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Original Article

Assessment and attenuation of risk of stroke in diabetes mellitus, dyslipidemia and hypertensive patients

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ABSTRACT

The aim of the study is to assess and attenuate the risk of stroke in diabetes mellitus, dyslipidemia and hypertensive patients. The main objective is to assess the risk of stroke in diabetes mellitus, dyslipidemia and hypertensive patients. The prospective interventional study was conducted in the department of general medicine at PSG IMSR medical college, Coimbatore for a period of 6 months. Total 150 stroke patients were recruited in the study based on inclusion and exclusion criteria and were analyzed. Based on the interview, 17 patients were having the history of hypertension, 35 patients were known case of diabetes mellitus and there were 2 dyslipidemic patients. From this study it was concluded that males are more prone to risk of stroke than females. The outcome of this study will reduce or modify risk factors associated with stroke in study participants. It may create effective awareness regarding management of risk factors.

Keywords: Stroke, hypertension, diabetes mellitus, dyslipidemia, patient counselling

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INTRODUCTION

Stroke is the most common, life threatening disease and is the major cause of morbidity and mortality worldwide especially in South Asian subcontinent.[1,2] According World Health Organization, stroke is "a rapidly developed clinical sign of focal disturbance of cerebral function of presumed vascular origin and of more than 24 h".[3] Estimating stroke risk based on an individual's particular combination of risk factors, particularly for a first stroke event, is an important component of primary care [4]. Furthermore, the global burden of stroke is high, with stroke remaining the fourth leading cause of death worldwide, with a particularly large impact in developing nations [5,6].The risk factors for stroke are may be non-modifiable (race, age, sex, low birth weight), modifiable (hypertension, dyslipidemia, diabetes, tobacco smoking, atrial fibrillation, cardiac disorder, sickle cell disease, diet and body mass index) and potential risk factors (metabolic syndrome, alcohol, drug abuse, sleep apnea, migraines, oral contraceptive use) and other environmental factors include lower education, poor economic status, tobacco, infections, body mass index (obesity, body mass index >30 kg/m^2) exercise and diet etc.[7] The incidence of stroke increases with age, with the incidence doubling for each decade after 55 years of age [8]. The mean age of incident ischemic stroke in 2005 was 69.2 years. Recent evidence suggests, however, that the incidence and prevalence of ischemic stroke has been increasing in the 20 to 54-year-old age group, from 12.9% in 1993/1994 to 18.6% in 2005 [9].Primary prevention is particularly important because <70% of strokes are fist events. The age specific incidence of major stroke fell by 40% over a 20 year period in association with an increased use of preventive treatments and general reductions in cerebrovascular risk factors. Stroke risk factors can be treated or modified. Doing so may prevent an initial stroke or recurrent strokes, as well as decrease the risk of premature death. Risk assessment provides a frame work for patient counseling and decision making about life style changes. Interventions should be targeted on behavior and life style modification. Counseling on life style changes, dietary habits and intensive campaign against tobacco and alcohol use will prove rewarding [10].

MEHODOLOGY

The prospective interventional study was conducted in the department of general medicine at PSG IMSR medical college, Coimbatore for a period of 6 months. Patient's age > 30 of both genders, patient with diabetes, hypertension and dyslipidemia was included in the study. Pregnant and lactating women and patient with psychiatric illness were excluded from the study. All the patients who were deemed eligible for the study were recruited after obtaining their consent on the informed consent form (both English and Tamil was used based on patients understanding). The subjects were interviewed regarding their socio demographic details, past and present medical condition and their social habits. All these details were recorded in the data collection form, and subsequently scoring was done using STROKE RISK SCORE CARD. The percentage probability of stroke occurrence within 5 years was predicted in patients with high and moderate risk of Framingham Heart Study. For all those patients who have been categorized as high risk and caution, counseling and leaflet were given regarding dietary habits and life style modifications to manage their BP, DM and dyslipidemic conditions. Patients were reassessed during follow up and scoring was done using STROKE RISK SCORE CARD. The data collected was analyzed using different statistical methods and the variables were evaluated.

Statistical analysis: Wilcoxan matched pair sign rank test (non- parametric test) was used to analyze the significance of conseling with STOKE RISK and STOKE PREDICTION among males and females. Paired t test was used to analyze the association between the risk factors.

RESULTS

Total 150 stroke patients were recruited in the study based on inclusion and exclusion criteria. Out of that, 87 patients were males and 63 patients were females. Based on the interview, 17 patients were having the history of hypertension, 35 patients were known case of diabetes mellitus and there were 2 dyslipidemic patients. Patients with history of both hypertension and diabetes mellitus account a total of 51, there were 9 hypertensive-dyslipidemic patients and 7 patients were found to be having diabetic-dyslipidemic, 29 patients were having history of hypertension, diabetes mellitus and dyslipidemia. Based on the risk score card classification, there were 3 high risks and 14 low risk patients hypertensive patients and 15 high risk, 2 caution and 18 low risk diabetic patients and 2 low risk dyslipidemic patients were found. In combination of these co-morbidities there were 44 high risk, 1 caution and 6 low risk hypertensive-diabetic patients. In hypertensive dyslipidemic combination there were 6 high risk and 3 low risk patients. Also 3 high risk and 4 low risk categories in diabetic-dyslipidemic combination were categorized. In the category of all the three co-morbidity condition, there were 24 high risk, 2 caution and 3 low risk patients.

Counseling was given to high risk and caution risk categories. During the review 19 patients (19%) discontinued from this study due to lack of follow up. Remaining 81 (81%) participated in the study.

Based on the diet habits of patients they were classified based on body weight index. Patient above 30 m^2 were obese between 25-30 kg/ m^2 and between 18-24 kg/ m^2 were classified as healthy patients. Based on score risk card obese patients were classified as 41 high risk, 2 caution and 28 low risk patients. In slightly overweight category there were 43 high risk, 1 caution and 5 low risk patients in healthy individuals there were 11 high risk, 2 caution and 17 low risk patients.

Patients were interviewed based on exercise habits and were classified based as sedentary moderate and fit. Based on the score risk card sedentary risk patients were classified as 46 high risk, 3 caution and 29 low risk patients. In moderate exercise category there were 21 high risks, 2 cautions and 15 low risks. In fit category there were 28 high risk, no caution and 6 low risk patients.

Phase 1

Effect of patient counselling on attenuation of risk factors associated with stroke

Review of male patients: Among 87 male patients, 24 of them were low risk thus there was no counseling provided. Out of the 63 patients 17 of them discontinued from study. Among the 46 male patients, the risk analysis was done after counseling. 45 male patients who were categorized under high risk and 1 patient under caution were reviewed. Based on their second time risk analysis, 13 high risk patients, 12 caution risk and 12 low risk patients were found. There is significant association between the risk factors before and after counseling, $p<0.0001$ at 95% confidence interval using Wilcoxon matched pair sign rank test.

Review of female patients: Among 63 female patients, 26 of them were low risk thus there was no counseling provided. Out of 37 patients 2 of them discontinued from the study. Among 35 females who participated in the study the risk analysis was done after counseling. 32 female patients who were categorized under high risk and 3 were under caution risk were reviewed. Based on their second time risk analysis, 7 high risk patients, 19 caution risk and 9 low risk patients were found. There is significant association between the risk factors before and after counseling, $p<0.0001$ at 95% confidence interval using Wilcoxon matched pair sign rank test

Risk factor review: In the review study of 81 patients, 2 patients were having the history of hypertension, 12 patients were having diabetes mellitus and there were no review patients with dyslipidemic history. Patients with history both hypertension and diabetes mellitus account a total of 35, there were 6 hypertensive-dyslipidemic patients and 3 patients were found to be having diabetic-dyslipidemic.23 patients were having history of hypertension, diabetes mellitus and dyslipidemia. Based on the risk score card classification, after counseling there were 1 caution risk and 1 low risk hypertensive patients. 3 high risk, 2 caution risk and 7 low risk diabetic patients, no dyslipidemic patients. In combination of these co morbidities there were 5 high risk and 18 caution risk and 12 low risk hypertensive-diabetic patients. In hypertensive-dyslipidemic combination there were 1 high risk, 2 caution risk and 3 low risk patients. Also 3 low risk patients in diabetic-dyslipidemic combination. In the category of all the three co morbidity risk factor for stroke, there were 11 high risk, 8 caution risk and 4 low risk patients. (fig 1 and 2)

Hypertension review: Among the 92 hypertensive patients, counseling was provided to 63 high risk (69%), 3 caution risk (3%) and 26 low risk category patients (28%). On their review, stroke risk score was analyzed and found that there were 17 high risk (18%), 29 caution (32%) and 46 low risk (50%) patients.

Diabetic review: Among the 104 diabetic patients, counseling was provided to 69 high risk (66%), 4 caution risk (4%) and 31 low risk category patients (30%). On their review, stroke risk score was analyzed and found that there were 19 high risks (18%), 28 caution (25%) and 57 low risk (55%) patients.

Dyslipidemia review: Among the 44 dyslipidemic patients, counseling was provided to 30 high risk (68%), 2 caution risk (5%) and 12 low risk category patients (27%). On their review, stroke risk score was analyzed and found that there were 12 high risks (27%), 10 caution (23%) and 22 low risk (50%) patients.

Blood pressure: On initial analysis of 81 patients, they were classified based on different systolic blood pressure groups. In the category of bp<120 mmHg there were 12 patients, between 120-139 mmHg there were 19 patients, between 140-159 mmHg there were 36 patients, between 160-179 mmHg there were 9 patients and >179 mmHg 5 patients. On review it was seen that in category of blood pressure <120 mmHg there were 19 patients, between 120-139 mmHg there were 47 patients, between 140-159 mmHg there were 12 patients, between 160-179 mmHg there were 3 patients and none >179 mmHg. There was a significant

association with systolic blood pressure before and after counseling, p<0.0001 at 95% confidence interval using paired t test.

Diabetic profile-FBS: Based on initial analysis of 73 patients their FBS levels, patients were classified into 3 categories if FBS level above 140mg/dl they were diabetic, if FBS between 110-140mg/dl they were borderline and below 110mg/dl were non diabetic. Before counseling it was observed that there were 43 diabetic, 12borderline and 9 non diabetic patients. On review it was not observed that there were 25 diabetic, 36 borderline and 12 non diabetic patients. There was a significant association with fasting blood sugar before and after counseling, p<0.0001 at 95% confidence interval using paired t test.

Lipid profile-total cholesterol: Based on initial analysis of 32 patients total cholesterol levels, they were classified into 3 categories. It was observed that there were 9 patients had TC >240 mg/dl, between 200-240mg/dl TC of 12 patients were borderline and 11 patients with TC <200mg/dl. On review there were 6 patients had TC >240 mg/dl, between 200-240mg/dl TC of 11 patients were borderline and 15 patients with TC <200mg/dl. There was a significant association with total cholesterol before and after counseling, p<0.0001 at 95% confidence interval using paired t test.

Smoking: Based on the social history male patients were classified into smokers, non-smokers and those trying to quit. On initial analysis there were 27 smokers, 5 trying to quit and 14 non-smokers. On review it was found that there were 23 smokers, 8 trying to quit and 15 non-smokers.

Phase 2

Prediction of % of stroke occurrence within 5 years

A five year stroke prediction analysis was done with the 81 patients who participated in the study. The non-modifiable risk factors that were analyzed in the analysis were age and gender and the modifiable risk factors were systolic blood pressure and diabetic state. Prior stroke condition was considered because there were no stroke patients recruited. (Fig 3)

Males: There were 21 male patients who had 5-10% of stroke occurrence, 21 patients with 10-15% occurrence and 4 patients with 15-20% occurrence of stroke within 5 years

Females: There were 5 female patients who had 5-10% of stroke occurrence, 18 patients with 10-15% occurrence and 5 patients with 15-20% occurrence, 6 patients with 20-25% occurrence, 6 patients with 25-30% occurrence and only 1 patients with 30-35% occurrence of stroke within 5 years.

DISCUSSION

Totally 150 patients were recruited in this study based on inclusion and exclusion criteria of these, 87 were males and 63 were females. According to the stroke risk score card analysis, 95 patients (64%) were categorized under high risk, 5 patients (3%) categorized under caution risk and 50 patients (33%) categorized under low risk groups. The low risk group patients were not provided with the leaflets. The remaining 100 patients participated in the study out of which 19 patients lost follow up. Hence a total of 81 patients participated in the study.

Appelros et al., found that male patients are more prone to suffer from stroke than females. This may be due to differences in risk factors such as smoking and drinking which are more prevalent among men compared with women in India [11]. The same observation was found in our study, out of the 81 patients who participated in the study 46 males were at a high risk for developing stroke compared to 35 females who were at high risk for first stoke.

Among the risk factors hypertension plays a major role in induction of ischemic stroke. High blood pressure will put unnecessary stress on blood vessel walls, causing its deterioration. So rupture of blood vessel wall will mediate the clot formation by platelet aggregation which may leads to stroke by restrict the blood supply.

Next to hypertension, patients with history of diabetes and dyslipidemia were found to be more suffered by stroke, indicates diabetes mellitus and dyslipidemia also plays an important role in initiation of cerebral ischemic attack. Study also documented that diabetes mellitus is another important risk factors which may cause increase deposit of fatty substance in the blood vessel wall, which may affect the blood flow, there by chance of clogging and hardening of blood vessel. High cholesterol is also an important risk factor in stroke. Blood is carried to the brain through small and large arteries. High cholesterol may block these arteries and leads to reduced blood flow to the brain which may lightly to cause stroke [12]. In our study risk assessment use in stroke risk score card revealed significant association of risk factors like hypertension, dyslipidemia and diabetes mellitus with a higher chance for stroke occurrence Cigarettes smoking are a well-recognized and modifiable risk factor for ischemic stroke. Passive cigarettes smoke is also a risk factor for stroke. The most effective preventive measures are to never

smoke and to minimize exposure to environmental smoke. The risk of stroke is reduced with smoking cessation. Sustained smoking cessation is difficult to achieve [13]. Our study also show only 9% reduction in smokers when the review data was analyzed.

Obesity and sedentary lifestyle are risk factor for stroke primarily because they increase the risk of high blood pressure, heart disease and diabetes. Losing weight and following a moderate exercise regimen can help reverse these risks. [14]

Our study indicated that alteration of the modifiable risk factors like systolic blood pressure, fasting blood sugar, body weight, smoking habitsand diet can reduce the risk of stroke occurrence. These changes were brought about by effective counseling techniques and through leaf lets that were provided to patients.

Many therapeutic actions exit for risk factor management to prevent the first stroke. Many individuals have more than one risk factor some of which are well documented and less well documented. Several stroke risk assessment tools are available to use for primary stroke prevention screening programs. These stroke risk estimation tools generally focus on several major vascular risk factors and do not include the full range of contributing factors, especially do not consider different characteristics of various race/ethnicpoplations. The Framingham stroke profile is gender specific and provides a gender specific 1-, 5-, 10- year cumulative stroke risk. Independent stroke predictors included in the Framingham stroke profile are age, systolic blood pressure, hypertension, diabetes mellitus, gender and history of prior stroke.

CONCLUSION

The stroke risk score card is an effective tool in categorizing risk among patients. Risk assessment provides a framework for effective patient counseling. Counseling focusing on modifying risk factors for preventing first stroke is highly promising. An early awareness among patients about the necessary life style modifications helped them in reducing the chance of occurrence of stroke and in improving their quality of life. The outcome of this study will reduce or modify risk factors associated with stroke in study participants. It may create effective awareness regarding management of risk factors.

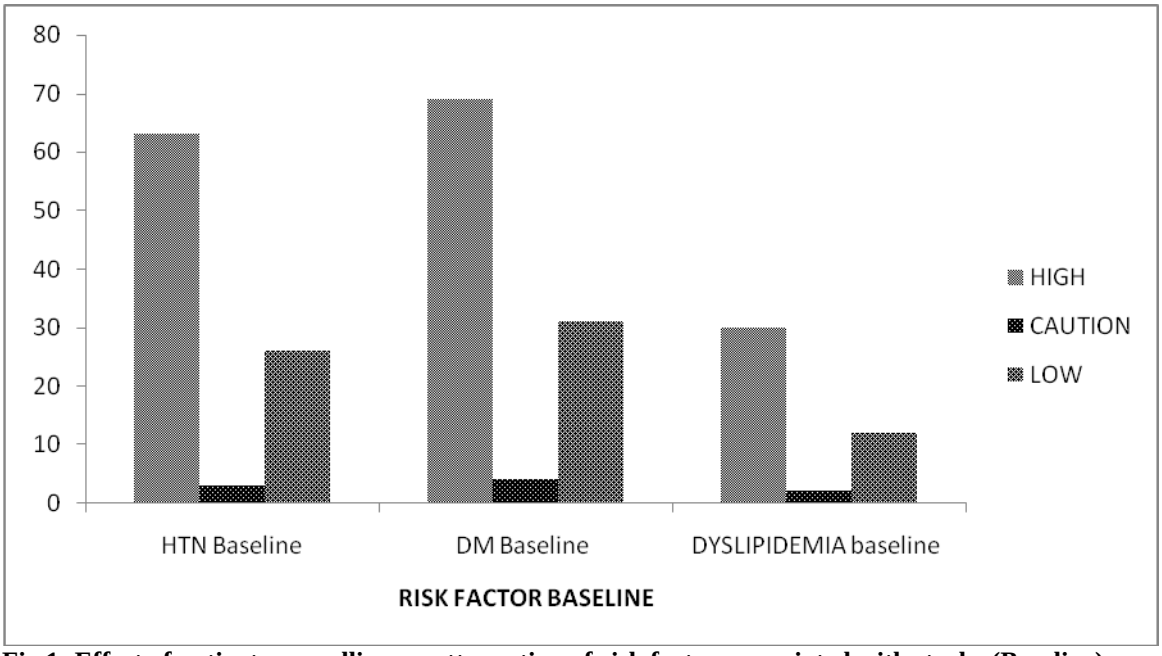

Fig 1: Effect of patient counselling on attenuation of risk factors associated with stroke (Baseline)

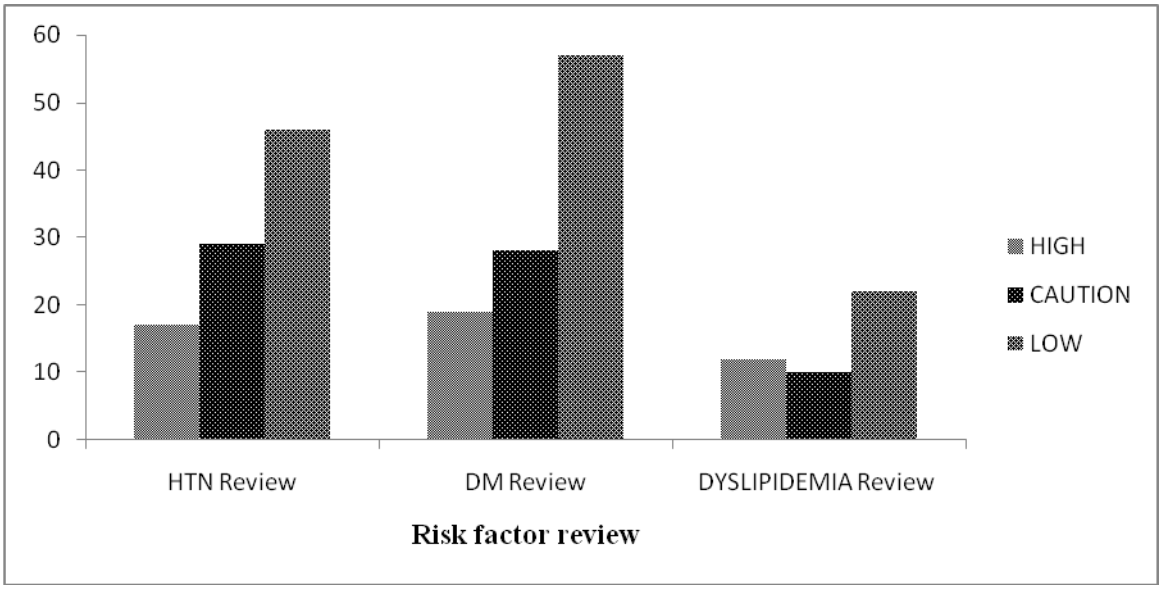

Fig 2: Effect of patient counselling on attenuation of risk factors associated with stroke (Review)

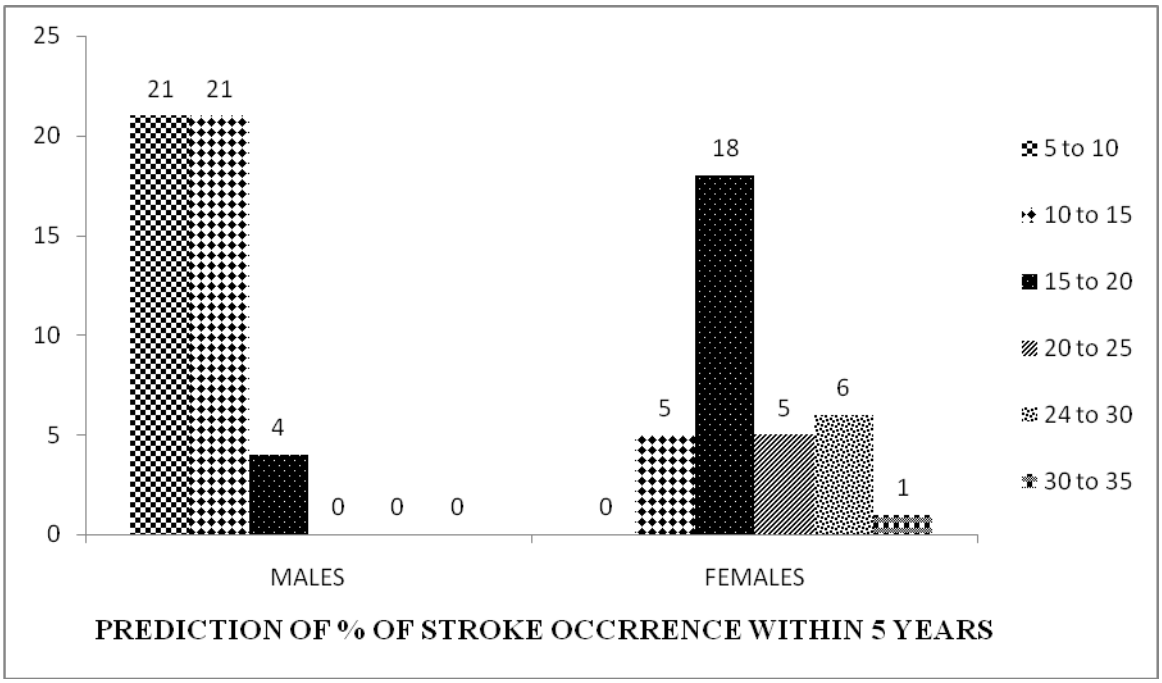

Fig 3: Prediction of % of stroke occurrence within 5 years

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