STROKE RISK CLASSIFICATION BY CHADS2 SCORE IN COMMUNITY POPULATION IN ABSENCE OF ATRIAL FIBRILLATION

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ABSTRACT

CHADS2 score is a proven, simply calculated, essential tool for estimating cardioembolic risk (mainly stroke) in patients with nonvalvular atrial fibrillation (AF). The CHADS2 score is used in clinical practice to guide decisions regarding antiplatelet and anticoagulation therapy. The study aimed to evaluat the performance of the CHADS2 score & Community Stroke Risk Classification (CSRC) to classify stroke risk factors in population without AF. This study was conducted as a community based descriptive cross-sectional study in North Africa (North West of Libya), among individuals living in Tripoli area "the capital". It was done by Department of Community & Family Medicine, Faculty of Medicine, University of Tripoli. Duration of the study was five years from 1/1/2010 to 31/12/2014. Data was collected using CHADS2 and CSRC scores; Total of 7497 individuals (52.8% males & 48.2% females) were interviewed by taking detailed histories (present, past, medical, hospital admission), checking of any available investigations, discharge letters and medical reports and perform medical examinations. Among 7497 screened, 64.2 % (4814) had risk factors (RF) of stroke and 35.8% (2682) have no risk on CHADS2 score corresponds to low stroke risk. Among population having CHADS2 risk score, 64.3% (3096) have intermediate risk score, corresponds to intermediate or moderate stroke risk. 1719 (35.7%) had high risk score corresponds to a greater high stroke risk. On Community Stroke Risk Classification (CSRC), majority of the population having stroke risk score grades with one or more risk factors (64.2%). Among 4814 had risk factors of stroke, The analysis showed significant difference in CSRC score grades (P<0.01), the majority of the population having intermediate score grades (1-2 RF)(69.4%)(P<0.001), IRS1 (41.4%) and IRS2 (27.9%). High score prevalence (≥3 RF) was 30.6%, with decrease in percentages with HRS3 (16.5%), HRS4 (9.5%), HRS5 (3.7%) and the lowest is HRS6 (0.9%). Males showed significant raise compared with females in all score grades especially in intermediate score risk (1-2 RF) (P<0.004). Intermediate score (1-2 RF) is dominated in all study age groups compared with high scores (3-6 RF)(P<0.001); 16-49 years (67% for 1-2 RF, 33% for 3-6 RF) and 50-80 years (51.1% for 1-2RF, 48.5% for 3-6RF). Hypertension and Diabetes were the major risk factors of stroke on all scores and highest among intermediate score (1-2 RF) (P<0.001). This study confirmed that stroke is a major public health problem in North Africa. CHADS2 & CSRC scores are very useful and simple method to classify stroke among population without AF.

KEY WORDS: Stroke, CHADS2 score, Prevalence, Risk factors, Classification, Community, Atrial Fibrillation, Africa.

INTRODUCTION

CHADS2 score is a proven and essential tool for estimating cardioembolic risk (mainly stroke) in patients with nonvalvular atrial fibrillation (AF). In this study we analyzed the use of CHADS2 score which adapted to classify stroke risk factors in general public without known atrial fibrillation in a Mediterranean population of Africa (Libya)[(1)].

The CHADS2 score is a validated clinical prediction tool commonly used to estimate the risk of stroke in atrial fibrillation[(2)]. The score is derived from the sum of point values of individual stroke risk factors, one point each for (congestive heart failure (CHF), hypertension, age≥ 70, diabetes, and two points each for prior stroke or transient ischemic attack (TIA)[(2)]. A high CHADS2 score corresponds to a greater risk of stroke, while low CHADS2 score corresponds to lower risk of stroke[(2)].

The CHADS2 score is used in clinical practice to guide decisions regarding antiplatelet and anticoagulation therapy. The simplicity of its calculation has facilitated its widespread adoption and endorsement by national and international society guidelines[(3)].

Although the CHADS2 score and other similar risk stratification schemes have proven useful in populations with known AF, the vast majority (85%) of ischemic strokes occur in individuals without known AF, hence the use of the score in general public[(4)].

North African population at increased risk for stroke. The incidence of stroke varies from 63 to 162 per 100,000 populations, males are affected more than females[(5)]. Furthermore, according to WHO 2014 report, 78% of deaths in North Africa are due to non-communicable diseases, which include stroke and the

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mean age of stroke is within the sixth and seventh decade (varying from 58.5 to 63)[6].

Although CHADS2 score was not used in North Africa, Centre of Disease Control –World Health Organization (CDC-WHO) in 2009 in north Africa (Libya) studied stroke in community survey among 3096 individuals where the risk of stroke among the total population of the that study was very high 99.6% and classified stroke into two categories; category one, representing low grade where population had one or two risk factors of stroke (1-2RF) and high grade where population having three to five risk factors (3-5RF)[7].

CDC-WHO report of that study, showed that high grade (3-5RF) was dominated with 57.6% among study population and the low grade (1-2RF) was 42.4%. Those findings were found among total study population and also among sex; were 37.3% of males had 1-2 RF, 62.7 had 3-5 RF and 48.8% of females had 1-2RF, 52.2% had 3-5RF. CDC-WHO report also confirmed that high grade (3-5RF) was dominated in both age groups , 25-44 years old (48.8% for 1-2RF, 52.2% for 3-5RF) and 45-64 years old (21.9% for 1-2RF, 78% for 3-5RF)[7] .

Each component co-morbidities of the CHADS2 score has been independently associated with stroke in large cohorts of North African population. Therefore, we hypothesized that stroke risk may also be well captured by the CHADS2 score in non-AF general population. To test this hypothesis, the performance of the CHADS2 score for prediction of stroke among general public without AF was evaluated. So, this study was conducted with the aim to analyze the role of the CHADS2 score and Community Stroke Risk Classification (CSRC) to estimate stroke risk factors in community based population without AF in North Africa.

MATERIALS AND METHODS

Study Design and Setting

This study was conducted as a community based descriptive cross-sectional study in North Africa (North West of Libya), among Individuals living in Tripoli area "the capital". It was done by Department of Community & Family Medicine, Faculty of Medicine, University of Tripoli. Duration of the study was five years from 1/1/2010 to 31/12/2014.

Study Population

The study population sample included 7497 randomly selected individuals from population without AF. The study included Adults aged from 16 to > 80 years old.

Methods

History and Medical Examination

Interviewing individuals by taking detailed histories (present, past, medical, hospital admission), medical examinations, checking of any available investigations, discharge letters and medical reports. Known cases of strokes or TIA had been established by medical diagnosis in the past by hospital specialists.

CHADS2 Score Questionnaire

Doctors working in community and family medicine department were trained by Professions to collect data using CHADS2 method; Individuals were interviewed using CHADS2 score questionnaire which adapted to be used among general public with absence of atrial fibrillation[1]. In this study CHADS2 score as well a local Libyan classification of stroke risk factors was used called (Community Stroke Risk Classification-CSRC). CHADS2 score is 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)[2] (table 1). The CHADS2 scoring table which shown below adding together the points that correspond to the condition represents the results in CHADS2 score which used to estimate stroke risk as follows;

Score Zero = No risk = Low Risk Score
Score 1 & 2 = Intermediate Risk Score
Score ≥3 = 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 & sex	1
D: DM	1
S: Prior Stroke or TIA	2

Community Stroke Risk Classification-CSRC

This classification depends on calculation of numbers of risk factors (RF), each Risk factor used in study as age ≥ 70, DM, Hypertension, CHF, TIA and prior stroke were given one number for each condition among each individual participated and the score was a result of summation of those risk factors as shown in (table 2).

(Table 2) showing CSRC score used in the study

Level	Score	No. of Risks	Abbreviation
Low risk	score of zero	No risk factor	LRS 0
Intermediate risk	score of one	One risk factor	IRS 1
	score of two	Two risk factors	IRS 2
High risk	score three	Three risk factors	HRS 3
	score four	Four risk factors	HRS 4
	score five	Five risk factors	HRS 5
	score six	Six risk factors	HRS 6

Statistical Analysis

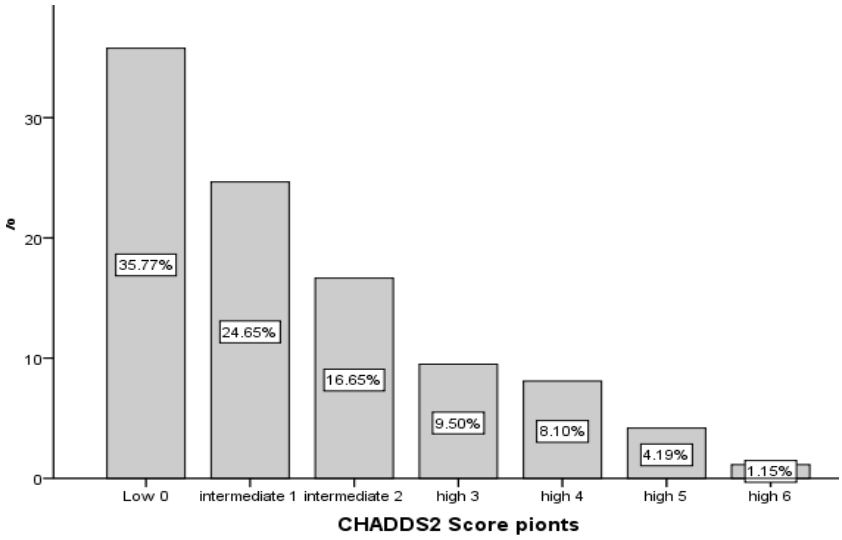
Statisticians were gathering, scoring CHADS2 and CSRC grades, analyzing all information and calculating T-test & P value by using SPSS package version 19- USA.

RESULTS

Among total population (7497), males were 52.8% (3881) and females were 48.2% (3616) with mean age of 52, which is also reflected on different age groups selected in the study and this age/sex structure in the study was agreed with Libyan census of 2010 (51% males & 49% females).

CHADS2 score among study population

Among 7497 individuals screened, 64.2 % (4815) had risk points (RP) of stroke and 35.8% (2682) have no risk on CHADS2 score corresponds to low stroke risk (Low risk score, LRS0). The CHADS2 score grades are gradually decreased in percentages from low to high, intermediate score (3096, 41.3%) is predominant (P<0.01) compared to high scores (1719, 22.9%). IRS1 (24.65%) having one risk point, IRS2 (16.65%) having two risk points. High scores, HRS3 (9.5%) having three risk points, HRS4 (8.1%) having four risk points, HRS5 (4.19%) having five risk points and HRS6 (1.15%) having six risk points (figure 1). Among population having CHADS2 risk score (4815 individuals), 64.3% (3096) have intermediate score risk, corresponds to intermediate or moderate stroke risk where individuals have one or two risk points. 1719 (35.7%) had high risk score corresponds to a greater high stroke risk, with three risk points or more.



(Figure 1) Showing CHADS2 score among total population

Community Stroke Risk Classification among study population

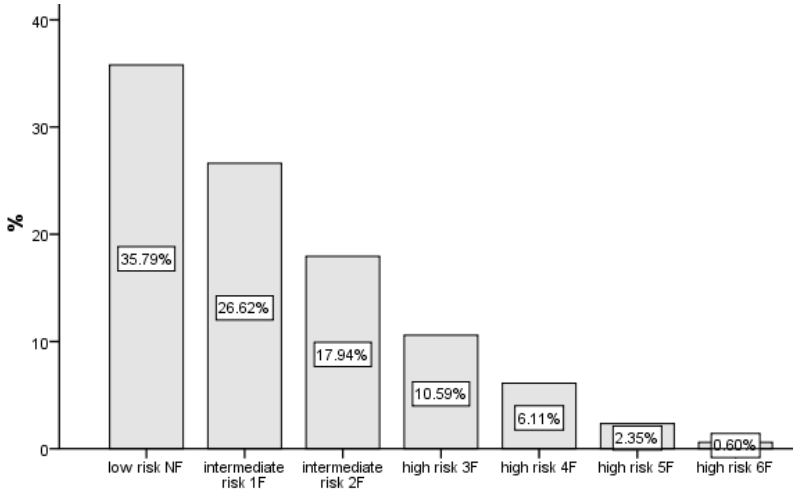
Among total population screened in the study (7497 individuals), 4814 (64.2%) have risk factors on CSRC. 2683 (35.8%) have no risk on CRSC score (LRS0). From those who have risk factors, 3341 (44.6%) have intermediate score risk (IRS 1&2), where individuals have one or two risk factors. 1473 (19.6%) have high risk score (HRS 3,4,5,6) with three risk factors or more.

The CRSC score grades is gradually decreased in percentages from low to high grades, intermediate sore is predominant (P<0.01) compared to high scores specially IRS1 (1996, 26.6%) having one risk factor, and IRS2 (1345, 17.9%) having two risk factors. High scores, HRS3 (10.6%, 794) having three risk factors, HRS4 (6.1%, 458) having four risk factors, HRS5 (2.3%, 176) having five risk factors and HRS6 (0.6%, 45) having six risk factors (figure 2).

Among 4814 individuals had risk factors of stroke, The analysis showed significant difference in CSRC score grades (P<0.01), the majority of the population having intermediate score grades (69.4%, 3341)(P<0.001), IRS1 (41.4%) and IRS2 (27.9%). High grade prevalence was 30.6% (1473), with decrease in percentages with HRS3 (16.5%), HRS4 (9.5%), HRS5 (3.7%) and the lowest is HRS6 (0.9%).

Age grouping & the classification scores

This result showed that a complexity of risk factors increased with increase of age. All age groups were affected with risk scores which increases from forty years old and most ages having the highest scores with multiple risk factors was, 50, 55 ,60, 70, 75 & 80 years old. Concerning age groups which showed higher score risk more than others were 30-49, 50-59, 60-69 with the highest prevalence in 50-59. Though risk scores still high among 70-79 and ≥80 years old. With age grouping, the most prominent scores were the intermediate score (IRS1 & IRS2) (P<0.001).



(Figure 2) Showing CSRC score grades among total population

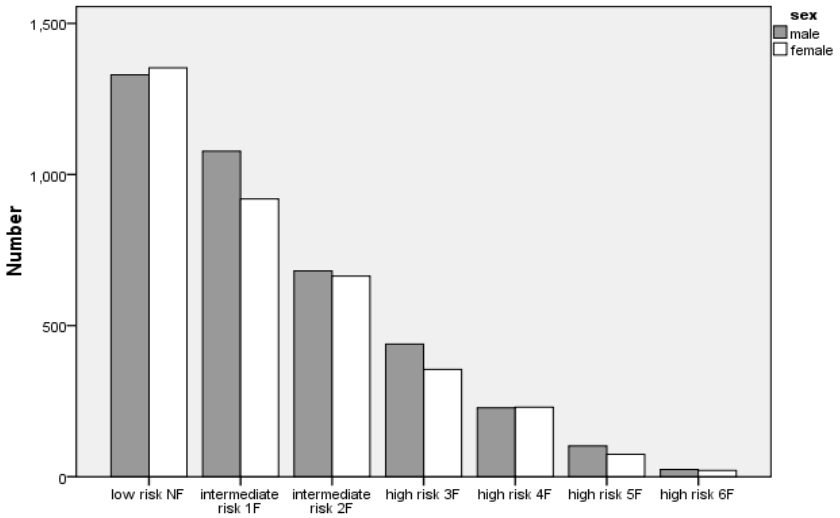
If we divide the age groups into two groups, 16-49 years old and 50->80 for simplicity , 25.6% of population had risk was among 16-49 and 74.4% among 50->80 (P<0.001), also we found that intermediate score (1-2-RF = IRS 1,2) is dominated in both age groups compared with high scores (3-6RF = HRS 3-6) with 69% (1-2 RF) & 31% (3-6RF) respectively (P<0.001), in 16-49 years (88.3% for 1-2RF, 11.7% for 3-6RF) and in 50->80 years (63.8% for 1-2RF, 36.2% for 3-6RF).

Sex & the classification scores (CHADS2 & CSRC score)

65.7% (3160) of male participant in this study had risk points (from 1 to 6 RP), and 62.6% (2718) of female participant had risk points of stroke. Among study population having risk points (4814), males constitute 53% and females 47%. Among males, 63.4% had intermediate score risk with 1-2 RP, 36.5% had high score with 3-6 RP, and among females 65.2% had 1-2 RP, 34.8% had 3-6 RP.

65.7 (2551) of male participant in this study had risk factors (RF) (from 1 to 6 RF), and 62.6% (2263) of female participant had risk factors of stroke. Among study population having risk factors (4814), males constitute 53% and females 47%. Among males, 68.9% had intermediate score risk with 1-2 RF, 31.1% had high score with 3-6 RF, and among females 70% had 1-2 RF, 30% had 3-6 RF.

Males showed significant raise compared with females in all score grades specially in intermediate CHADS2 & CSRC score risk 1-2 RF (P<0.004) (figure 3).



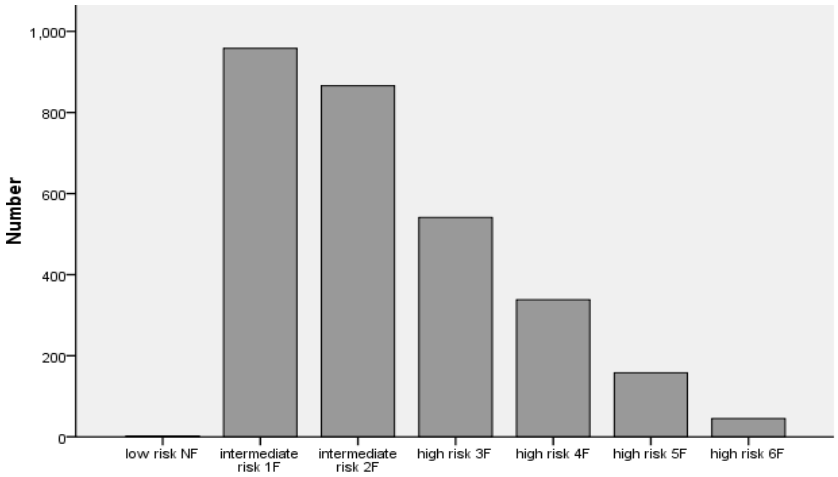
(Figure 3) Showing CSRC score grades and sex

Diabetes Mellitus (DM) & the classification scores

The prevalence of DM among study population over five years was 39%, 54.1% among males and 45.9% among females. DM present in all score risks with highest prevalence in IRS1 (33%) and IRS2 (30%) (P<0.001). DM showed decrease in HRS3 (18.6%), HRS4 (11.6%), HRS5 (5.4%) then declined to the lowest prevalence (1.5%) in HRS6 (figure 4). Males were slightly dominated over females in all scores and age groups.

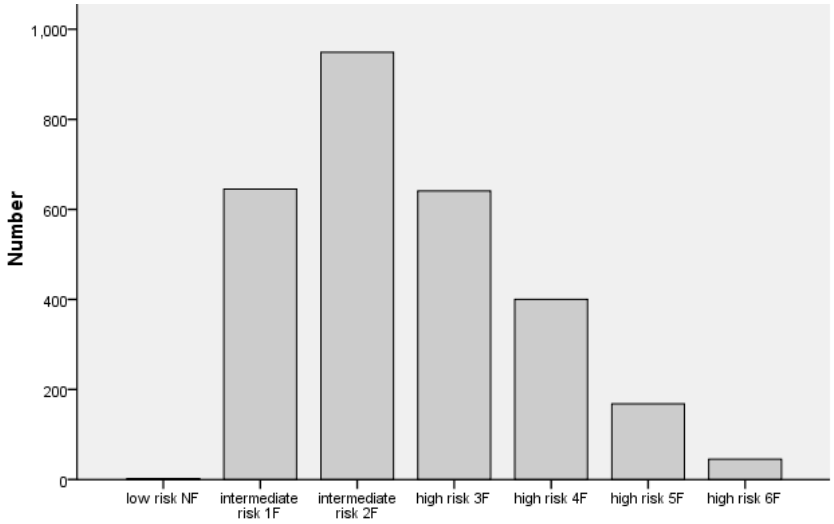
Diabetic patients were distributed all over the age groups but the highest prevalence was found in age

groups over forty (40-49, 50-59 & 60-69) with predominance in intermediate score (IRS1 & 2).
This result confirms that DM is major risk factor of stroke, usually come alone or with hypertension as risk factor and with less account with other risk factors in multiple high score pattern.



(Figure 4) Showing Diabetes Mellitus & CSRC score

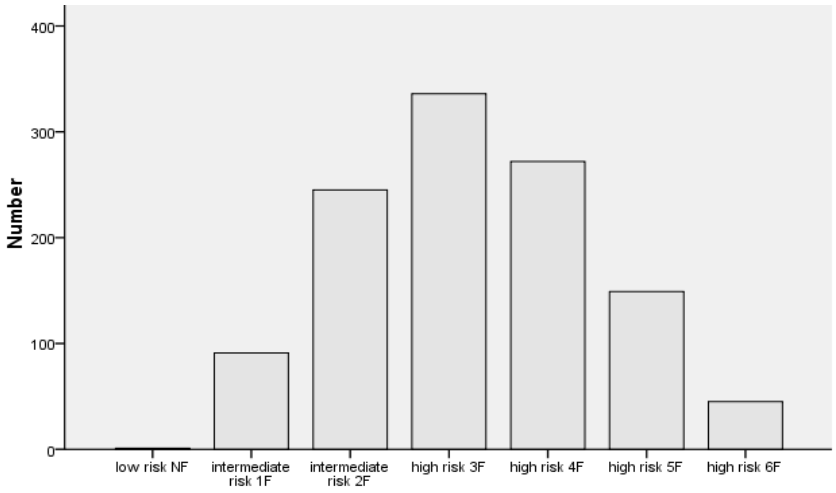
Hypertension (HT) & the classification score
The prevalence of HT among our participants was 38%, among males and females were 50.2% and 49.2% respectively. HT is a major risk factor present in all scores, especially IRS2 (33.3%) then lowered to 22.6% in IRS1, HRS3 (22.3%), HRS4 (14%), HRS5 (5.9%) then declined to the lowest in HRS6 (0.8) (figure 5).
Hypertensive females were generally higher than males in most sores except in high scores HRS3, HRS5 & HRS6. Female predominated in middle age groups (40-59), and males dominated in younger age groups 16-39 and in older ages >60. HT prevalence increase with age, shows higher prevalence in IRS1, IRS2 in age >40 (P<0.001).
This result showed that HT associated with stroke in more than one third of the study population, which is coming alone or with DM forming intermediate risk score of stroke, and also to less extent can be accompanies other risk factors to form multiple risks in higher scores



(Figure 5) Showing Hypertension & CSRC score

Congestive heart failure (CHF) & the classification score
Prevalence of CHF among study population was 15.2%, 51.2% males and 48.8% females. CHF is distributed over all scorers with high prevalence in IRS2 (21.5%), HRS3 (29.5%), HRS4 (23.9%), HRS5 (13.0%), its less in HRS1 (7.9%) and lest in IRS6 (3.9%). Males were dominated in all scores (P<0.001) except in HRS4 where females were higher (figure 6). CHF in all score grades is concentrated in age groups

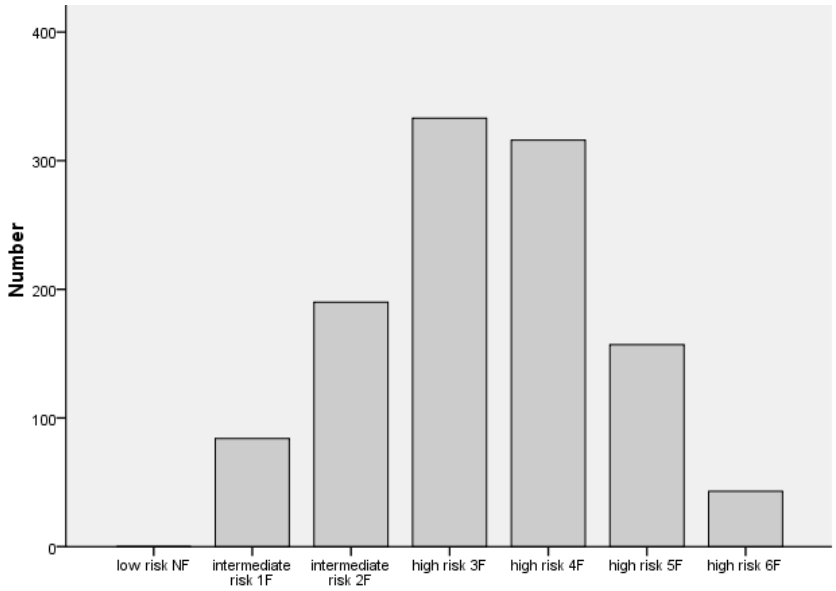
over forty and predominated in 60-69 & 70-79. This result showed that CHF usually come with or as result of other risk factors to form multiple risk factors in higher scores.



(Figure 6) Showing Congestive heart failure & CSRC score

Transit Ischemic Attack (TIA) & the classification score

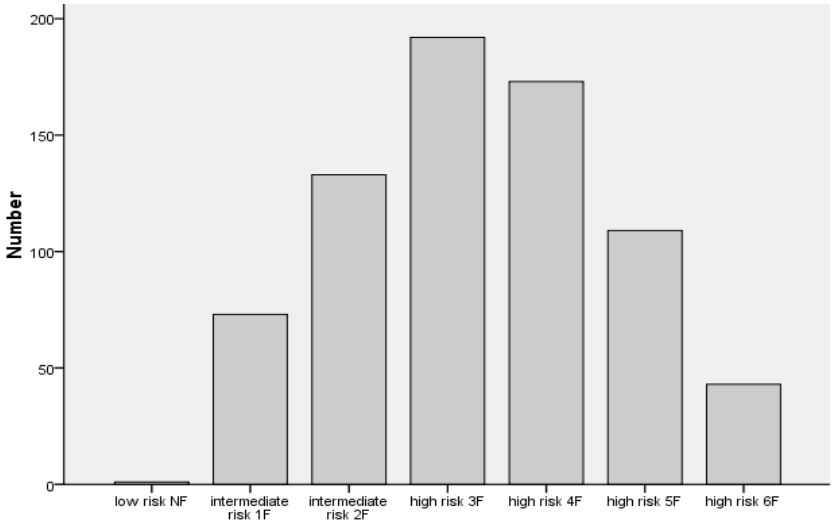
The prevalence of TIA among study population was 15% (1521), 58.2% males and 41.8% females. TIA is present in all risk scores but highest in HRS3 (29.7%), HRS4 (28.1%), HRS5 (13.9%), HRS6 (3.8%), and lower in IRS1 (7.5%), IRS2 (16.9). Males were higher in all scores compared to females (figure 7). TIA is present with higher prevalence in older ages over sixty years especially with multiple high scores. This result showed that TIA affecting older ages and usually come with or as result of other risk factors forming multiple risks associated with strokes especially in higher scores.



(Figure 7) Showing transient ischemic attack (TIA) & CSRC score

Prior Stroke (PS) (embolic or hemorrhagic) & the classification score

Prior stroke prevalence was 9.7%, males 48.9% and 51.1% females. PS found in all risk scores especially high score grades, HRS3 (26.5%), HRS4 (23.9%), HRS5 (15%), IRS2 (18.4%) and lower prevalence in IRS1 (10%), (figure 8). Females were more among intermediate score and males dominated in higher scores. Prevalence of PS is higher in older ages than forty years old. This result showed that PS usually complicated with other risk factors to form multiple pattern in higher scores.



(Figure 8) Shows prior stroke (embolic or hemorrhagic) & CHADS2 score

DISCUSSION

This is the first time such big study of assessing risk factors of stroke have been done in North Africa (North West of Libya), among Tripoli population; and it founded that stroke is a very common and important public health problem among study population.

A past systematic literature review done in Arab countries[5], and other different studies in Africa & Middle East[8], showed high prevalence of stroke among North African population.

In North Africa (Libya) Reports of research institutes 2001[9], and reports from CDC-WHO 2009[7], revealed that stroke is associated with multiple risk factors. That was also confirmed with the results of our present study.

This present study confirmed that mainly age, hypertension and diabetics, CHF, prior stroke and TIA were major stroke risk factors in North Africa, where in a systematic review including studies in Arab countries (Saudi Arabia, Qatar, Libya, Kuwait, Jordan, United Arab Emirates, Bahrain, Tunisia, Iraq, and Sudan)[5], North Africa[8], and Libya[7] showed that stroke is strongly associated with age, hypertension, DM, obesity and smoking.

Our results showed that stroke can be occurred at any age but the prevalence was increased by age specially over 40 years old, and this finding was also confirmed by other study in Africa[7,8].

Despite the proven utility of the CHADS2 score and other risk stratification approaches in patients with nonvalvular atrial fibrillation, most ischemic strokes (85%) occur in individuals without known atrial fibrillation[10] which encourages us to use the score among community population not having AF. Moreover, epidemiologic studies have shown that hypertension and DM is the most important determinants of stroke risk, and that each component of the CHADS2 score is independently associated with cerebrovascular events in the general population[11]. Nonetheless, to our knowledge, there are no studies investigating the utility of this score for estimating the risk of a cerebrovascular event in general publics without known atrial fibrillation.

This study which used CHADS2 score among community population without AF in North Africa was not odd or unique as this it has been used to classify the risk factors of stroke elsewhere in the world[1,4]. More ever Morillas P et al., 2014[1], showed that CHADS2 score is proved, essential and useful tool to estimating stroke risks in patients with hypertension without presence of AF.

Our study used this score which is usually used as clinical predictor of stroke, in patients with nonvavular AF[12], because its simple rule that easy to remember and to apply in clinical practice and also it has been validated by several studies as that conducted by Ruiz Ortı´z et al., 2008[13].

This study confirms that age, hypertension and DM are major stroke risk factors among North African, moreover, epidemiological studies elsewhere in the world, have shown that hypertension is the most important determinant of stroke risks, and major component of CHADS2 score which is independently associated with cerebral events in general populations[1].

Present study shown that among total population surveyed, 68.7% were having risk factors of stroke where in other studies in North Africa, a Libyan CDC and WHO reported a much higher prevalence (99.8%) of their study population had risk factors[7].

Our results showed that CHADS2 score is the first time used in North Africa but WHO report 2009 did classify strokes in North Africa into two grades, low grade (1-2FR) and High grade (3-5RF)[7], our study classified stroke according to CHADS2 score which divided into Low score (Zero RF), intermediate score (1-2RF) and high score (3-6RF).

Present results confirmed that the intermediate score (1-2RF) was dominated more than other scores (56%), compared to high score (3-6RF)(44%). This is also dominated in age groups; as in 16-49 (76% for 1-2 RF, 33% for 3-6RF), and in 50->80 (51.1% 1-2RF, 48.5% 3-6RF). Also the intermediate score is dominated

among sex, males (55.2% 1-2RF, 44.8% 3-6RF) and females (57.1% 1-2RF, 42.9% 3-6RF).

WHO report in North Africa showed reverse to our results, where high grade (3-5RF) was dominated (57%) than low grade (1-2RF) (42.4%), and this also dominated over sex and age groups, Males (37.3% 1-2RF, 62.7% 3-5RF), females (47.8% 1-2RF, 52.2 3-5RF), in 25-44 age group (21.9% 1-2RF, 51.2% 3-5RF) and in 45-64 age group (21.9% 1-2RF, 78% 3-5RF)[7].

Our finding of dominating intermediate score (1-2RF) more than CHADS2 high score (3-6RF), was not comparable with published CHADS2 rates in AF patients studies where shown domination of high scores of 5-6RF more than the moderate CHADS2 scores of 1-2RF[4]. Our explanation for this is that patients with AF will have a complex of risk factors and multiple medical complications which can be associated with stroke compared to general public with less risk factors. This study showed that CHADS2 score is very simple and useful to be used to classify stroke in North Africa where it used for the first time for such purpose.

This score although used in general public living in the community without the presence of AF but still giving valid classification of the risk factors of stroke among such population.

CONCLUSION

This study confirms that stroke is a major and important public health problem and causing death in North Africa. Results showed that more than 44.6% of study population had only one or two risk factors of stroke constitute intermediate scores (IRS1 & 2), and mostly is associated with HT, DM or age over seventy years old. All classification scores are mostly affected by age, gender, HT, DM and to lesser extent by other risk factors like CHF, TIA and prior stroke. Hypertension and DM found in all age groups, and mostly with intermediate CHADS2 scores (IRS1 & 2), especially in age groups between 40 and 60 years old, and mostly presented each one alone or together associated with strokes and to lesser extent forming multiple risk groups in higher CHADS score.

Other risk factors like CHF, TIA & PS usually presented with multiple pattern in higher CHADS2 score (HRS 3-6) among older ages >60 years old.

Our observations confirm that CHADS2 & CSRC predication of stroke is very good, simple and useful method to classify the grades of risk factors among North African.

STUDY LIMITATION

This is descriptive cross section study which seen each individual in the study only once without follow up or treatment mentoring as its designed to predict prevalence rates and classification of risk factors.

RECOMMENDATION

To conduct future studies which depend on medical and laboratory investigation with follow up & treatment monitoring of stroke.

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