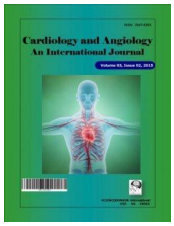

Cardiology and Angiology: An International Journal
4(2): 51-60, 2015, Article no.CA.2015.027
ISSN: 2347-520X

SCIENCEDOMAIN *international*
www.sciencedomain.org

Congestive Heart Failure among the Libyan Population (North Africa); A Community Based Survey of Risk Factors and Complication

Mohamed Kaled A. Shambesh[1*], Taher Mohamed Emahbes[1], Zeinab Elmehdi Saleh[1], Iman Mohamed Shambesh[2] and Malik Abdurrazag A. Elosta[3]

[1]Department of Community Medicine, Faculty of Medicine, University of Tripoli, Libya.
[2]Department of English, Faculty of Education, University of Tripoli, Libya.
[3]CELTA, American Star Books, Headquartered in Frederick, Maryland, USA.

Authors' contributions

This work was carried out in collaboration between all authors. Author IMS designed the study, wrote the protocol. Authors MKAS and ZES wrote the first draft of the manuscript. Author TME managed the literature searches and help in discussion writing. Author MKAS done the analyses of the study with help of statisticians. Authors MAAE and IMS was done the English editing. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CA/2015/19203
Editor(s):
(1) Obinna Ikechukwu Ekwunife, Department of Clinical Pharmacy and Pharmacy Management, Nnamdi Azikiwe University Awka, Anambra State, Nigeria.
Reviewers:
(1) Dmitry Napalkov, Moscow State Medical University, Russia.
(2) Alexander Berezin, Medical University, Zaporozhye, Ukraine.
Complete Peer review History: http://sciencedomain.org/review-history/10073

Original Research Article

Received 29th May 2015
Accepted 23rd June 2015
Published 7th July 2015

ABSTRACT

Congestive Heart failure (CHF) is a very common medical disorder and a major health problem in Libya. CHF is associated with an increase in the risk of stroke and hospitalization.
Objectives: To estimate and describe the main risk factors and complications of CHF among people with a particular interest in Libyan community.
Methodology: This project is classified as a community based descriptive cross-sectional study using the CHADS2 questionnaire as well as the local Libyan classification called the Community Stroke Risk Classification (CSRC).
Area; North Africa (North of Libya, the capital Tripoli).
Time; five years from 2010-2014

**Corresponding author: E-mail: mkshambesh@yahoo.com;*

Population: Convenient sampling was done from a large cohort of individuals living in the Libyan community. 7497 individuals were screened for risk factors of stroke. CHF was one such factor which was studied in detail among the sample population and was diagnosed by taking detailed histories (including treatment), medical examinations and previous hospital confirmations.
Results: The prevalence of CHF among our participants (7497 individuals) was 15.2% (1139 patients) among the sample population as a total with males and females being 51.2% and 48.8% respectively (P=0.87). Among different age groups, females had higher rates than the males except for age interval from 60 to 79 where males had higher rates. The male to female ratio among the total population screened for CHF was 7.8%: 7.4% (583:556 respectively with males being higher).
CHF prevalence increased with the progress of age, with higher rates among age groups of over 40 (P <0.0001).
68.3% of CHF patients had hypertension (778 patients), 54.3% had DM (618 patients), 38.7% had transient ischemic attach (TIA) (441 patients), 27.2% had atrial fibrillation (AF) (310 patients), 25.9% had prior stroke (PS) (295 patients), All of these risk factors accompanying CHF increased with age (P<0.0001).
99.92% of CHF patients had risk points of stroke in CHADS2 scores (0.08% had no risk points), from whom 27.1% had intermediate scores (1-2 Risk Points) and 72.9% had high scores (≥3 risk points) (P<0.0001).
Results of the CSRC scores showed that 99.91% had risk factors of stroke (0.09% had no risk factors), from whom 29.5% had intermediate scores (1-2 Risk Factors) and 70.5% had high scores (≥3 risk factors) (P<0.0001).
Conclusion: CHF is a major risk factor of stroke among the Libyan population in North Africa of whom had very high CHADS2 risk scores. These scores are defined as a combination of six different risk points; 0 points being low risk, 1-2 being intermediate, and a score of 3 or more risk points is defined as being high risk. CHF appeared to dominate the high scores (≥3 risk points). Almost all CHF patients had risk factors of stroke on the CSRC scoring system of whom expressed intermediate and high scores with a significant proportion of high scores (≥3 risk factors of stroke). Hypertension, DM, AF and being aged of over 40 years were very important risk factors contributing to CHF. Both genders of male and female had similar chances of developing CHF in the Libyan community. CHADS2 & CSRC classification scores are very useful and simple tools to be used to classify and describe the risk factors of stroke in populations living within a community.

Keywords: CHF; stroke; prevalence; risk factors; risk points; classification; community; CHADS2; CSRC; Africa; Libya.

ABBREVIATIONS

AF : Atrial Fibrillation
HT : Hypertension
DM : Diabetes Mellitus
CHF : Congestive Heart Failure
TIA : Transient Ischemic attack
PS : Prior Stroke
WHO : World Health Organization
CDC : Centers of Disease Control
CSRC : Community Stroke Risk Classification
RF : Risk Factor
RP : Risk Points

1. INTRODUCTION

Congestive Heart failure is a common, costly, and potentially fatal condition [1]. In developed countries, around 2% of adults have heart failure and in individuals over the age of 65, this risk increases to 6–10% [1,2]. In the following year after diagnosis of CHF, the risk of death is about 35% after which it decreases to below 10% each year afterwards [2]. This is similar to the risks with a number of types of cancer [3]. In the United Kingdom, this illness is the reason for 5% of emergency hospital admissions [3].

Common causes of heart failure are usually comprised of coronary artery disease including a previous myocardial infarction (heart attack), high blood pressure, atrial fibrillation, valvular heart disease, and cardiomyopathy [1,3].

Men have a higher incidence of heart failure than women, but the overall prevalence rate is similar in both sex, since women survive longer after the onset of heart failure [4]. Women tend to be older when diagnosed with heart failure (after menopause), they are more likely than men to have diastolic dysfunction, and seem to experience a lower overall quality of life than men after diagnosis [4].

Heart failure is associated with high health expenditures, mostly because of the cost of hospitalizations; costs have been estimated to amount to 2% of the total budget of the National Health Service in the United Kingdom, and more than $35 billion in the United States [5,6].

Heart failure is the leading cause of hospitalization in people older than 65 years of age [7]. In developed countries, the mean age of patients with heart failure is 75 years old. In developing countries, two to three percent of the population have heart failure but the rate rises dramatically to 20-30% in those 70 to 80 years old [7].

More than 20 million people have heart failure worldwide [8,9]. The prevalence and incidence of heart failure is increasing, mostly because of increasing longer life spans, but also because of a higher prevalence of risk factors (hypertension, diabetes, dyslipidemia, and obesity) and improved survival rates from other types of cardiovascular disease (myocardial infarction, valvular disease, and arrhythmias) [9,10].

In the United States, heart failure affects 5.8 million people, and each year 550,000 new cases are diagnosed [8]. In 2011, congestive heart failure was the most common reason for hospitalization for adults aged 85 years and older, and the second most common for adults aged 65–84 years [11].

Heart failure is much higher in African Americans, Hispanics, Native Americans and recent immigrants from the eastern bloc countries like Russia. This high prevalence in these ethnic minority populations in the U.S. has been linked to an increasing incidence of diabetes and hypertension. In many new immigrants to the U.S., the high prevalence of heart failure has largely been attributed to lack of preventive health care or substandard treatment [12].

Nearly one out of every four patients (24.7%) hospitalized in the U.S. with congestive heart failure are readmitted within 30 days [12]. Additionally, more than 50% of patients seek re-admission within 6 months after treatment and the average duration of hospital stay is 6 days.

Congestive heart failure is the leading cause of hospital readmissions in the U.S. In a study of 18 States, Medicare patients aged 65 and older were readmitted at a rate of 24.5 per 100 admissions in 2011. In the same year, Medicaid patients were readmitted at a rate of 30.4 per 100 admissions, and uninsured patients were readmitted at a rate of 16.8 per 100 admissions. These are the highest readmission rates for both patient categories. Notably, congestive heart failure was not among the top ten conditions with the most 30-day readmissions among the privately insured [13].

In 2011, non-hypertensive congestive heart failure was one of the ten most expensive conditions seen during inpatient hospitalizations in the U.S., with aggregate inpatient hospital costs of more than $10.5 billion [14].

In tropical countries, the most common cause of HF is valvular heart disease or a type of cardiomyopathy. As underdeveloped countries have become more affluent, there has also been an increase in the incidence of diabetes, hypertension and obesity, which have in turn raised the incidence of heart failure [13].

As CHF research studies in Libya are seldom, this study was done to find the most important risk factors of CHF and to describe the role of CHF as one of the most important conditions associated with cerebovascular accidents among populations living in a community.

2. OBJECTIVES

This study was done to find the most important risk factors of CHF and to describe the role of CHF as one of the most important conditions associated with Cerebovascular accidents among a population living in a community by using both CHADS2 and the Community Stroke Risk Classification (CSRC) scoring systems.

3. METHODOLOGY

Study was a community based descriptive, cross-sectional study.

3.1 Populations

Individuals who are 16 years old or above.

3.2 Population Sample

Sampling was done from a large cohort of individuals living in a community. 7497 individuals were screened by Shambesh et al. [15] looking for risk factors of stroke.

3.2.1 Sample size calculation

Results were obtained by Epi-Info statistic package USA version-6, calculating the sample size of the descriptive cross section survey for convenient sampling; using the Tripoli population size of 2.000.000 and an expected CHF frequency of 20% [13], the calculated sample size by this system was 7.000 which was used in our sampling model (7497) (with an 80% confidence level).

3.3 Area

North Africa, Mediterranean area of Libya (Tripoli the Capital).

3.4 Time

Five years from 2010-2014.

3.5 Method of Survey

3.5.1 Using CHADS2 questionnaire

Individuals were interviewed using CHADS2 questionnaires which is usually used to assess stroke risk in patients with atrial fibrillation [16], and was adapted in this study to be used among a population without AF as it had been used in other studies elsewhere [17]. Additionally, the local Libyan classification of stroke risk factors was also used in this study (known as the Community Stroke Risk Classification-CSRC which was created to be used for the first time in Libya by Shambesh et al. [15]. CHADS2 scores are derived from the sum of point values of individual stroke risk factors {congestive heart failure (CHF), hypertension (HT), age≥ 70, diabetes (DM) (1 point each), and prior stroke or transient ischemic attack (2 points) (Table 1). The CHADS2 scoring table which, shown below, adds together the points that correspond to the condition, representing the result as a CHADS2 score which is used to estimate stroke risk as follows:

Score Zero points = No risk = Low Risk Score
Score 1 & 2 points = Intermediate Risk Score
Score ≥3 points = High Risk Score

Table 1. Showing CHADS2 score questionnaire used in the study

Condition	Points
C: Congestive heart failure	1
H: Hypertension	1
A: Age ≥70	1
D: DM	1
S: Prior Stroke or TIA	2

3.5.2 Community stroke risk classification-CSRC

This classification depends on a calculation on a number of risk factors (RF), each risk factor used in the study (age ≥ 70, DM, Hypertension, CHF, TIA and prior stroke) was given a value (number) for each condition and applied to each individual who participated. The score is a result of summation of those risk factors as shown in Table 2.

3.6 Field Survey

The sampling method was convenient, doctors working in the community and family medicine department were trained by professionals to collect data using CHADS2 questionnaires and CSRC scores by interviewing individuals about their families and relatives, by taking a detailed history (present, past, medical, hospital admission), checking of any available investigations, discharge letters and medical reports as well as doing medical examinations. Known cases of DM, hypertension, CHF, AF, TIA and prior strokes had been established by previous medical diagnoses by hospital specialists. CHF was diagnosed through histories (treatments taken), medical examinations and previous hospital confirmations.

Table 2. Showing CSRC score used in the study

Level	Score	No. of Risks
Low risk score	Score of zero	No risk factors
Intermediate risk score-1	Score of one	One risk factor
Intermediate risk score-2	Score of two	Two risk factors
High risk with a score 3. Subdivided to:		
High risk score-3	Score three	Three risk factors
High risk score-4	Score four	Four risk factors
High risk score-5	Score five	Five risk factors
High risk score-6	Score six	Six risk factors

3.7 Statistical Analysis

This step was done by statisticians who scored the CHADS2 and CSRC grades by the statistical package of social sciences (SPSS) version 19-USA. Data was calculated and described by using mean, mode, standard deviation, cross tabulations and graphical presentations. "T" student test for independent samples of numerical data were used with Chi-square analysis for categorized data.

4. RESULTS

4.1 Congestive Heart Failure (CHF) Prevalence

The prevalence of CHF among our participants (7497 individuals) in this study done by Shambesh et al. [15] was 15.2% (1139 patients). Males and females expressed a similar prevalence in individuals known to have CHF in this study (51.2% and 48.8% respectively) (P=0.87). Among different age groups, females had higher rates than males except for age interval from 60 to 79 where males had higher rate as shown in Table 3 and Fig. 1.

Males had a slightly higher rate of prevalence than females but was not considered to be significant among the total population screened (P=0.51). (7.8%:7.4%, 583:556 respectively). CHF prevalence increased with the progress of age, with higher rates among age groups of over 40 (P <0.0001) Fig. 1.

4.2 CHF and Hypertension

68.3% of CHF patients had hypertension (778 patients), of whom 48.9% were males and 51% female (P=0.87) with the rate of CHF increasing with the progress of age (P<0.0001).

4.3 CHF and Diabetes Mellitus (DM)

54.3% of CHF patients had DM (618 patients), of whom 50.6% were males and 49.4% female (P=0.87) with the rate of CHF increasing with the progress of age (P<0.0001).

Table 3. Showing CHF age/sex structure

Sex	10-19	20-29	30-39	40-49	50-59	60-69	70-79	>80
Male	2	10	24	58	86	158	159	86
Female	0	21	27	64	97	108	148	91
Total	2 (0.17%)	31 (2.7%)	51 (4.5%)	122 (10.7%)	183 (16%)	266 (23.4%)	307 (27%)	177 (15.5%)

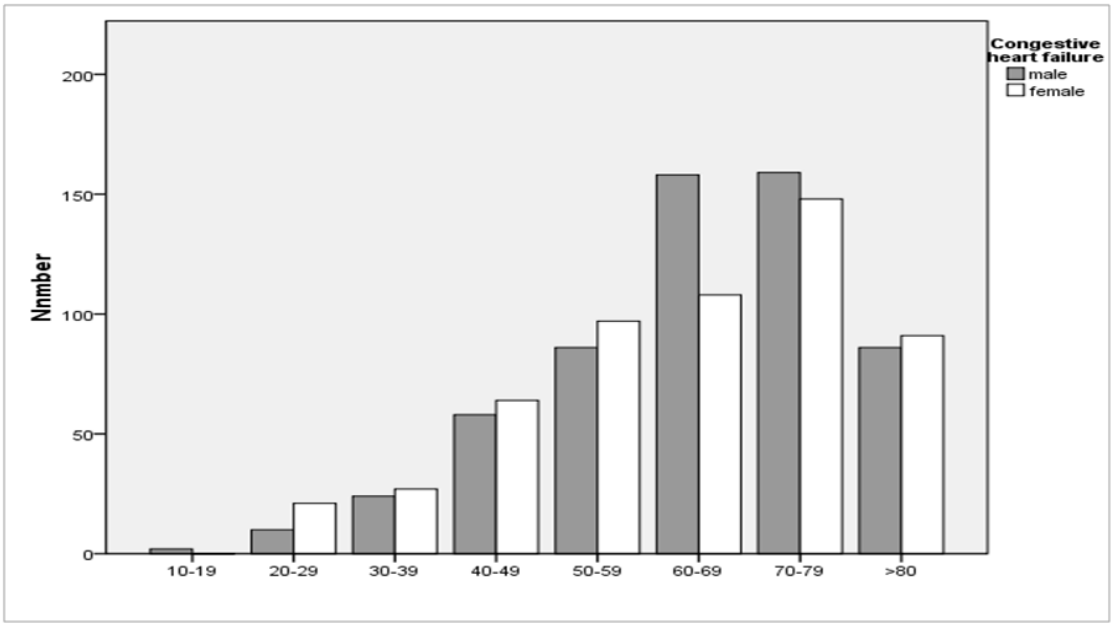

Fig. 1. Showing CHF age/sex structure

4.4 CHF and Atrial Fibrillation (AF)

27.2% of CHF patients had AF (310 patients), of whom 50.3% were males and 49.7% female (P=0.87) with the rate of CHF increasing with the progress of age (P<0.0001).

4.5 CHF and Transient Ischemic Attack (TIA)

38.7% of CHF patients had TIA (441 patients), of whom males displayed a significantly higher proportion (56.7%) than females (43.3%) (P<0.0001), with the rate of TIA increasing with the progress of age (P<0.0001).

4.6 CHF and Prior Stroke (PS) (Embolic or Hemorrhagic)

25.9% of CHF patients had PS (295 patients) of whom 50.2% were males and 49.8% female (P=0.87) with the rate of CHF increasing with the progress of age (P<0.0001).

4.7 CHF and CHADS2 Scores

The CHADS2 scores work with points; the higher the points (P) the higher the risk (R) score for stroke. CHF patients showed that 99.92% had risk points of stroke (0.08% had no risk points), of whom 27.1% had intermediate scores (1-2 Risk Points) and 72.9% had high scores (≥3 Risk Points) (Table 4 and Fig. 2).

These results found almost all CHF patients had risk factors of stroke with an emphasis in intermediate and high scores (1-6 risk points), with particular significance in the high scores (P<0.0001).

4.8 CHF and Community Stroke Risk Classification Score (CSRC)

CSRC works with a number of risk factors (RF), the higher the number of risk factors, the higher the stroke risk. 99.91% of CHF patients had risk factors of stroke (0.09% had no risk factors), of whom 29.5% had intermediate scores (1-2 Risk Factor) and 70.5% had high scores (≥3 Risk Factors) (Table 5 and Fig. 3).

These results found that almost all CHF patients had risk factors of stroke with an emphasis in intermediate and high scores (1-6 risk points), with particular significance in the high scores (P<0.0001).

Table 4. Showing CHADS2 score among CHF patients

Score	No.	%
Low	2	0.08
Intermediate-1	91	8
Intermediate-2	217	19
High-3	262	23
High-4	261	23
High-5	220	19
High-6	86	8

Table 5. Showing CSRC score among CHF patients

Score	No.	%
low risk NF	1	0.01
intermediate risk 1F	91	7.9
intermediate risk 2F	245	21.5
high risk 3F	336	29.5
high risk 4F	272	23.9
high risk 5F	149	13.1
high risk 6F	45	3.9

5. DISCUSSION

This study confirms that CHF is a very important public health problem among the Libyan population. The prevalence of CHF was found to be very high (15.2%) which agreed with very few studies done previously in Libya [18,19].

Congestive Heart failure is a common and potentially fatal condition [1]. In developed countries, around 2% of adults have heart failure and in those over the age of 65, this proportion increases to 6–10% [1,2], These numbers in developed countries are very low when compared to the prevalence of CHF in this present study could be attributed to socio-economic status differences and low public health services in developing countries like Libya.

Worldwide reports show that men have a higher incidence of heart failure than women, but the overall prevalence rate is similar in both sexes since women survive longer after the onset of heart failure [4]. Our results showed the same in terms of the overall prevalence which was similar among males and females with the exception of males dominating over the age group between 50 to 79 years old.

This study confirmed that CHF increases with the progress of age. Hence, the increase in stroke prevalence among older ages was also reported by other studies done in USA [11].

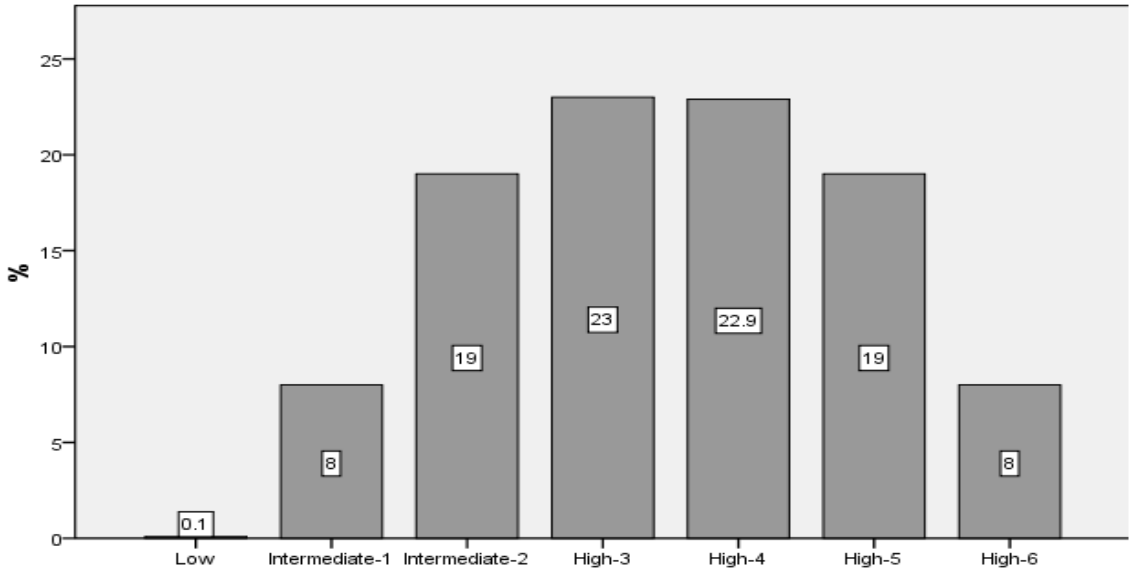

Fig. 2. Showing CHADS2 score among CHF patients

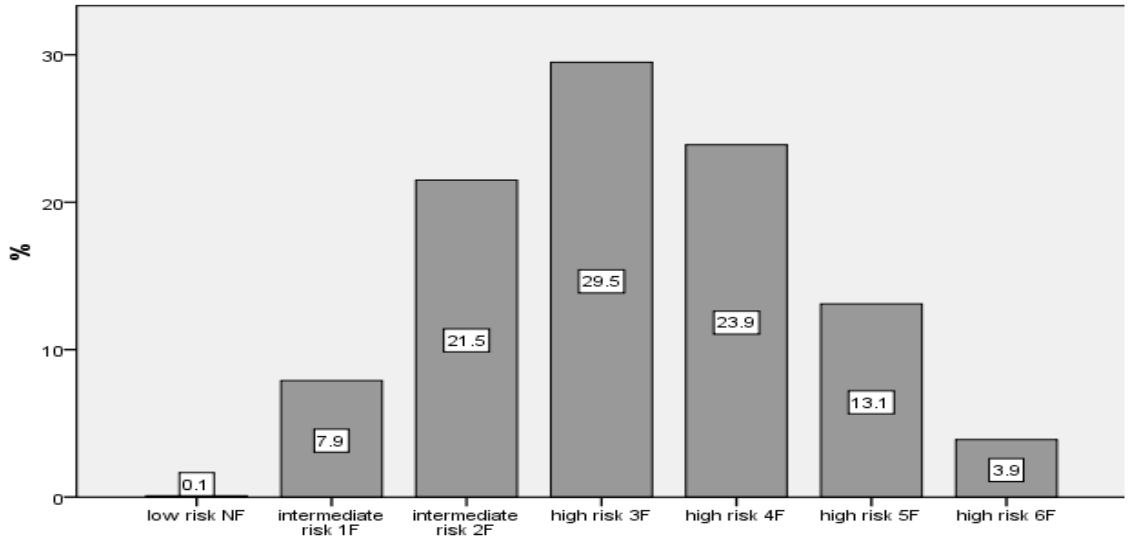

Fig. 3. Showing CSRC score among CHF patients

The prevalence and incidence of heart failure are increasing in Libya and other parts of the world, mostly because of increasing longer life spans, but also because of an increased prevalence of risk factors (hypertension, diabetes, dyslipidemia, and obesity) and improved survival rates from other types of cardiovascular disease (myocardial infarction, valvular disease, and arrhythmias) [9,10].

In developed countries, the mean age of patients with heart failure is 75 years old. In developing countries, two to three percent of the population have heart failure, but in those demographics of 70 to 80 years of age, occurrence dramatically increases to 20–30 percent [7], all these findings were confirmed to be present among the Libyan population and confirmed by results of the present study.

Risk factors of stroke in Libya are multiple and complex. Libyan population surveys done in 2001, showed obesity prevalence at 32.7%, only 18% of the study population were performing

exercise and 45% were smokers of whom 99.3% were male [18]. A survey done in 2009 showed that only 12.4% of the study population as having a daily healthy diet, only 22.6% of the population having daily exercise, 63.5% were obese, 20% having high cholesterol and 25% were smokers [19]. These reports in Libya showed that such risk factors may play a role in the increase of CHF prevalence and hence accelerated cerebrovascular accidents rates among the Libyan population.

Hypertension, ischemic heart disease, diabetes mellitus, smoking and hypercholesterolemia are well-known risk factors for stroke [20]. The Oxfordshire community stroke project study in the United Kingdom showed that risk factors for cerebral infarction were present in 80% of cases, hypertension in 52%, ischemic heart disease in 38%, peripheral vascular disease in 25%; cardiac lesions resulting in a major potential source of emboli to the brain in 20% and diabetes mellitus in 10% [20]. Our study results also confirmed such reports that CHF is a major risk factor for stroke but the stroke prevalence in Libya among CHF (15.2%) was more than that of the United Kingdom, and this may be explained by the increase in rates of CHF in developing countries in Africa like Libya following the trend of urbanization and lifestyle changes, including a "Western-style" diet [21].

Several articles have reported stroke incidence in Arab and North African countries: Kuwait, Saudi Arabia, Qatar, Libya and Bahrain. The incidence varied from the lowest of 27.5 per 100,000 population per year in Kuwait to highest of 63 per 100,000 population in Libya. The most frequent stroke type is ischemic. Stroke increased with age affecting older patients, with males being more affected than females. Hypertension was the most frequent risk factor, followed by DM, hyperlipidemia, cardiac diseases and cigarettes smoking [22]. Our study results confirmed that all these stroke results were reviewed in previous Arab articles with particular relation to CHF as one of the leading factors. Also these reports imply that Arab countries constitute populations with similar lifestyles and diet that may influence CHF risk and stroke risk, type and survival after stroke [22,23].

Mortel et al. [24] reported that CHF is the third risk factor for stroke, followed by hypertension, DM and smoking, which were also shown by the results of this study and by Shambesh et al. [15], where DM & hypertension are leading risk factors followed by CHF.

CHF and stroke among patients in Libya is high and this can be explained by reports done in the United states, which showed that heart failure is much higher in African Americans, Hispanics, Native Americans and recent immigrants to the U.S. from the eastern bloc countries like Russia and Africa. The high prevalence of heart failure in these ethnic populations has been linked to a high incidence of diabetes and hypertension which were also confirmed by the results of this study. In regards to many new immigrants to the U.S., the high prevalence of heart failure has largely been attributed to lack of preventive health care or substandard treatment [12] which could be a major cause of CHF and stroke prevalence presented by this study among the Libyan population.

As Libya is located near the tropical countries where the most common cause of CHF is valvular heart disease or some type of cardiomyopathy and is classified as an underdeveloped country, it has become more affluent, therefore has also witnessed an increase in the incidence of diabetes, hypertension and obesity, which has in turn raised the incidence of heart failure [13].

This study confirmed that Hypertension, DM, AF and being of over 40 years of age were very important risk factors of CHF and that CHF is third to hypertension and DM as the most frequent risk factor of stroke among Libyans and this was also found to be true in other studies in Arab countries [22], in the Middle East and North Africa [23].

Finally, this study confirmed that CHF widely affects the Libyan population which constitutes a very important public health problem.

6. CONCLUSION

This study concluded that CHF is indeed a major public health problem in Libya. CHF is a major risk factor associated with stroke. Moreover, stroke risk factors such as Hypertension, DM and previous history of stroke or transient ischemic attack are higher among CHF patients. Hypertension, DM, AF and being of over 40 years of age were very important risk factors of CHF. CHF prevalence was similar among males and females but increased significantly with the progress of age.

Additionally, both CHADS2 & CSRC classification scores are very useful, easy to use

and simple tools which are used to estimate, describe and classify the risk factors of stroke in a population living in a community based on studies of having CHF or not.

7. STRENGTHS & LIMITATIONS OF THE STUDY

It is the first Libyan community based study to use CHADS2 & CSRC questionnaires to assess stroke risk factors among those who have hypertension. The limitations of this type of study as being a cross-sectional descriptive one explore associations, not causation. But as it uses a large sample size, the results produced thus should reflect the real situation in the Libyan community. Also because data was used on a huge scale and took a long time to be collected (more than five years), the study was affected by the loss of follow up from physicians working in the field of research and also by the loss of interest of residents in some areas.

8. RECOMMENDATIONS

To do other studies in order to measure CHF risk factors by using laboratory investigations and other medical diagnostic procedures. In conclusion, to estimate the most accurate and true rates especially in other parts of Libya like the North-East and South.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this paper and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all research steps have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. McMurray JJ, Pfeffer MA. Heart failure. Lancet. 2005;365(9474):1877–89.
2. Dickstein K, Cohen-Solal A, Filippatos G, et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: the task force for the diagnosis and treatment of acute and chronic heart failure 2008 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association of the ESC (HFA) and endorsed by the European Society of Intensive Care Medicine (ESICM). Eur. Heart J. 2008;29(19): 2388–442.
3. Chronic Heart Failure: National Clinical Guideline for Diagnosis and Management in Primary and Secondary Care: Partial Update. National Clinical Guideline Centre: 2010;19–24. PMID 22741186.
4. Strömberg A, Mårtensson J. Gender differences in patients with heart failure. Eur. J. Cardiovasc. Nurs. 2003;2(1):7–18.
5. Stewart S, Jenkins A, Buchan S, McGuire A, Capewell S, McMurray JJ. The current cost of heart failure to the National Health Service in the UK. Eur. J. Heart Fail. 2002; 4(3):361–71.
6. Rosamond W, Flegal K, Furie K, et al. Heart disease and stroke statistics-2008 update: A report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 117. 2008;4:e25–146.
7. Krumholz HM, Chen YT, Wang Y, Vaccarino V, Radford MJ, Horwitz RI. Predictors of readmission among elderly survivors of admission with heart failure. Am. Heart J. 2000;139(1 Pt 1):72–7.
8. Bui AL, Horwich TB, Fonarow GC. Epidemiology and risk profile of heart failure. Nature Reviews Cardiology. 2011; 8(1):30–41.
9. Mann DL, Chakinala M. Harrison's principles of internal medicine: Chapter 234. Heart Failure and Cor Pulmonale. (18th ed.). New York: McGraw-Hill; 2012. ISBN 978-0071748896.
10. Goldman Lee. Goldman's Cecil Medicine: Heart Failure (Ch 58, 59) (24th ed.). Philadelphia: Elsevier Saunders. 2011; 295–317. ISBN 1437727883.
11. Pfuntner A, Wier LM, Stocks C. Most Frequent Conditions in U.S. Hospitals. HCUP Statistical Brief #162. September 2013. Agency for Healthcare Research and Quality, Rockville, MD; 2011.

12. Elixhauser A, Steiner C. Readmissions to U.S. Hospitals by Diagnosis, 2010. HCUP Statistical Brief #153. Agency for Healthcare Research and Quality; 2013.
13. Hines AL, Barrett ML, Jiang HJ, and Steiner CA. Conditions With the Largest Number of Adult Hospital Readmissions by Payer, 2011. HCUP Statistical Brief #172. Rockville, MD: Agency for Healthcare Research and Quality; 2014.
14. Torio CM, Andrews RM, Rockville MD. National Inpatient Hospital Costs: The Most Expensive Conditions by Payer, 2011. HCUP Statistical Brief #160. Agency for Healthcare Research and Quality; 2013.
15. Shambesh M, Emahbes T, Saleh Z, Franks E, Bosnena O. Community based study of cerebrovascular risk factors in Tripoli-Libya (North Africa). Journal of Scientific Research and Reports. 2015; 6(6):451–60.
16. Skanes A, Healey J, Cairns J, Dorian P, Gillis A, McMurtry M, et al. Focused 2012 update of the Canadian Cardiovascular Society atrial fibrillation guidelines: recommendations for stroke prevention and rate/rhythm control. Can J Cardiol. 2012;28:125–36.
17. Morillas P, Pallarés V, Fácila L, Llisterri JL, et al. The CHADS2 score to predict stroke risk in the absence of atrial fibrillation in hypertensive patients aged 65 years or older. Rev Esp Cardiol (Engl Ed). 2014; 1-7.
18. Bony AM, Sasi AA, Bacuch MM, Elmshergy A. Risk factors of hypertension in Libya. National Research Institute. 2001;1-32
19. Tamer HE, Al-Shref EA, Imsalem OR, et al. Survey of risk factors of non-communicable diseases in Libya. Ministry of Health Report. 2009;1-48
20. Sandercock PA, Warlow CP, Jones LN, et al. Predisposing factors for cerebral infarction: the Oxfordshire community stroke project. BMJ. 1989;298:75-80.
21. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27(5):1047–53.
22. Benamer HT, Grosset D. Stroke in Arab countries: A systematic literature review. J Neurol Sci. 2009;(jns-10981):1-6.
23. Tran J, Mirzaei M, Anderson L, et al. The epidemiology of stroke in the Middle East and North Africa. J Neurol Sci. 2010;(jns-11401):1-3.
24. Mortel KF, Meyer JS, Sim PA, et al. Diabetes mellitus as a risk factor for stroke. South Med J. 1990;83:904-11.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/10073