

## RESEARCH ARTICLE

### Clinico-epidemiological profile of stroke patients in the Himalayan Subcontinent – A retrospective study

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Received: August 04, 2020; Accepted: August 24, 2020

#### ABSTRACT

**Background:** The use of the raw and naturally available substance is increasing in the Himalayan region of the Indian subcontinent. Strikingly, not a single study points out the magnitude of substance abuse among stroke patients. **Aims and Objectives:** This record analysis aims to study the sociodemographic, clinical profile, and magnitude of substance abuse among stroke patients. **Materials and Methods:** A retrospective record analysis was conducted using 48 medical records of stroke patients admitted during the period of June 1, 2018,–May 1, 2019, in a newly established tertiary care public hospital, North India. Records were studied for the clinical profile, epidemiological details, and other relevant investigations at the time of admission. Appropriate statistics was applied to generate the results. **Results:** Majority (70.8%) of patients were old (>50 years) with a mean age of 55.25 (±1.322) years. Of the 48 medical records, ischemic stroke (79.16%) patients reported substance abuse (80.6%) and rehospitalization (31.25%) within a year of stroke. Patients with alcohol use as compared to non-users had significantly lower good cholesterol (high-density lipoprotein) ( $P < 0.003$ ), lower diastolic hypertension ( $P < 0.032$ ), higher pulse rate ( $P < 0.037$ ), and higher creatine kinase-myocardial band (CK-MB) ( $P < 0.005$ ) status. Further, substance abuse found a significant association with the type of stroke ( $P < 0.01$ ), dyslipidemia ( $P < 0.018$ ), and stroke recurrence events ( $P < 0.031$ ). **Conclusion:** Smoking and alcohol are an alarming stage among stroke patients in the Himalayan region. Stroke patients should be routinely screened and counseled regarding abstinence from substance abuse, if present, as it may be associated with poor control of vascular risk factors and contribute to recurrence.


**KEY WORDS:** Stroke; Substance Abuse; Risk Factors; Recurrence

#### INTRODUCTION

Stroke is a significant public health problem in developing countries, including India.<sup>[1]</sup> India witnessed a considerable spike in stroke cases from 1970 through 79 and 2000 to 2008, with an estimated of 8 lakh news cases of stroke in India every year.<sup>[2]</sup> Stroke occurrence links to many predisposing

and potentially modifiable risk factors. Smoking, chronic alcohol use, abnormal lipid profile, sedentary lifestyles, diabetes mellitus, and abdominal obesity are a few common risk factors linked to the origin of stroke.<sup>[3-6]</sup>

Illicit use of the substance (tobacco, alcohol, methamphetamine, and stimulants) also reported a direct link to increased risk for stroke.<sup>[3,6]</sup> Overtime, long-term alcohol use can cause high blood pressures and thickening of arteries and become a risk factor to stroke and other heart diseases, with binge alcohol use being potential risk factors for all subtypes of stroke.<sup>[3,7]</sup> In a report, it has been revealed that 50% of the population in Dehradun and Haridwar districts of state consume alcohol in varying amount with a rising trend

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| Website: <a href="http://www.njppp.com">www.njppp.com</a> | Quick Response code   |
| DOI:10.5455/njppp.2021.10.08158202024082020               |  |

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of its use among women.<sup>[8]</sup> Heavy alcohol consumption, more than 2 standard drinks (175 ml) and binge drinking, found close links to increased risk of stroke.<sup>[9]</sup> However, it has been reported that the use of single or two drinks by men and a single drink by women may be helpful to prevent stroke occurrence.<sup>[10]</sup> Lack of awareness of ill effects of substance abuse, unemployment and crunch of deaddiction, and rehabilitation facilities is commonly reported reasons for uncontrolled use of the substance in the state.

Further, in a report, 58.7% of adolescents surveyed used one or another substance in their lifetime, with 31.3% reporting ongoing substance use.<sup>[11]</sup> Cannabis is one of the most commonly used substances by drug abusers in the state.<sup>[12,13]</sup> Likewise, natural cultivation and easy availability of natural and raw products in Himalayan belt induced use of marijuana and cannabis in this region.<sup>[12]</sup> Remote history of cocaine use<sup>[14]</sup> and chronic smoking in any form has been linked to ischemic stroke/transient ischemic attack.<sup>[6,9]</sup> Likewise, individuals exposed to passive or second-hand smoking had a significantly higher risk of developing coronary artery disease and stroke later in life.<sup>[15,16]</sup> Therefore, individuals with a history of chronic smoking should be encouraged to quit tobacco and avoid exposure to passive smoking, if possible. The present study focused on sociodemographic and clinical profile and current trends of substance abuse among stroke patients, belonging to the Himalayan region, admitted in a tertiary care public hospital during the period from June 1, 2018, to May 1, 2019.

## MATERIALS AND METHODS

A record analysis was conducted to study the sociodemographic and clinical profile and contribution of substance abuse among stroke patients at a newly established tertiary care public hospital, North India. Records of patients with stroke admitted during the 11 months from June 1, 2018, to May 1, 2019, accessed from the medical record department. Briefly, investigators reviewed the medical records of all patients admitted with the diagnosis of stroke. The study was approved by the Institute Ethical Committee (IEC) of All India Institute of Medical Sciences (AIIMS), Rishikesh, with wide letter No. AIIMS/IEC/19/1264.

A total of 48 patients' records ascertained and studied for following details.

### Demographic and Clinical Profile Checklist

A checklist was prepared to retrieve information on age, gender, body mass index (BMI), details on blood pressure, cholesterol, diabetes mellitus, ejection fraction, creatine kinase-myocardial band (CK-MB), and pulse rates, score on National Institutes of Health Stroke Scale (NIHSS) and Glasgow Coma Scale (GCS) at admission, history of substance abuse, number of cigarettes or bidi/day, type of stroke, area

affected by stroke and site of stroke, homocysteine level, recurrence of ischemic stroke cases, length of hospital stay (in days), and deaths.

### Study Design

A retrospective record analysis was performed on patients admitted with stroke in neurology ward at AIIMS, Rishikesh, from June 1, 2018, to May 1, 2019. AIIMS, Rishikesh, is a newly built tertiary care public hospital, and a separate neurology inpatient started in May 2018. Trained neurologists run the department along with a multidisciplinary team of experts. Dedicated clinical pathways and standard clinical guidelines are followed for the treatment of stroke patients. All stroke patients underwent routine and specialized investigations and imaging studies. Brain computed tomography (CT) and/or magnetic resonance imaging brain are used to ascertain the type and extent of the cerebrovascular lesion. Other routine investigations included complete blood picture including erythrocyte sedimentation rate, fasting lipid profile, echocardiography, and carotid Doppler and/or CT angiography. Serum (CK-MB) and troponin-I were assessed in patients with suspected cardiac events. Young, apparently healthy patients (<50 years) lacking risk factors underwent coagulation profile including serum homocysteine level, antinuclear antibodies, lupus anticoagulants, protein C, protein S, antithrombin III, and factor V Leiden mutation estimation. All patients with confirm or probable diagnosis of stroke reported were admitted in the emergency ward and shifted to neurology service after stabilization, were included in the study.

### Data Analysis

Records of all patients admitted in the neurology ward included in the study. The cohort of substance abuse and alcohol use was compared with non-users. Clinical profile, length of hospital stay, and NIHSS score were compared between the cohorts. Data were presented as mean and standard deviation score for continuous variables and as frequency and percentage for categorical variables. Student's *t*-test and Chi-square test were applied to compare the mean and proportion, respectively. Data were analyzed using Statistical Package for the Social Sciences-23 (SPSS) version.  $P < 0.05$  was considered significant for statistical analysis.

## RESULTS

Mean age of patients was 55.25 ( $\pm 1.32$ ) years. More number of stroke patients (70.8%) were in the old age category (>50 years) followed by 29.2% were young ( $\leq 50$  years). Majority of patients (91.7%) were men with BMI in the range of 18–24.9 kg/m<sup>2</sup> (72.9%). In terms of the history of comorbidities, 68.75% of patients had hypertension (HTN), and 80.6% were using one or another substance; with smoking (45.8%) and 31.2% had a history of using alcohol. In terms

of asking duration of substance use, 27.0% and 18.8% of patients reported duration <2 years for smoking and alcohol, respectively.

Out of 48 patients, 79.16% had an ischemic stroke with the left side of stroke (52.1%). One-third of patients underwent homocysteine testing (33.33%) with hyperhomocysteinemia detected in 75.0% of them. Surprisingly, none of the patients reported in golden hours (<60 min) of stroke treatment. However, 45.8% of patients admitted in an emergency for acute care within 24 h of stroke occurrence were reported with GCS 13–15 at time of admission (87.5%). In terms of recurrent events, a total of 37.5% of cases reported recurrent events within 1 year of hospital discharge, with 31.2% recurrence event were recorded in ischemic stroke patients [Table 1].

In terms of length of hospitalization, the mean duration of stay was 7.24 ( $\pm 4.02$ ) days. The mean NIHSS score was 8.06 ( $\pm 5.09$ ) with a mortality rate of 6.25% among admitted cases in hospital [Table 1].

Further, the cohort of alcohol use is compared to the non-alcoholic cohort on clinical parameters. Findings revealed a significant difference in alcohol use cohort on diastolic HTN ( $P < 0.032$ ), dyslipidemia ( $P < 0.003$ ), CK-MB ( $P < 0.005$ ), and pulse rate ( $P < 0.037$ ). However, there was no group difference on NIHSS score, length of hospital stay, BMI, and ejection fraction measured by echocardiography between two cohorts [Table 2].

Similarly, the substance abuse cohort is being compared to non-substance abuse cohort on clinical parameters. Findings show a significant group difference on dyslipidemia ( $P < 0.018$ ) with higher cholesterolemia in substance users as compared to their counterparts. Likewise, a significant association was reported for types of stroke ( $P < 0.01$ ) and stroke recurrence ( $P < 0.031$ ) with substance abuse [Table 3].

## DISCUSSION

The present study focused to study the sociodemographic and clinical profile of the stroke patients admitted in a newly developed tertiary care hospital. The study reported that the mean age of patients was 55.25 ( $\pm 1.32$ ) years and majority of patients (91.7%) were men with BMI in the range of 18–24.9 kg/m<sup>2</sup> (72.9%). Further, 8.75% of patients had HTN and 80.6% were using one or another substance; with smoking (45.8%) and 31.2% had a history of using alcohol. Out of 48 patients, 79.16% had an ischemic stroke with the left side of stroke (52.1%). One-third of patients underwent homocysteine testing (33.33%) with hyperhomocysteinemia detected in 75.0% of patients.

Globally, the incidence of stroke is rising. In contrast to the incidence of stroke in the normal population, a high rate of risk factors is equally reported in Indian population.<sup>[17]</sup> Cigarettes

smoking, dyslipidemia, HTN, and heavy and binge alcohol abuse are found to increase the risk of stroke.<sup>[3,17]</sup> Findings

**Table 1: Clinical characteristics of the study population**

| Demographic and clinical variables        | f (%)              |
|---|--------------------|
| Age (years) Mean $\pm$ SD                 | 55.25 $\pm$ 1.321  |
| Age (years)                               |                    |
| Young                                     | 14 (29.2)          |
| Old                                       | 34 (70.8)          |
| Gender                                    |                    |
| Male                                      | 44 (91.7)          |
| Female                                    | 4 (8.3)            |
| BMI (18–24.9 kg/m <sup>2</sup> )          | 35 (72.9)          |
| Pulse rate                                | 87.89 $\pm$ 1.75   |
| Hypertension                              | 33 (68.75)         |
| Blood sugar (HbA1C) %                     | 6.28 $\pm$ 3.26    |
| Dyslipidemia                              |                    |
| HDL (mg/dL)                               | 35.17 $\pm$ 1.23   |
| Total cholesterol (mg/dL)                 | 150.32 $\pm$ 93.38 |
| Ejection fraction (using echo) %          | 54.00 $\pm$ 1.42   |
| CK-MB% ( $n=17$ )                         | 13.39 $\pm$ 2.27   |
| Substance abuse profile                   |                    |
| Substance abuse*                          | 39 (80.6)          |
| Substance abuse                           |                    |
| Smoking (cigarettes/bidi)                 | 22 (45.8)          |
| Smokeless                                 | 2 (4.2)            |
| Alcohol                                   | 15 (31.2)          |
| No. of cigarettes/bidi/day                |                    |
| $\leq 15$                                 | 15 (31.2)          |
| $> 15$                                    | 5 (10.4)           |
| Duration of substance abuse               |                    |
| $\leq 2$ years                            | 13 (27.0)          |
| $> 2$ years                               | 11 (22.9)          |
| Duration of alcohol abuse                 |                    |
| $\leq 2$ years                            | 9 (18.8)           |
| $> 2$ years                               | 18 (16.7)          |
| Stroke profile                            |                    |
| Ischemic stroke                           | 38 (79.16)         |
| Left-sided stroke                         | 25 (52.1)          |
| Homocysteine test                         | 16 (33.33)         |
| Hyperhomocysteinemia ( $>15$ $\mu$ mol/L) | 12 (75.0)          |
| GCS status (13–15)                        | 42 (87.5)          |
| NIHSS score (Mean $\pm$ SD)               | 8.06 $\pm$ 5.09    |
| Total recurrence events <sup>#</sup>      | 18 (37.5)          |
| Recurrence in ischemic stroke             | 15 (31.25)         |
| Admission $\leq$ 24 h of stroke           | 22 (45.8)          |
| Length of stay (days)                     | 7.22 $\pm$ 4.02    |
| Number of deaths                          | 3 (6.25)           |

\*Alcohol, smoking; GCS: Glasgow Coma Scale; <sup>#</sup>stroke, cardiovascular events, TIA, and rehospitalization; CK-MB: Creatine kinase myocardial band. HDL: High-density lipoprotein. BMI: Body mass index, NIHSS: National Institutes of Health Stroke Scale

**Table 2: Clinical characteristics of stroke patients with alcohol user versus non-users**

| Clinical outcome                    | Alcohol users | Non-users   | P-value |
|-------------------------------------|---------------|-------------|---------|
| Diastolic hypertension <sup>#</sup> | 77.33±10.99   | 85.12±11.42 | 0.032*  |
| Dyslipidemia – HDL <sup>#</sup>     | 26.18±11.44   | 39.44±10.49 | 0.003*  |
| CK-MB <sup>#</sup>                  | 26.80±30.73   | 7.29±14.89  | 0.005*  |
| Pulse rate <sup>#</sup>             | 90.66±20.25   | 79.36±15.25 | 0.037*  |
| NIHSS score on admission            | 4.80±4.08     | 9.80±5.02   | 0.077   |
| Length of hospital stay (days)      | 7.06±4.11     | 7.33±4.15   | 0.837   |
| BMI                                 | 21.00±2.84    | 24.2±4.49   | 0.282   |
| Ejection fraction in ECHO%          | 49.00±17.12   | 56.00±12.66 | 0.191   |

<sup>#</sup>-Chi-square test, <sup>#</sup>independent *t*-test; \**P*<0.05. BMI: Body mass index, HDL: High-density lipoprotein, NIHSS: National Institutes of Health Stroke Scale

**Table 3: Clinical characteristics of stroke patients in substance abuser versus non-abusers**

| Clinical variables                          | Categories       | Substance abusers | Non-abusers | P-value |
|---|------------------|-------------------|-------------|---------|
| Age (years) <sup>#</sup>                    |                  | 55.37±12.84       | 55.12±13.87 | 0.94    |
| NIHSS score on admission <sup>#</sup>       |                  | 10.33±5.08        | 6.66±5.00   | 0.19    |
| Length of hospital stay – days <sup>#</sup> |                  | 8.25±4.84         | 6.25±2.95   | 0.09    |
| Dyslipidemia – HDL <sup>#</sup>             |                  | 41.18±12.04       | 30.82±10.91 | 0.018*  |
| BMI <sup>#</sup>                            |                  | 24.65±3.37        | 22.15±5.00  | 0.23    |
| Ejection fraction in ECHO % <sup>#</sup>    |                  | 55±11.31          | 53.05±16.72 | 0.692   |
| Site of stroke <sup>#</sup>                 | Left sided       | 12 (25.0)         | 13 (27.08)  | 0.50    |
|   | Right sided      | 12 (25.0)         | 11 (22.91)  |         |
| Type of stroke <sup>#</sup>                 | Ischemic         | 23 (47.92)        | 16 (33.33)  | 0.01*   |
|   | Hemorrhagic      | 1 (2.08)          | 8 (16.67)   |         |
| Stroke recurrence <sup>#</sup>              | Recurrent stroke | 12 (25.0)         | 12 (25.0)   | 0.031*  |
|   | First stroke     | 19 (39.58)        | 5 (10.42)   |         |
| Hypertension <sup>#</sup>                   | Yes              | 16 (33.33)        | 17 (35.42)  | 0.50    |
|   | No               | 8 (16.67)         | 7 (14.58)   |         |
| Diabetes mellitus <sup>#</sup>              | Yes              | 6 (12.5)          | 9 (18.75)   | 0.26    |
|   | No               | 18 (37.5)         | 15 (37.5)   |         |

<sup>#</sup>Chi-square test; <sup>#</sup>independent *t*-test; BMI: Body mass index; \**P*<0.05, HDL: High-density lipoprotein, NIHSS: National Institutes of Health Stroke Scale

on risk factors, HTN, diabetes mellitus, alcohol, smoking, and hypercholesterolemia, remain consistent with the other existing literature.<sup>[4,9,16,18-21]</sup> Further, the geographical distribution of Uttarakhand makes its population more vulnerable to substance abuse due to natural production and ease of availability. Natural cultivation of tobacco and other smoking and illicit substance in Himalayan belt promotes excessive use of these substances.

The present study findings reported that 81.2% of patients using the substance in one or another form. Smoking use was comparatively more common (50%) in the population than alcohol (31.2%) consumption in the region, it may be due to ease of availability of smoking and its related products such as tobacco and other similar products in the region. The dearth of information on substance abuse in stroke patients made it difficult to find the current magnitude and could not confirm with the previous research on substance use among stroke patients in the region. One of the Indian studies conducted in Kerala reported that 22.8% urban and 39.3%

rural stroke patients were visiting health care facility using smoking in one or another form.<sup>[17]</sup> Similarly, literature from a population-based study from Northern Europe reported 20.31% of population using heavy cannabis, smoking, and alcohol.<sup>[22]</sup>

However, the literature examining the risk of stroke associated with substance abuse is limited in the region. This analysis examines the clinicoepidemiological status of stroke patients in the Himalayan region and the contribution of substance abuse and recurrence of stroke.

The present study findings reported that 37.5% of stroke cases reported recurrence, out of the 31.25% were ischemic stroke. These findings are in line with earlier studies conducted on ischemic stroke, including the hypertensive cerebral crisis in 49.5% of cases and myocardial infarction in 16.4% of cases during the initial 3 years of the first onset of stroke.<sup>[23]</sup> However, the recurrent event was less (32.1%) at 7 years of follow-ups in the study. The less recurrence rate

may be because of change in demographic characteristics and use of different treatment strategies at follow-up in the study. A repeat episode of stroke was reported in 10% of stroke patients survived from the first-ever attack within a year, and 20% had the second incidence of stroke within 5 years of the first-ever stroke.<sup>[24]</sup> Further, it has been reported that the recurrence rate in stroke patients was 30% by 5 years, with 13% highest risk of new events after the first stroke.<sup>[25]</sup> Although this is not a conclusive finding, the previous studies on stroke reported much higher recurrence in the 1<sup>st</sup> year of stroke.<sup>[21,24]</sup> Population-based follow-up studies also reported an average of 4–6% recurrence in stroke, that is, very low in comparison to other studies. Studies analyze the course and survival of stroke in the early 50s–60s also reported a close comparable recurrence rate in stroke victims.<sup>[24]</sup> Another population-based study in Rochester, Minnesota, reported a risk of 2% ± 0.4% at 7 days, 12% ± 1.1% at 1 year, and 29% ± 1.7% at 5 years in first-ever stroke patients.<sup>[26]</sup>

Further, the present study findings reported a protective effect of alcohol showing high high-density lipoprotein (HDL) and contribute to developing HTN, higher pulse rate, and CK-MB. These findings are consistent with an earlier report suggested moderate consumption of alcohol as a protective factor and found associated with the high level of HDL.<sup>[27]</sup> Similarly, another study reported a protective effect of moderate alcohol consumption on developing ischemic stroke.<sup>[28]</sup> Similarly, for HTN, it has been evident that the use of >20 g ethanol/day is associated with a higher chance of developing pre-HTN.<sup>[29,30]</sup> Further, findings reported a significantly higher level of CK-MB in alcohol user. These findings are in a match to an earlier report depicted higher concentration of creatinine kinase in chronic alcohol users.<sup>[31]</sup> However, these findings were indirect and found associated with the development of acute pancreatitis and subsequently to higher CK-MB level. Although an inflammatory effect of alcohol consumption is also found linked to the development of acute myocyte destruction resulting in higher CK-MB in laboratory diagnosis in alcohol users.<sup>[32]</sup> Findings on heart rate were significantly higher in alcohol users in this study.<sup>[33]</sup> A contradictory finding on cardiac arrhythmias and heart rate fluctuation is reported in earlier published work. However, the reason for contradictory findings is unclear, but possibilities include excessive acute or chronic abuse of alcohol or decreased sympathetic activity in response to the vasodilation effect of acute alcohol. Despite a limited record availability in a newly developed public health center, we believe that our study helps to understand the clinicians about the impact of geographical pattern on development of stroke and other profile of stroke patients. Further, it will develop an insight to use a best treatment strategy for stroke patients in future.

## CONCLUSION

Ischemic stroke patients constitute a more significant proportion of stroke subtypes in the Himalayan region.

Substance abuse is on alarming stages in stroke patients and warrants a strategy to curb the menace in this region. Control over risk factors need shared governance; community support, investing in the health-care system, evidence-based medical education, and law enforcement to control illicit use of smoking and alcohol in the region.

## REFERENCES

1. Kaul S, Bandaru VC, Suvarna A, Boddu DB. Stroke burden and risk factors in developing countries with special reference to India. *J Indian Med Assoc* 2009;107:358.
2. Kamalakannan S, Gudlavalleti AS, Gudlavalleti VS, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. *Indian J Med Res* 2017;146:175-85.
3. Mostofsky E, Burger MR, Schlaug G, Mukamal KJ, Rosamond WD, Mittleman MA. Alcohol and acute ischemic stroke onset: The stroke onset study. *Stroke* 2010;41:1845-9.
4. George MG, Tong X, Kuklina EV, Labarthe DR. Trends in stroke hospitalizations and associated risk factors among children and young adults, 1995-2008. *Ann Neurol* 2011;70:713-21.
5. Whisnant JP, Homer D, Ingall TJ, Baker HL, O'Fallon WM, Wievers DO. Duration of cigarette smoking is the strongest predictor of severe extracranial carotid artery atherosclerosis. *Stroke* 1990;21:707-14.
6. Shinton R, Beevers G. Meta-analysis of relation between cigarette smoking and stroke. *Br Med J* 1989;298:789-94.
7. O'Connor AD, Rusyniak DE, Bruno A. Cerebrovascular and cardiovascular complications of alcohol and sympathomimetic drug abuse. *Med Clin North Am* 2005;89:1343-58.
8. Ravi KS. Nearly 50% Population in Doon, Haridwar Consumes Alcohol, Finds AIIMS Survey. *Hindustan Times*; 2018. Available from: <https://www.hindustantimes.com/dehradun/alcoholism-growing-menace-in-dehradun-haridwar-dists-aiims-survey/story-7Anicw9ai1OKAPHOILsZ7O.html>. [Last accessed on 2020 Jul 24].
9. O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, *et al.* Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): A case-control study. *Lancet* 2010;376:112-23.
10. Ronksley PE, Brien SE, Turner BJ, Mukamal KJ, Ghali WA. Association of alcohol consumption with selected cardiovascular disease outcomes: A systematic review and meta-analysis. *BMJ* 2011;342:d671.
11. Juyal R, Bansal R, Kishore S, Negi KS, Chandra R, Semwal J. Substance use among intercollege students in District Dehradun. *Indian J Community Med* 2006;31:14-6.
12. Kuddus M, Ginawi IA, Al-Hazimi A. *Cannabis sativa*: An ancient wild edible plant of India. *Emir J Food Agric* 2013;25:736-45.
13. Juyal R, Bansal R, Kishore S, Negi K. Pattern of substance abuse among students in a district of Uttaranchal. *Indian J Prev Soc Med* 2007;38:166-71.
14. Toossi S, Hess CP, Hills NK, Josephson SA. Neurovascular complications of cocaine use at a tertiary stroke center. *J Stroke Cerebrovasc Dis* 2010;19:273-8.
15. Zhang X, Shu XO, Yang G, Li HL, Xiang YB, Gao YT, *et al.* Association of passive smoking by husbands with prevalence of stroke among Chinese women nonsmokers. *Am J Epidemiol*

- 2005;161:213-8.
16. Hou L, Han W, Jiang J, Liu B, Wu Y, Zou X, *et al.* Passive smoking and stroke in men and women: A national population-based case-control study in China. *Sci Rep* 2017;7:45542.
  17. Sridharan SE, Unnikrishnan JP, Sukumaran S, Sylaja PN, Nayak SD, Sarma PS, *et al.* Incidence, types, risk factors, and outcome of stroke in a developing country: The Trivandrum stroke registry. *Stroke* 2009;40:1212-8.
  18. Panda S, Agarwal C, Sharma A. Piloerection : A rare ictal phenomenon-case report and review of literature. *Ann Indian Acad Neurol* 2017;20:169-72.
  19. Wolfe CD, Smeeton NC, Coshall C, Tilling K, Rudd AG. Survival differences after stroke in a multiethnic population: Follow-up study with the South London stroke register. *Br Med J* 2005;331:431-3.
  20. Kernan WN, Ovbiagele B, Black HR, Bravata DM, Chimowitz MI, Ezekowitz MD, *et al.* Guidelines for the prevention of stroke in patients with stroke and transient ischemic attack: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2014;45:2160-236.
  21. Viitanen M, Eriksson S, Asplund K. Risk of recurrent stroke, myocardial infarction and epilepsy during long-term follow-up after stroke. *Eur Neurol* 1988;28:227-31.
  22. Falkstedt D, Wolff V, Allebeck P, Hemmingsson T, Danielsson AK. *Cannabis*, tobacco, alcohol use, and the risk of early stroke: A population-based cohort study of 45 000 Swedish men. *Stroke* 2017;48:265-70.
  23. Schmidt EV, Smirnov VE, Ryabova VS. Results of the seven-year prospective study of stroke patients. *Stroke* 1988;19:942-9.
  24. Matsumoto N, Whisnant JP, Kurland LT, Okazaki H. Natural history of stroke in Rochester, Minnesota, 1955 through 1969: An extension of a previous study, 1945 through 1954. *Stroke* 1973;4:20-9.
  25. Burn J, Dennis M, Bamford J, Sandercock P, Wade W, Warlow C. Long-term risk of recurrent stroke after a first-ever stroke. The Oxfordshire community stroke project. *Stroke* 1994;25:333-7.
  26. Petty GW, Brown RD, Whisnant JP, Sicks JD, O'Fallon WM, Wiebers DO. Survival and recurrence after first cerebral infarction. *Neurology* 1998;50:208-16.
  27. Mori TA, Burke V, Beilin LJ, Puddey IB. Randomized controlled intervention of the effects of alcohol on blood pressure in premenopausal women. *Hypertension* 2015;66:517-23.
  28. Elkind M, Boden-Albala B, Lin IF, Kargman DE, Hauser WA, Shea S. The protective effect of moderate alcohol consumption on ischemic stroke. *JAMA* 1999;281:53-60.
  29. Briasoulis A, Agarwal V, Messerli FH. Alcohol consumption and the risk of hypertension in men and women: A systematic review and meta-analysis. *J Clin Hypertens (Greenwich)* 2012;14:792-8.
  30. Fan X, Hua W, Xu Y, Ding L, Niu H, Chen K, *et al.* Incidence and predictors of sudden cardiac death in patients with reduced left ventricular ejection fraction after myocardial infarction in an era of revascularisation. *Heart* 2014;100:1242-9.
  31. Su M, Jiang Y, Yan XH, Zhao QH. Alcohol abuse-related severe acute pancreatitis with rhabdomyolysis complications. *Exp Ther Med* 2013;5:189-92.
  32. Maisch B. Alcoholic cardiomyopathy: The result of dosage and individual predisposition. *Herz* 2016;41:484-93.
  33. Brunner S, Herbel R, Drobisch C, Peters A, Sinner MF, Massberg S, *et al.* Alcohol consumption, sinus tachycardia, and cardiac arrhythmias at the Munich Oktoberfest: Results from the Munich Beer Related Electrocardiogram Workup Study (MunichBREW). *Eur Heart J* 2017;38:2100-6.

**How to cite this article:** Kumar R, Kataria N, Radhakrishnan DM, Kumar N. Clinico-epidemiological profile of stroke patients in the Himalayan Subcontinent – A retrospective study. *Natl J Physiol Pharm Pharmacol* 2021;11(01):17-22.

**Source of Support:** Nil, **Conflicts of Interest:** None declared.