical sub-groups such as inpatients or those with heart failure were excluded, in order to arrive at accurate estimates of AF burden at a population-wide level. The selected abstracts underwent full text reviews (Phase 3) to confirm eligibility, generating a final list of publications selected for abstraction. Each publication was assigned to one of 21 epidemiologic regions as designated in GBD 2005. In order to minimize potential bias due to inconsistent case definitions of AF all published studies of paroxysmal, persistent or permanent/chronic AF and atrial flutter were included.

Statistical Methods

Incidence rate was defined as the annual number of new cases with AF, divided by the population at mid-year. Prevalence rate was defined as the overall number of cases with the total population as denominator. Prevalence and incidence rates were age-adjusted. Rates were presented per 100,000 persons or person-years with 95% uncertainty intervals (UI). The denominators were derived from the United Nations (UN) population database (http://www.un.org/esa/population/) and classifications of countries, regions and groups (e.g. developed and developing countries) followed the definitions of the World Bank (http://data.worldbank.org/about/country-classifications) and GBD core team decisions.[22]

Modeling of AF as a cause of death

Mortality associated with AF was estimated using an integrated method with information of several country level covariates utilized to inform the analysis.[19] All combinations of the covariates with a significant coefficient ($P<0{\cdot}05$) and expected direction of the effect were used to estimate the number of deaths. The performance of each model in terms of external validity was evaluated and constituted the final ensemble model estimate. External validity criteria were employed to rank all models and produce ensemble results.[23] The covariates and external validity of the ensemble model are reported in Appendix 4 (Tables 1 and 2). In the next step, each individual cause of death was adjusted to obtain overall cardiovascular mortality (CoDCorrect process)[19]. The GBD method provides the mortality rate attributable to AF, as opposed to total case fatality rate in AF patients.

Modeling of morbidity associated with AF

We used incidence, prevalence, excess mortality, and AF mortality rate (estimated by CODEm process) in a Bayesian meta-regression tool (DisMod-MR: Figure 1).[21] DisMod-MR estimates a generalized negative binomial model for all the epidemiological data with fixed and random effects. Data modeled with fixed effects include age, covariates that predict country variation in the quantity of interest, variation across studies due to attributes

of the study protocol, and random effects of super-region, region, and country. DisMod-MR can be used to estimate age-sex- country specific prevalence from heterogeneous and often sparse data sets. We used DisMod to estimate the total number of patients living with AF. The history of at least one confirmed AF episode is the common definition of AF used in prevalence studies. We used this definition in the modeling and estimation of different epidemiological parameters such as prevalence, incidence, and case fatality (excess mortality rate).[21]

As for all conditions assessed in the GBD project, burden associated with AF was measured as disability adjusted life-years (DALYs). The DALY metric was introduced in the original GBD 1990 study as a means of assessing the disability of chronic disorders.[22] DALYs combine information regarding premature death (years of life lost, YLL) as well as disability caused by the condition (years lived with disability, YLD). One DALY corresponds to one lost year of health and is calculated as YLL plus YLD. As previously described in detail,[24, 25] YLDs are calculated by multiplying the estimated number of incident cases by the average duration of the disease and a disability weight factor (range 0–1 where 0 is total health and 1 is total disability). Disability weights for sequelae of multiple disease conditions were estimated by four population-based surveys in Bangladesh, Indonesia, Peru, and Tanzania, a telephone survey in the United States, and an open-access web-based survey.[26] AF sequelae were defined as “daily medication and at least minimal interference with daily activities” and accordingly assigned a disability weight of 0·031.

Role of the Funding Source

The funding sources had no influence over the study, the interpretation of the results, writing of the manuscript or the decision to submit for publication. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Data Availability

The initial search generated 4,574 abstracts (Appendix 1). Of these, 377 (8·2%) published studies were identified as meeting initial criteria. After full text review, 193 studies were excluded (i.e. did not meet the pre-specified quality measures) and the remaining184 studies moved to the abstraction stage. The majority of studies were from Western Europe and North America (35·9% and 35·6% of included data sources, respectively).

Prevalence of AF

Table 1 shows the estimated age-adjusted AF prevalence rates stratified by sex (complete data for all GBD regions in Supplemental Tables 1a & 1b; Figure 2). In 1990 the estimated global prevalence rates (per 100,000 population) were 569·5 in males (95% UI, 532·8–612·7) and 359·9 (UI, 334·7–392·6) in females. In 2010, prevalence rates were 596·2 (UI, 558·4–636·7) in males and 373·1 (UI, 347·9–402·2) in females. The prevalence rates showed a modest increase between 1990 and 2010 (Figure 3) across both sexes. Developed countries had higher prevalence rates compared to developing countries, however this difference was

more pronounced in males than in females. For all time points, the prevalence was higher in males compared to females. There was significant variation in prevalence between GBD regions. The lowest prevalence rates (2010) were estimated in Asia Pacific region for both males and females (340·2 and 196·0 respectively). The highest rates were estimated in North America (925·7 for males and 520·8 for females). The prevalence and incidence for Sub-Saharan Africa was lower compared to a developed region such as North America. Overall, for the Sub-Saharan Africa super region, in 2010, the prevalence of AF (age-adjusted, per 100,000 population) was 659.8 (95% UI 511.0–850.4) for males and 438.1 (340.2–561.0) for females. The median change in prevalence was higher in developed countries, with the largest increase noted in North America (40.1%) and the least change in Sub Saharan Africa, East (3.4%; Supplemental Table 2). Prevalence rates increased significantly with increasing age (Supplemental Figures 1A & 1B), with rates in the ≥35 year population observed to be more than double the overall prevalence. Applying the DisMod MR estimated prevalence rates to the world population of 2010, the estimated number of individuals with AF globally is 20·9 million (95% UI 19·5–22·2 million) males and 12·6 million (UI, 12·0–13·7 million) females.

Incidence of AF

Table 2 shows the estimated age-adjusted incidence rates of AF stratified by sex (complete data for all GBD regions in Supplemental Tables 3a & 3b). In 1990 the overall incidence rates of the world population were 60·7 (UI, 49·2–78·5) per 100,000 person-years in males and 43·8 (UI, 35·9–55·0) in females. In 2010, the estimated incidence rates were higher, 77·5 (UI, 65·2–95·4) in males and 59·5 (UI, 49·9–74·9) in females as shown in Figure 4. There were significantly higher (~2-fold) incidence rates in developed regions when compared to developing countries. For both time periods, similar to the observations for prevalence, AF incidence rates were higher in males compared to females. Again, there was great variation between GBD regions. The lowest incidence rates (2010) were estimated in the Asia Pacific region for both males and females (33·8 and 19·8 respectively). The highest rates were estimated in North America (264·5 for males and 196·3 for females). As for prevalence, the incidence rates were also lower in the Sub-Saharan region, reported as 58.4 (43.7–78.5) and 42.7 (31.1–60.5) in males and females respectively. Incidence rates were also higher in the older age-groups (Supplemental Figures 2A & 2B).

When applying the estimated incidence rates to the world population of 2010, the estimated number of new AF cases per year is 2·7 million (95% UI 2·3–3·3 million) for males and 2·0 million (UI, 1·7–2·6 million) for females.

Mortality and Disease Burden associated with AF

The age-adjusted mortality rate (per 100,000 population) for AF in 1990 was 0·8 (UI, 0·5–1·1) for males and 0·9 (UI, 0·7–1·2) for females. The age-adjusted mortality rate increased to 1·6 (UI, 1·0–2·4) and 1·7 (UI, 1·4–2·2) in 2010, representing 2 fold (UI, 2·0–2·2) and 1·9 fold (UI, 1·8–2·0) increases, for males and females respectively (Table 3; full data for all GBD regions as Supplemental Tables 4a & 4b). Mortality increased steadily through 1995, 2000 and 2005 (Figure 5), especially in the developed world. Mortality associated with AF was higher in females overall; this was mainly driven by comparatively higher mortality in

females (compared to males) in developing countries (Figure 6). In 2010, the estimated numbers of total deaths (males and females) represented less than 1% of the global mortality in the vast majority of the 21 GBD regions (Figure 7).

The estimated age-adjusted DALYs (per 100,000 population) due to AF were 54·3 (UI, 39·2–72·7) and 38·6 (UI, 28·9–50·5) in 1990 for males and females respectively. This number increased to 64·5 (UI, 46·8–84·2) and 45·9 (UI, 35·7–58·5) in 2010, representing increases of 18·8% (UI, 15·8–19·3) and 18·9% (UI, 15·8–23·5) for males and females respectively (Table 4; complete data for all GBD regions as Supplemental Tables 5a & 5b; Figure 8). In keeping with the higher incidence and prevalence of AF, the DALYs were higher in developed compared to developing countries. The rate of change in DALYs was also higher in developed compared to developing countries (Supplemental Table 2).

Discussion

Our systematic review of the current worldwide epidemiological data on AF confirms the emergence of this condition as a global epidemic, with significant and progressive effects on estimated disability and mortality. Furthermore there were specific differences identified based on age and GBD region that are likely to have significant implications for global public health.

As expected, higher rates of AF were observed in older age groups. For example, males 75–79 years have double the prevalence rate compared to males age 65–69 years, and more than 5-fold higher prevalence compared to males age 55–59 years. The 2010 rates are higher than 1990 with increases in both prevalence and incidence rates in both sexes. Other regional studies have reported an increasing prevalence of AF, especially in the developed world. Piccini et al. reported a greater increase in the prevalence of AF (from 41.1 to 85.8 per 1000 between 1993 to 2007, with an annual rate of increase of about 5%)[13] compared to the present study, which is likely to be related to differences in the population studied with the former study being restricted to elderly Medicare beneficiaries in the United States. The annual new cases of AF globally in 2010 were estimated at close to 5 million, which together with the increasing trends observed, highlight the observation that the burden of AF is growing rapidly.

The exact reasons for these trends are unknown but may be partly explained by aging trends in the global population. One hypothesis for the increasing incidence is that AF in the majority of people is a vascular disease due to hypertension, atherosclerosis, and other cardiovascular risk factors, which increase arterial stiffness, cause diastolic dysfunction, and atrial volume overload, resulting in AF. Analysis of global risk factors in the GBD 2010 study showed that high blood pressure is the number one risk factor globally (increasing from 4th position in 1990), accounting for 7% of all global DALYs. High body mass index ranks sixth in the global list, ascending from 10th position in 1990. Deaths attributable to hypertension increased by 28.8% from 1990 to 2010, while deaths attributable to obesity increased by 71.7%[18]. Thus, it appears that the increase in AF burden potentially could be linked to such risk factors at a global level. While these alterations can be observed as part of the aging process, they are also likely to be involved independently of aging. While a

renewed focus on risk factors may help, other contributors to increasing AF incidence such as aging of the population, better survival from other disease conditions and improved diagnosis need to be acknowledged as well.

Temporal trends in AF prevalence may in addition, result from lead time bias (such that AF cases may be diagnosed earlier in their course), increased survival from coexistent cardiovascular conditions such as ischemic heart disease and heart failure due to improved management of such cardiovascular comorbidities resulting in a larger high-risk group. In addition, increased awareness of AF symptoms and clinical diagnosis also likely play a role. Of interest, the change in AF prevalence from 2005 to 2010 was seen to be minimal, especially among males in the developed countries as opposed to developing countries. While the exact reason for the leveling of prevalence rates is difficult to ascertain, one possibility may be an improved awareness and focus on management of risk factors in the developed world.

AF is known to have a significant impact on health care costs, with the major cost-drivers being hospitalizations, stroke, and loss of productivity.[6, 27, 28] In the present study, AF was associated with less than 1% of all deaths in most World Health Organization (WHO) regions. However, AF is known to co-exist and interact with other conditions contributing to a worse prognosis than for individuals without AF. For example, recent meta-analyses have shown that patients with heart failure and myocardial infarction have worse outcomes if they also have AF.[29, 30] Moreover, new-onset AF in heart failure patients might be associated with a particularly poor prognosis.[31, 32]

There were significant variations in the AF burden by GBD region, with developed countries having a greater burden overall. Published studies suggest that individuals of European ancestry have a higher incidence and prevalence of AF. Furthermore, recent reports indicate that higher degree of European ancestry is associated with an increased predisposition to AF.[33] However, part of the global variation in AF epidemiology may also be attributable to better surveillance in developed countries. In the 1990 GBD study, no specific data for AF was reported, but cardiovascular diseases as a group accounted for 9·7% of the global DALYs with ischemic heart disease being the fifth ranking disorder in total number of DALYS (~$47x10^6$) behind lower respiratory infections, diarrheal diseases, perinatal disorders, and unipolar major depression.[34] In 2010, ischemic heart disease moved up to the number one position; with cardiovascular disease accounting for 11·8% of global DALYs. With the exception of Sub-Saharan Africa and Oceania, cardiovascular disease ranked among the top three causes of DALYs in most regions.[20] In keeping with these trends, DALYs related to AF increased by about 18% from 1990 to 2010. Although the absolute DALYs related to AF (about 52 per 100,000 overall) is much lower compared to conditions such as chronic obstructive lung disease (1114 per 100,000), diabetes mellitus (680 per 100,000) and chronic kidney disease (307 per 100,000)[20], as discussed earlier, AF can interact with other diseases in multiple ways, potentially contributing to worse outcomes. The rise of cardiovascular disease burden in developing countries possibly indicates an ongoing transition towards non-communicable diseases, earlier associated more with developed nations. Especially with current, rapidly evolving demographic changes in large population centers of the developing world, the effects of the rising global AF burden

merits careful consideration with respect to distribution of dwindling health care resources. Additionally there is an urgent need to design and deploy effective surveillance strategies for AF that will guide future, WHO-region specific prevention.

Limitations

Our study has several limitations. AF is a heterogeneous condition, and in a subset of individuals can be asymptomatic.[35, 36] Both features underscore the difficulties associated with making accurate estimates of the burden of this disease. Therefore our findings could represent an underestimate. In addition, we note that differences in extent of patient surveillance, including access to health care, use of routine electrocardiograms and assessment of electrical devices such as pacemakers may be contributing to secular trends. We also acknowledge the inability of observational data to accurately estimate the relative importance of various factors contributing to such trends. Moreover, we cannot rule out the possible impact of publication-bias and did not actively seek out unpublished manuscripts or data. Estimation of the mortality associated with AF was performed based on modeling the causes of death using input from all available cause of death data. As with any cause of death analysis, assignment of cause of death may be prone to some misclassification. Further, any inferences about future trends should be made with caution trategies since the rapid development of surveillance and treatment strategies might change mortality and prevalence rates. Due to the low availability of data from several regions, our findings should be interpreted with caution. Regional differences in AF burden do exist, but our observations may not always be a reliable estimate, due to geographical disparity of data density and non-representative population bias, as well as estimates based on imputations. However, even though the need for better estimates particularly in the developing world is crucial, our report likely represents the ‘best available’ data source for global policy and decision making. Targeted population surveillance studies of AF could fill the gaps in data and permit more reliable burden of disease estimates in coming decades.

Conclusion

There have been progressive increases in the worldwide prevalence and incidence of AF with significant effects on associated morbidity and mortality, findings that have implications for public health policy and health care costs. Evidence for geographic variation in AF burden, especially in developing versus developed nations indicates that systematic, global surveillance of AF is required to formulate effective region-specific prevention and treatment strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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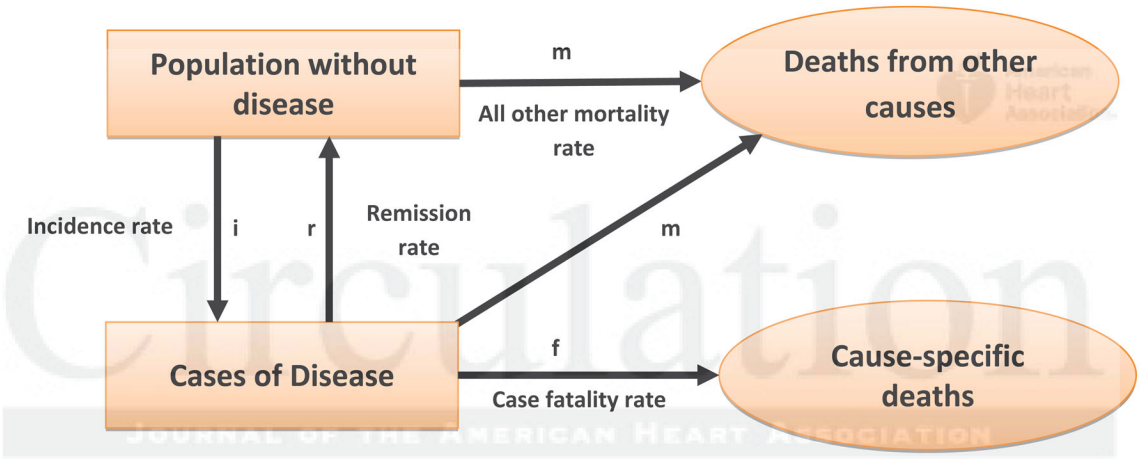

Figure 1.

Conceptual disease model. Flow-chart illustrating the conceptual disease model utilized (DisMod-MR software). The model includes the number of people without the disease (AF in this case), the number of people with the disease, the number of deaths associated with the disease, and the number of deaths from all other causes. The transitions between these states are represented by i: incidence, r: remission, f: case fatality, and m: all other mortality. In the case of AF, remission was assumed to be zero. (Modified from: Barendregt et al. *A generic model for the assessment of disease epidemiology: the computational basis of DisMod II. Popul Health Metr*. 2003 Apr 14; 1:4. Copyright © 2003 Barendregt et al; licensee BioMed Central Ltd.) (AF- Atrial Fibrillation).

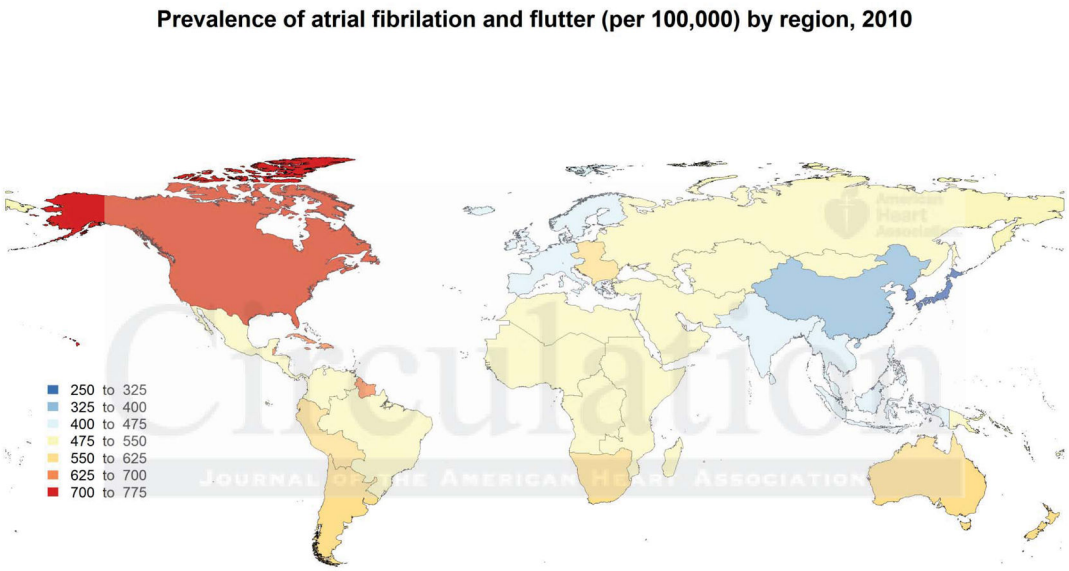

Figure 2.

World Map Showing the Age-adjusted Prevalence rates (per 100,000 population) of AF in the 21 Global Burden of Disease (GBD) regions, 2010 (AF- Atrial Fibrillation).

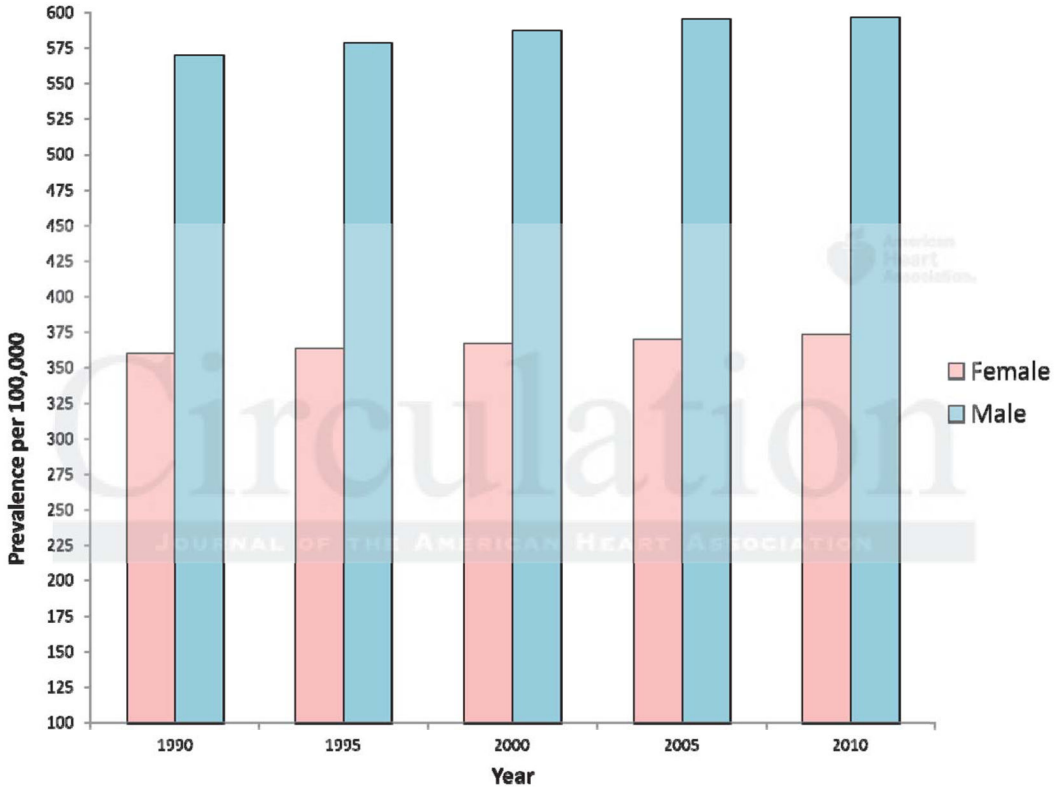

Figure 3.

Prevalence of AF: 1990 to 2010. Estimated age-adjusted global prevalence of Atrial Fibrillation (per 100,000 population) for males and females from 1990 to 2010 (AF- Atrial Fibrillation).

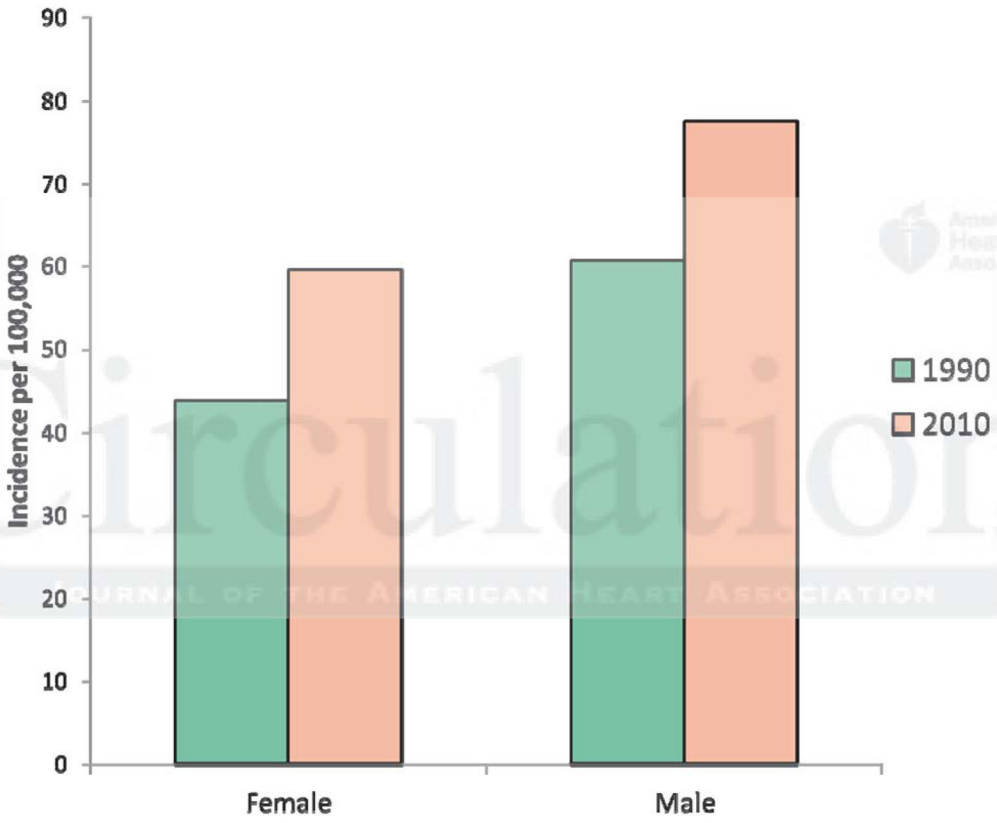

Figure 4.

Incidence of AF: 1990 & 2010. Estimated age-adjusted global incidence (per 100,000 person years) for males and females for 1990 and 2010. (AF- Atrial Fibrillation)

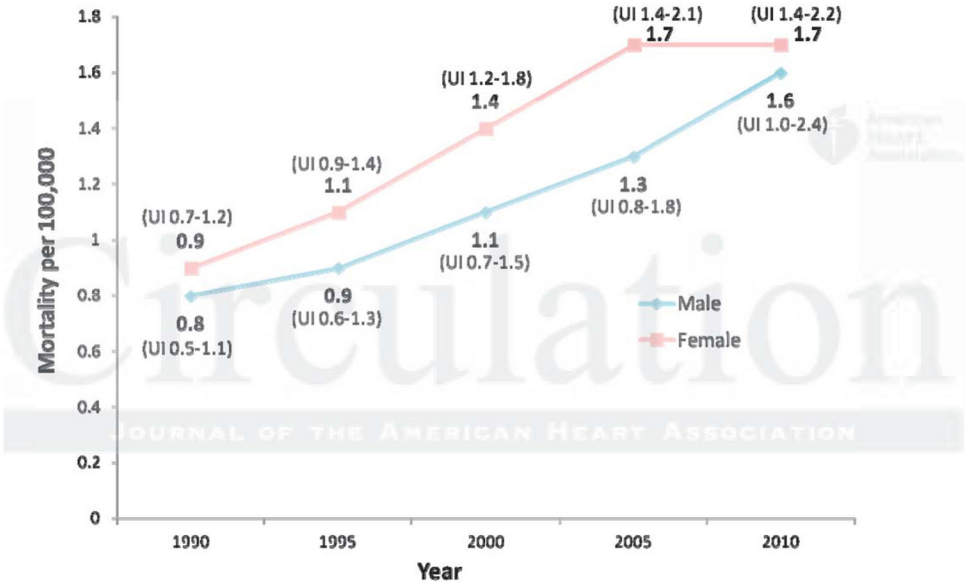

Figure 5.

Mortality Associated with AF: 1990 to 2010. Estimated age-adjusted mortality (per 100,000 population) associated with AF from 1990 to 2010 (AF- Atrial Fibrillation).

Figure 6.

Mortality Associated with AF stratified by sex and type of Region (Developed vs. Developing). Mortality associated with AF was higher in males and females in the Developed regions. The significantly higher mortality in females in the Developing regions is responsible for the overall higher AF-related mortality among females compared to males (AF- Atrial Fibrillation).

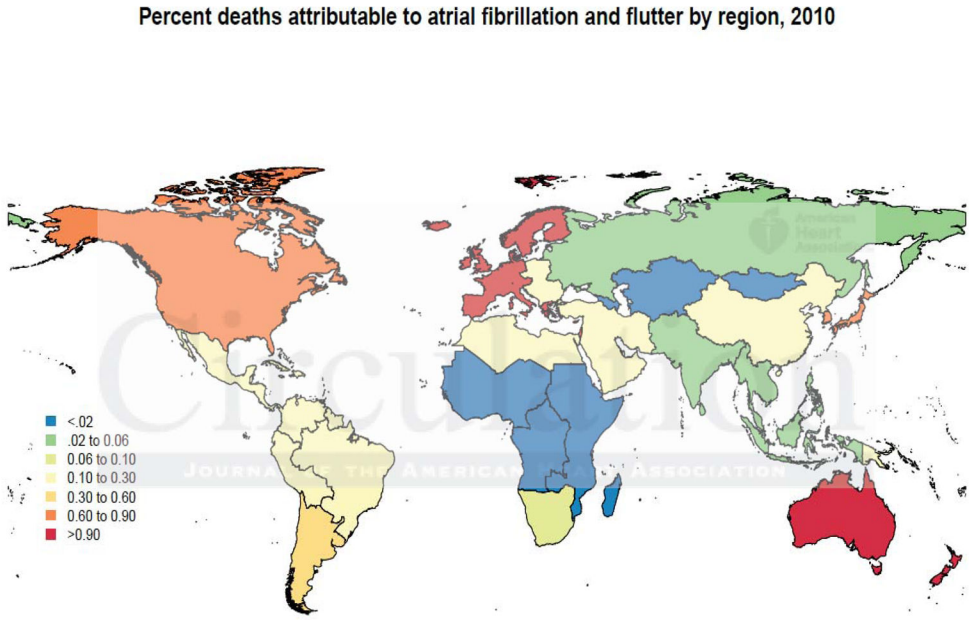

Figure 7.

Proportion of Global deaths Associated with AF in 2010. The map shows color-coded proportions (in percentages) of global deaths in 2010 associated with AF (AF- Atrial Fibrillation)

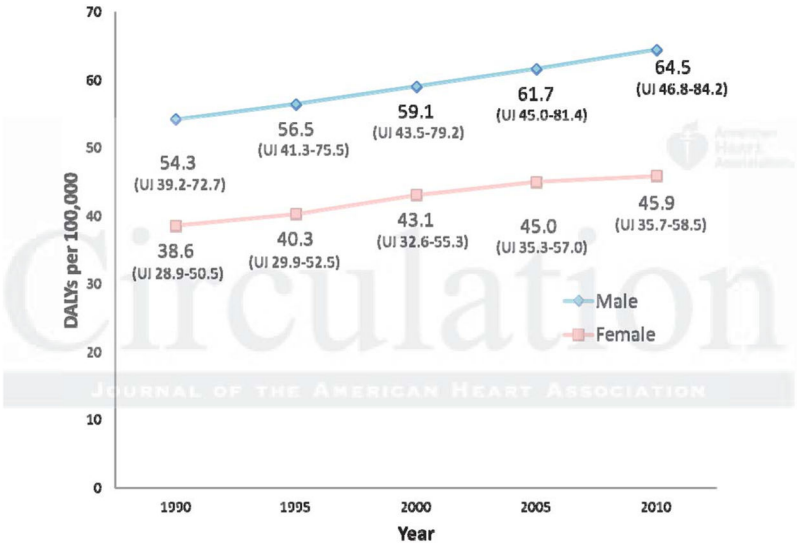

Figure 8.

DALYs Related to AF. Estimated age-adjusted DALYs (per 100,000) related to AF: 1990 to 2010 (AF- Atrial Fibrillation; DALYs- Disability Adjusted Life-Years)

Table 1

Estimated age-adjusted prevalence rates with 95% Uncertainty Intervals of Atrial Fibrillation (per 100,000) for males and females.

Year	1990	1995	2000	2005	2010
			Males		
Global, All Ages	569·5 (532·8–612·7)	578·1 (541·2–620·9)	586·8 (549·8–629·5)	595·1 (557·3–639·0)	596·2 (558·4–636·7)
Age ≥ 35 years	1,307·4 (1,222·5–1,407·3)	1,327·3 (1,243·2–1,425·7)	1,347·6 (1,263·4–1,445·8)	1,366·6 (1,281·0–1,467·1)	1,368·5 (1,280·8–1,462·7)
Developed Countries	608·2 (547·0–693·5)	625·6 (564·0–712·5)	643·1 (580·3–730·2)	660·0 (594·5–740·8)	660·9 (597·1–738·2)
Developing Countries	546·6 (503·0–599·6)	551·1 (506·6–604·8)	555·8 (511·0–610·1)	561·3 (517·5–618·4)	565·7 (522·9–617·6)
			Females		
Global, All Ages	359·9 (334·7–392·6)	363·4 (338·5–395·3)	366·7 (342·0–397·8)	369·6 (345·5–399·9)	373·1 (347·9–402·2)
Age ≥ 35 years	826·5 (768·4–902·3)	834·7 (776·6–909·2)	842·3 (784·7–915·5)	849·0 (792·4–919·6)	856·8 (797·7–923·5)
Developed Countries	362·5 (319·3–422·3)	370·1 (326·7–429·5)	377·5 (334·0–436·8)	385·1 (340·1–446·8)	387·7 (343·8–450·0)
Developing Countries	358·2 (329·8–393·0)	359·0 (330·8–394·0)	359·8 (331·5–395·0)	360·9 (331·6–396·0)	366·1 (337·4–400·8)

Table 2

Estimated age-adjusted incidence rates with 95% Uncertainty Intervals of Atrial Fibrillation (per 100,000 person years) for males and females.

Year	1990	2010
	Males	
Global, All Ages	60·7 (49·2–78·5)	77·5 (65·2–95·4)
Age ≥ 35 years	141·0 (114·6–182·6)	181·2 (152·6–222·8)
Developed Countries	78·4 (67·5–91·9)	123·4 (107·6–141·5)
Developing Countries	50·0 (33·8–76·8)	53·8 (38·7–79·8)
	Females	
Global, All Ages	43·8 (35·9–55·0)	59·5 (49·9–74·9)
Age ≥ 35 years	102·0 (83·9–127·9)	139·7 (117·1–175·3)
Developed Countries	52·8 (45·0–62·9)	90·4 (77·8–104·5)
Developing Countries	36·0 (24·5–54·7)	40·0 (27·2–62·6)

Table 3

Estimated age-adjusted mortality rates with 95% Uncertainty Intervals (per 100,000) associated with Atrial Fibrillation for males and females.

Year	1990	1995	2000	2005	2010
			Males		
Global, All Ages	0·8(0·5–1·1)	0·9(0·6–1·3)	1·1(0·7–1·5)	1·3(0·8–1·8)	1·6(1·0–2·4)
Age ≥ 35 years	1·9(1·3–2·8)	2·2(1·4–3·1)	2·7(1·7–3·6)	3·2(2·0–4·4)	3·8(2·4–5·8)
Developed Countries	1·3(0·9–1·9)	1·6(1·1–2·2)	2·0(1·3–2·7)	2·3(1·6–3·2)	2·7(1·9–4·3)
Developing Countries	0·4(0·2–0·8)	0·4(0·2–0·8)	0·5(0·3–0·9)	0·6(0·3–1·1)	0·7(0·4–1·3)
			Females		
Global, All Ages	0·9(0·7–1·2)	1·1(0·9–1·4)	1·4(1·2–1·8)	1·7(1·4–2·1)	1·7(1·4–2·2)
Age ≥ 35 years	2·2(1·8–3·0)	2·7(2·2–3·4)	3·5(2·8–4·4)	4·0(3·4–5·0)	4·2(3·4–5·4)
Developed Countries	1·1(1·0–1·3)	1·4(1·2–1·6)	1·9(1·7–2·2)	2·3(2·0–2·7)	2·4(2·0–3·0)
Developing Countries	0·7(0·4–1·4)	0·8(0·4–1·4)	0·9(0·5–1·5)	0·9(0·6–1·6)	1·0(0·6–1·7)

Table 4

Estimated age-adjusted DALYs with 95% Uncertainty Intervals (per 100,000) associated with Atrial Fibrillation for males and females.

Year	1990	1995	2000	2005	2010
			Males		
Global, All Ages)	54·3 (39·2–72·7)	56·5 (41·3–75·5)	59·1 (43·5–79·2)	61·7 (45·0–81·4)	64·5 (46·8–84·2)
Age ≥ 35 years	125·2 (90·5–167·1)	130·4 (95·8–174·0)	136·6 (100·9–182·7)	142·6 (104·1–188·0)	149·3 (108·7–194·5)
Developed Countries	63·4 (47·2–83·9)	67·8 (50·7–89·5)	72·8 (54·7–94·9)	77·2 (58·4–100·5)	81·5 (60·8–106·2)
Developing Countries	48·2 (33·3–65·6)	49·2 (34·5–67·8)	50·6 (35·6–69·4)	52·2 (36·4–70·9)	54·5 (37·7–73·2)
			Females		
Global, All Ages	38·6 (28·9–50·5)	40·3 (29·9–52·5)	43·1 (32·6–55·3)	45·0 (35·3–57·0)	45·9 (35·7–58·5)
Age ≥ 35 years	89·3 (67·1–116·6)	93·5 (69·5–121·2)	100·2 (76·1–128·2)	104·6 (82·3–132·1)	106·8 (82·9–135·8)
Developed Countries	39·6 (30·0–51·8)	42·6 (32·5–54·7)	47·0 (36·9–59·9)	50·1 (40·0–63·2)	51·0 (39·8–63·7)
Developing Countries	37·0 (26·3–49·5)	37·6 (26·6–51·3)	38·9 (27·8–53·2)	39·8 (29·2–52·5)	41·1 (30·5–54·4)

DALYs- Disability Adjusted Life Years