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## **Electrophysiological Detection of Asymptomatic Neuropathy in Alcohol Dependence Syndrome Patients- A Cross Sectional Observational Study**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author AV designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors Murugesan and Avudaiappan managed the analyses of the study. Author AP managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aim:** To detect the prevalence of asymptomatic neuropathy using nerve conduction study among alcohol dependence syndrome patients and to investigate the existence or not of correlation between duration, quantity of alcohol consumption and neuropathy.

**Study Design:** Observational cross-sectional study.

**Place and Duration of Study:** Department of General Medicine and Department of Psychiatry, Mahatma Gandhi Medical College and Research Institute, Pondicherry, affiliated to Sri Balaji Vidyapeeth (Deemed to be) University, India between February 2019 and August 2020.

**Methods:** Alcohol dependence syndrome patients, asymptomatic for neuropathy were prospectively included and, patients who were symptomatic and had other comorbid conditions that

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can cause neuropathy were excluded. Patients were then submitted to nerve conduction studies. In patients who had neuropathy, duration and quantity of alcohol consumption were compared for correlation.

**Results:** This study included 65 male patients who were mostly middle aged heavy drinkers of alcohol. 73.8% (n=48) had neuropathy. Our research showed longer the duration, larger the quantity of alcohol consumption, and higher the Cut-Annoyed-Guilty-Eye (CAGE score), more were the prevalence of neuropathy. This research also used Severity Of Alcohol Dependence Questionnaire (SAD-Q) scoring for screening alcohol dependence which showed patients with neuropathy were moderate drinkers. We did not find correlation with age of patients and neuropathy.

**Conclusion:** This research results like correlation of prevalence of neuropathy and duration of alcohol consumption and quantity of alcohol consumption were in contrast with previous studies on alcoholic neuropathy. This research used SAD-Q scoring for dependence, future researches can throw light on usage of SAD-Q score in asymptomatic neuropathy and the correlation of neuropathy with alcohol consumption.

**Keywords:** *Alcohol dependence syndrome; alcohol use disorder; alcoholic neuropathy; alcohol-related neuropathy; CAGE; SAD-Q.*

## 1. INTRODUCTION

Chronic alcoholic consumption results in multiple organ damage among which the central nervous system is affected in the form of Wernicke encephalopathy, Korsakoff psychosis, cerebellar ataxia and, peripheral neuropathy and, sensory ataxia [1].

Alcohol-related peripheral neuropathy is a potentially irreversible complication of alcoholism that results in sensory, motor, autonomic dysfunction which commonly presents as pain, paraesthesia, sensory ataxia. Exact prevalence of people affected by this condition is not known, however studies have shown that approximately 66% of chronic alcoholics are found to have peripheral neuropathy [1].

Alcohol-related neuropathy can be differentiated from other causes of neuropathy by eliciting detailed history and conducting a thorough physical examination. Previously conducted studies have used nerve conduction study of all motor and sensory nerves to diagnose neuropathy in symptomatic patients [2–4]. Neuropathy sets in much earlier before the onset of symptoms. However, there is limited knowledge on the prevalence of neuropathy in asymptomatic chronic alcoholics. Earlier detection of neuropathy and advocacy of abstinence of alcohol can alter the course of illness and avoid further nerve injury. This study is intended to detect asymptomatic neuropathy in alcohol dependence syndrome patients using nerve conduction studies and to correlate the presence of neuropathy with duration and

quantity of alcohol consumption in asymptomatic alcohol dependence syndrome patients. Uniqueness in this research is that we have used SAD-Q scoring a higher sensitive and specific scoring for screening for dependence which have been used less commonly in previous studies.

## 2. METHODOLOGY

This was a cross-sectional observational study performed at a tertiary care hospital at Pondicherry. We enrolled patients admitted in General Medicine and Psychiatry wards, who were above 18 years of age after obtaining a written informed consent. History regarding alcohol habituation, the duration and quantity of consumption, symptoms of neuropathy, and history concerning other possible causes of neuropathy were taken and physical examination was done. Glycemic and thyroid status of the patients were evaluated by checking their HbA1C, random blood sugar and thyroid profile. Patients with alcohol dependence syndrome confirmed through questionnaires like Cut-Annoyed-Guilty-Eye "(CAGE) score (2 or more) and Severity Of Alcohol Dependence Questionnaire (SAD-Q) score (16 and above), who had alcohol habituation for more than two years and were asymptomatic for neuropathy were included in this study. Patients with signs and symptoms of neuropathy, patients with other probable comorbid conditions that can cause neuropathy and can act as confounding factors of the study were excluded.

Studies on alcohol-related peripheral neuropathy that used clinical and electrophysiological criteria

showed that neuropathy was found in 25% to 66% of chronic alcoholics [1]. Based on this prevalence, the sample size was calculated using the following formula:

$$\text{Sample size } n = \frac{(\text{DEFF} * Np(1-p))}{(d^2/2^2 - 1/\alpha^2 * (N-1) + p^2(1-p))}$$

The estimated sample size was 65. Patients fitting the inclusion criteria were subjected to Nerve conduction study under the supervision of a neurologist using the RMS nerve conduction machine as per the standard Indian Neurologist Association approved technique. The sensory and motor components of the median, ulnar, sural, superficial peroneal and the tibial nerves were studied under latency (ms), amplitude (mV), and conduction velocity(m/s) and the results were validated by the neurologist.

Patients with neuropathy were compared with duration and quantity of alcohol consumption for any significant correlation. Similarly, neuropathy was compared with the CAGE and SAD-Q scores of the patients for correlation. Patients with neuropathy were treated as per the neurologist's advice.

## 2.1 Statistical Analysis

Statistical analysis was carried out using SPSS version 19.0 (IBM SPSS. US) software. Description of categorical variables was done using frequency and percentage, continuous data were described in mean, and standard deviation. Association between categorical independent variables such as demographic factors, duration of consumption of alcohol with

the presence of peripheral neuropathy was assessed using the Chi-square test. Statistical comparison of normal values of nerve conduction parameters with the mean values obtained for various peripheral motor and sensory nerves was done using a one-sample t-test. Association between continuous variables like SADQ score between alcoholics with normal and asymptomatic neuropathy was performed using an independent sample t-test. All tests were two-tailed and results were considered significant when the p-value was less than 0.05.

## 3. RESULTS

We enrolled 65 male patients. The mean age of participants was 45.7. The mean duration of alcohol consumption was 20 years, and mean units of alcohol consumed per week was 35.

According to the nerve conduction study, 73.8% of asymptomatic patients had neuropathy and electrophysiological evaluation was normal in 26.2% of the patients in this research.

This research could not achieve a significant correlation between age of the study population and presence of neuropathy (Chart 1). The correlation of duration of alcohol consumption (Table 1) and quantity of alcohol consumption with outcome (Table 2), correlation of CAGE scoring with outcome (Table 3) are as below.

There was a positive correlation between duration of alcohol consumption, units of alcohol consumption and the development of neuropathy with a p value<0.001.

**Chart 1. Age comparison between alcoholics with normal and abnormal NCS (n=65)**

<b>Age Group in Years</b>	<b>No neuropathy</b>		<b>Abnormal</b>		<b>P value</b>
	<b>n= 17</b>	<b>%</b>	<b>n=48</b>	<b>%</b>	
20 – 29	4	23.5	10	20.8	
30 – 39	4	23.5	9	18.8	0.64
40 – 59	7	41.2	16	33.3	
≥ 60	2	11.8	13	27.1	

*Note: p-value based on Chi-square test*

**Table 1. Correlation of duration of alcohol consumption with outcome (n=65)**

<b>Alcohol Consumption in years</b>	<b>No neuropathy</b>		<b>Neuropathy</b>		<b>P value</b>
	<b>n= 17</b>	<b>%</b>	<b>n= 48</b>	<b>%</b>	
< 10	12	70.6	6	12.5	
10 – 19	2	11.8	10	20.8	<0.001*
≥ 20	3	17.6	32	66.7	

*Note: p-value based on Chi-square test, \*statistically significant*

**Table 2. Comparison of alcohol consumption in units between alcoholics with normal and abnormal NCS (n=65)**

Alcohol consumption in units	Normal		Neuropathy		P value
	N=17	%	N=38	%	
10 – 19	10	58.8	3	6.3	
20 – 29	5	29.4	6	12.5	<0.001*
30 – 39	0	0	16	33.3	
40 – 50	2	11.8	23	47.9	

Note: p-value based on Chi-square test, \*statistically significant

**Table 3. Comparison of cage score between alcoholics with normal and abnormal NCS (n=65)**

	Cage score			P value
	2	3	4	
No neuropathy	n	15	2	0
	%	88.2	11.8	0
Neuropathy	n	17	21	10
	%	35.4	43.8	20.8

Note: p-value based on Chi-square test, \*statistically significant

**Table 4. Comparison of SADQ between alcoholics with no neuropathy and neuropathy (n=65)**

	Mean	S.D	P value
NO neuropathy	27.6	1.5	
Neuropathy	29.1	2.3	0.02*

Note: p-value based on independent sample t-test, \*statistically significant

Above (Table 4) shows that moderate dependence was seen among patients with neuropathy.

score more were the prevalence of neuropathy. Mean SAD-Q score was 29 among patients with neuropathy denoting moderate dependence in patients with neuropathy.

#### 4. DISCUSSION

This research was performed with the aim of assessing the presence of neuropathy in asymptomatic alcohol dependence syndrome patients and to investigate the existence or not of correlation between the presence of neuropathy with duration and quantity of their alcohol consumption. In this research most of the participants were middle aged and were heavy drinkers based on mean values of duration and quantity of alcohol consumption. This research showed that the, majority of the asymptomatic alcohol dependence syndrome patients had neuropathy diagnosed by nerve conduction study and showed a positive correlation with duration and amount of alcohol consumption implying that longer the duration of alcohol habituation was associated with higher the was the prevalence of neuropathy, likewise more the units of alcohol consumed more was the prevalence of neuropathy. We also found, higher the CAGE

The prevalence of alcoholic neuropathy in this research was similar to that found in other previous studies [1,4,5].

In this research patients, there was no evidence of neuropathy by history and physical examination but NCS revealed conduction velocity to be decreased in motor and distal sensory nerves which was similar to the study by E. B. Casey et al. [6].

We did not find an association between age and development of neuropathy with a p-value of 0.64 similar to a previous study that did not show a correlation between age and neuropathy [7]. We hypothesize that alcohol could be an additive effect for development of neuropathy and may not be the sole reason for neuropathy. Therefore, with increasing age this association is controversial.

Our cohort included only males because the alcohol consumption exposure is higher in males than females in India similar to other studies whose study group included males about 70% [8] and 100% (9) respectively showing a male predominance in enrolled study population.

This research showed a association between the duration of alcohol consumption and the development of neuropathy with a p value<0.001 which is similar to previous studies [8,9].

The mean value of alcohol consumption per week (35 units) was higher than a previous study (21units/week) [10]. A statistical significant association between units of alcohol consumption and development of neuropathy with a p value<0.001 was achieved which is in contrast to previous studies [3,4,7]. This research showed statistical significance between CAGE scoring and neuropathy similar to that of a previous study [4].

This research has some limitations. First of all, our sample was characterized by convenience, requiring further studies for example, longitudinal, to define the cutoff values to predict the prevalence of asymptomatic neuropathy. Additionally due to its design, a cross-sectional study, the onset of neuropathy could not be studied.

Our research differs from previous studies regarding the association between duration, amount of alcohol consumption and neuropathy; hence future research can give clarity about the relationship between the units of alcohol consumption and its adverse effects on peripheral nerves. The results of this research may enable early identification of alcohol-related peripheral neuropathy and initiation of its treatment to prevent disabilities in chronic alcoholics, thereby improving the quality of life of the patients.

## 5. CONCLUSION

We conclude that our research showed association between duration and quantity of alcohol consumption with neuropathy among asymptomatic chronic alcoholics. Uniqueness in this study is that a positive correlation between SAD-Q scoring and neuropathy was achieved which is a new finding in comparison with previous studies that had used only CAGE

scoring for screening for alcohol dependence; hence future studies can validate the usage of SAD-Q scoring in alcoholic neuropathy.

## ETHICAL APPROVAL AND CONSENT

The Institutional Human Ethics Committee (IHEC) approved this study from February 2019 to august 2020. We enrolled patients admitted in General Medicine and Psychiatry wards, who were above 18 years of age after obtaining a written informed consent.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

- Chopra K, Tiwari V. Alcoholic neuropathy: possible mechanisms and future treatment possibilities. *Br J Clin Pharmacol.* 2012; 73(3):348–62.
- Behse F, Buchthal F. Alcoholic neuropathy: Clinical, electrophysiological, and biopsy findings. *Annals of Neurology.* 1977;2(2):95–110.
- Bhansali DSC, Sunder DRR, Balananda P, Venkateswarlu DK, Parvathi DR. Nerve Conduction Studies in Asymptomatic Alcoholics. 2015;03(06):6.
- Rebecca J, Peter G, Kavina F. Pattern of peripheral neuropathy among patients with alcohol dependence syndrome. 2016;4.
- Ammendola A, Gemini D, Iannaccone S, Argenzi F, Ciccone G, Ammendola E, et al. Gender and peripheral neuropathy in chronic alcoholism: a clinical-electroneurographic study. *Alcohol Alcohol.* 2000;35(4):368–71.
- Casey EB, Quesne PML. Electrophysiological evidence for a distal lesion in alcoholic neuropathy. *Journal of Neurology, Neurosurgery & Psychiatry.* 1972;35(5):624–30.
- Monforte R, Estruch R, Valls-Solé J, Nicolás J, Villalta J, Urbano-Marquez A. Autonomic and peripheral neuropathies in patients with chronic alcoholism. A dose-related toxic effect of alcohol. *Arch Neurol.* 1995;52(1):45–51.
- Efficace F, Mandelli F, Fazi P, Santoro C, Gaidano G, Cottone F, et al. Health-related quality of life and burden of fatigue in

- patients with primary immune thrombocytopenia by phase of disease. Am J Hematol. 2016;91(10):995–1001.
9. Zambelis T, Tsivgoulis G, Karandreas N. Carpal tunnel syndrome: Associations between risk factors and laterality. European Neurology. 2009; 63:43–7.
10. Swaroop Chand Bhansali, Ragam Ravi Sunder, Perugu Balananda, Venkateswarlu K, Parvathi R. Nerve conduction studies in asymptomatic alcoholics. JMSCR. 2015;03(06):6347-6352.

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