

Alcohol Consumption and Severity of Polyneuropathy by Electrophysiological Study

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Research Article

Abstract: Objective: To study severity of polyneuropathy by EPS and its correlation with alcohol consumption. **Methodology:** Chronic alcoholic subjects who were above 18 years of age included in the study. All subjects were subject to EPS study and categorized in 4 different types of severity. Alcohol consumption of subjects were noted. TLDE was calculated. Correlation of severity of polyneuropathy by EPS and alcohol consumption was done. **Outcome measures:** Severity of polyneuropathy by EPS with respect to type, duration and amount of alcohol consumption. **Study design:** Hospital based, cross sectional study. **Conclusion:** Most of subjects 54(51.4%) consumed country made liquor; followed by 13(12.3%) consumed beer. 76.2% subjects had daily alcohol intake more than 100g/day. Duration of alcohol use was at least 2 years for all subjects. Majority 61(58.09%) of them consumed alcohol for 6 to 10 years. On EPS the average number of years of alcohol consumption in 'Severe' category was highest with 15.94±5.76 yr, while for cases falling in 'Borderline' category, it was lowest with 7.0476±2.01yr so this study concludes that Patient who consumed country liquor for longer time and larger amount had more severe type of neuropathy.

Key words: EPS, TLDE.

Introduction

Persons who have consumed large quantities of alcoholic beverages over an extended period of time are at risk for developing a primary axonal sensorimotor peripheral polyneuropathy (1). It seemed worthwhile to investigate, using a range of electrophysiological techniques, alcoholics with peripheral nerve lesions and correlate its severity with alcohol consumption.

Material and Method

Subject above 18 years of age with a history of chronic alcoholism, symptomatic or asymptomatic with evidence of polyneuropathy on EPS were included in study. Chronic alcoholism was defined as an individual having daily alcohol intake more than 75gm/day and more than 2 years (2). Subjects with chronic liver disease,

diabetes mellitus, renal dysfunction, thyroid dysfunction, HIV and those on drug therapy which leads to peripheral neuropathy, were excluded from the study. All subjects were provided with study information and those willing were enrolled in to study after a written informed consent. Complete history of the subject was taken. General examination and systemic examination with emphasis on peripheral nervous system was done

Total lifetime dose of ethanol (TLDE) was calculated for every subject

The total dose of ethanol consumed in lifetime (TLDE), was expressed as ethanol/kg of body weight. It was estimated by first multiplying the daily consumption of ethanol by number of days of the periods of exposure to alcohol and then dividing the product by the body weight of the subject.(1)

$$TLDE = \frac{\text{Daily ethanol consumption (gm)} \times \text{no. of days of consumption}}{\text{wt. in kg}}$$

Nerve conduction velocity study

Prior to the procedure all subject were considered for data on age, height, weight. Nerve conduction study was carried out by RMS EMG EP MARK II (Recorder and Medicare system) the surface electrodes were used for recording action potential as well as for stimulating nerves. Four nerves were studied; median nerve, ulnar nerve, peroneal nerve, sural nerve and following tests were done.

- A) Nerve Conduction Velocity Sensory and Motor
- B) Amplitude of sensory or motor potential which ever was applicable.

Classification of electrophysiological neuropathy

Polyneuropathy was classified on EPS values in borderline, mild, moderate, severe category.(1)

Results

Table 1: Type of alcohol consumed and number of subjects

Type of liquor							Total
Beer	Country liquor	Mixed	Spirit / Beer	Spirit/ Beer / wine	Spirits	Wine	
13 (12.38%)	54 (51.42%)	14 (13.33%)	7 (6.66%)	5 (4.76%)	6 (5.71%)	6 (5.71%)	105

Table 2: Distribution of subject according to amount of alcohol consumption

Alcohol consumption g /day	Subject number (percentage)
80-100	25(23.8%)
>100-200	41(39%)
>200	39(37.2%)

Table 3: Distribution of subject according to duration of alcohol consumption

Duration of consumption (yr)	Number of subjects (percentage)
2-5	16 (15.23%)
6-10	61 (58.09%)
11-15	17 (16.19%)
16-20	9 (8.57%)
More than 20	2 (1.9%)

Table 4: Distribution of subject according to TLDE

TLDE (Kg)	Number of subjects (percentage)
Less than 5	19 (18.09%)
5.1-15	49 (46.6%)
15.1-30	20 (19.04%)
30.1-40	8 (7.6%)
More than 40	9 (8.5%)

Table 5: Relationship between types of liquor(s) consumed by subjects and severity level

Type of Severity	Type of liquor							Total
	Country liquor	Beer	Wine	Spirits	Country liquor+ Beer (Mixed)	Beer+ Whisky (spirit)	Beer+ wine+ Whisky (spirit)	
Borderline	10 (47.6%)	1 (4.7%)	2 (9.5%)	3 (14.2%)	4 (19%)	1 (4.7%)	0	21
Mild	13 (44.8%)	4 (13.7%)	1 (3.4%)	2 (6.9%)	3 (10.3%)	4 (13.7%)	2 (6.9%)	29
Moderate	18 (47.3%)	8 (21%)	2 (5.2%)	1 (2.6%)	5 (13.1%)	2 (5.2%)	2 (5.2%)	38
Severe	13 (76.4%)	0	1 (5.8%)	0	2 (11.7%)	0	1 (5.8%)	17
Total	N=54	N=13	N=6	N=6	N=14	N=7	N=5	105

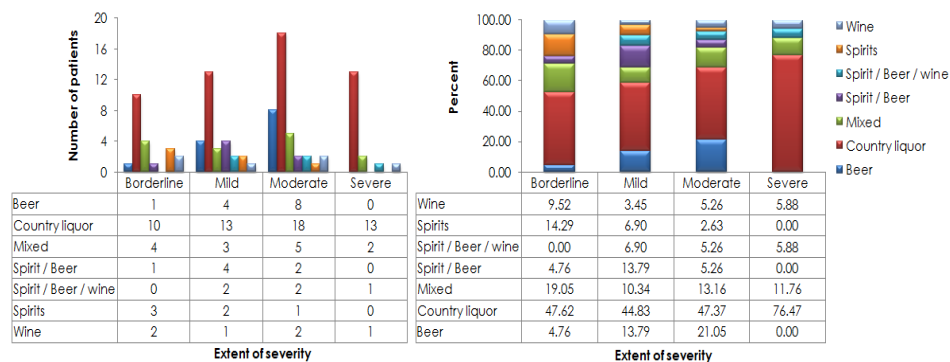


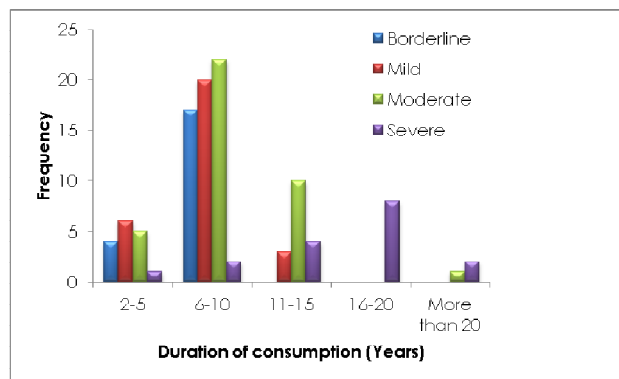
Figure 1: Relationship between types of liquor(s) consumed by subjects and severity level

Table 6A: Relation between electrophysiological severity of neuropathy and duration of alcohol consumption

Type of Severity	Duration of consumption (years) Mean $\pm$ SD	p-value
Borderline	7.0476 $\pm$ 2.01	1.172e-10 *
Mild	8.0689 $\pm$ 3.15	
Moderate	9.4210 $\pm$ 3.80	
Severe	15.9411 $\pm$ 5.76	

* $p < 0.0001$ **Table 6 B:** Showing electro-physiological severity of neuropathy and duration of consumption of alcohol

Type of severity Duration of consumption (Years)	Borderline	Mild	Moderate	Severe	Total
2-5	4 (3.8%)	6 (5.7%)	5(4.7%)	1(0.9%)	16
6-10	17(16.2%)	20(19.04%)	22(20.9%)	2(1.9%)	61
11-15	0	3(2.8%)	10(9.5%)	4 (3.8%)	17
16-20	0	0	0	8(7.6%)	8
More than 20	0	0	1(0.9%)	2(1.9%)	3
Total	21	29	38	17	105

**Figure2:** Bar diagram of severity of neuropathy electro physiologically and duration of consumption of alcohol**Table 7A:** Relationship between severity of neuropathy on EPS and total lifetime dose of ethanol (TLDE)

Type of Severity	Mean $\pm$ SD	p-value
Borderline	6.12 $\pm$ 2.4650	2.2e-16 *
Mild	9.99 $\pm$ 7.5315	
Moderate	15.09 $\pm$ 9.3117	
Severe	40.68 $\pm$ 18.3762	

* $p < 0.0001$ **Table 7B:** Showing severity of neuropathy on EPS and total lifetime dose of ethanol (TLDE)

Type of severity Total Lifetime Dose of Ethanol (Kg /kg wt)	Borderline	Mild	Moderate	Severe	Total
Less than 5	7	8	4	0	19
5.1-15	14	16	16	3	49
15.1-30	0	4	15	2	21
30.1-40	0	1	3	3	7
More than 40	0	0	0	9	9
Total	21	29	38	17	105

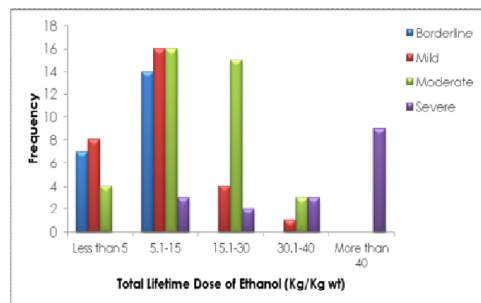


Figure 3A: Bar diagram showing TLDE and number of subjects

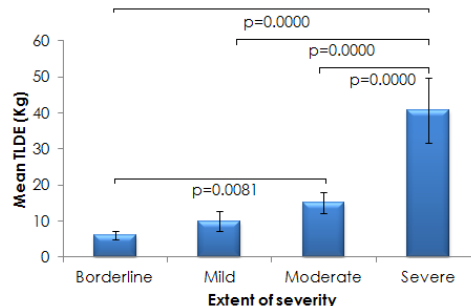


Figure 3B: Mean and 95% error bars for TLDE according to extent of severity

Discussion

Type of alcohol consumed:(table 1) In present study nearly 51% of the cases were addicted to country liquor, followed by 13% to beer, 14% to mixed type and very few 6% to wine and spirits. Spirits and beer together were consumed by 7% of patients. 5% of patient had beer, spirits and wine together. This correlates with other Indian studies by **Bajaj B et al in 2003(3)**; they found majority of drinkers consumed country liquor. **Bijil A et al in 2007(4)** also found that country liquor was drunk by majority of patients, mostly from low economic and rural background. **Vittadini G. et al 2001(1)** found that beer was the favored drink of young patients. 111(37.5%) patients drank only wine. Beer was consumed by 20 (6.8%) of patients, whereas 8 (2.7%) patients had both beer and spirits together. 63(21.3%) patients had wine, beer and spirits together. Some South Asian countries do consume illicit alcohol more predominantly, as seen by **Ferdinandis T. G. H. C. et al in 2008(5)**. They found 71% of the heavy drinkers had consumed illicit alcohol.

Amount of alcohol consumed:(table 2) In present study, 41(39%) patients had daily alcohol intake of 100 - 200 gms. 39(37.2%) patients had an intake more than 200 gms/day. However 25(23.8%) had daily intake less than 100 gms but above 80gms. In present study the average daily intake of patients was 201.8 ± 91.6 gm. The intake ranged between 80 to 450 g/day. This correlates with a study by **Johnson R et al in 1988(6)**, they found daily intake as 216 ± 86 gms. **Ammendola A. et al. in 2001(7)** found daily intake as 284 ± 142 gms.

Duration of alcohol consumed: (table 3) Duration of alcohol use was at least

2 years for all patients. 61(58%) of them, consumed alcohol for 6 to 10 years. 17(16%) of patients had consumed for 11 to 15 years. Those who consumed for more than 16 years were 11(11%). 16(15%) consumed it for 2 to 5 years. Mean duration of alcohol consumption in a study by **Ammendola A. et al. in 2000(8)** was 14.8 years and ranged from 2 to 35 years. In a study by **Johnson R et al in 1988(6)**; they found mean duration of alcohol consumption of 21 years with a SD of 9 years. This finding does not correlate with a study by **Bijil A et al in 2007(4)**; they found that mean duration of alcohol consumption was $8.59 (\pm 6.64)$ years. **Wetterling et al in 1999(9)**, also found duration of continuous drinking to be 13 years with SD of 9.2

Total Lifetime Dose of Ethanol (TLDE):(table 4) In present study; the total life time dose of ethanol was in the range of 5.1 to 15 kg/kg wt in 49(46%) of the patients. 20(19%) had TLDE of 15.1 to 30 kg/kg wt. and 17% had more than 30 kg/kg wt. 19(18%) had TLDE less than 5 kg/kg wt. The total lifetime dose of ethanol (TLDE) was obtained for each individual resulting into a mean of 16.03 Kg/kg body wt with SD of 15.13 Kg/kg body wt. It ranged between 1.75 to 65.18 Kg/kg body wt. which correlate with a study conducted in Srilanka by **Ferdinandis T. G. H. C. et al in 2008(5)**; they found mean total lifetime dose of ethanol was 17 ± 10.2 kg ethanol per kg bodyweight for illicit alcohol drinkers and 15 ± 7.4 kg ethanol per kg bodyweight for legal spirit drinkers. Another study by **Ammendola A et al 2000(38)** from Italy states TLDE of 23.6kg/kg body wt; which ranged from 1.6 to 79 kg/kg body wt). A study by **Bijil A et al in 2007(4)** also found TLDE of 20.6 kg/kg wt with SD of 9.07.

Relationship between types of liquor(s) consumed by patients and severity level(table 5) Figure 1

In present study it was observed that patients who drank country liquor were had moderate to severe electrophysiological neuropathy in 47.37% and 76.37% respectively. Patients who drank wine also had severe electrophysiological neuropathy in 5.88%. No patient had severe neuropathy that drank beer or spirit or both combined. Borderline neuropathy was seen less in patients who drank beer alone (4.7%), spirits alone (14.2%), beer and spirits together (4.7%), wine alone (9.5%). These findings correlate with a study by **Vittadini G et al in 2001(1)**; they found severe neuropathy 55.6% in wine, 33% in wine and spirit together, 11% in spirit and beer together drinker. Moderate neuropathy was seen in 44.2% of wine drinker, 15.4% of wine and spirit together drinker and 26.9% of mixed drinkers. Mild neuropathy was common in wine drinkers 41.5%, mixed drinker had 24.5%. They also found border line neuropathy in 9.5% of beer drinker, 9.5% in spirit drinker. 2.4% of patients who had borderline neuropathy were drinking beer and spirits together.

Relation between electrophysiological severity of neuropathy and duration of alcohol consumption

From table (6A and 6 B) (figure 2) In present study we found that the average number of years in 'Severe' category was highest with 15.94 ± 5.76 yr, while for cases falling in 'Borderline' category, it was lowest with 7.0476 ± 2.01 yr. The overall difference was found to be highly significant with p -value of $1.172e-10$ ($p < 0.0001$). In present study; 17(16.2%) patients had borderline, 20(19.04%) had mild, 22(20.9%) had moderate, 2 (1.9%) had severe neuropathy who consumed alcohol for 6 to 10 years. Patients who consumed alcohol for 11 to 20 years; 3(2.8%) had mild, 10(9.5%) had moderate, 12(11.4%) had severe neuropathy. Those who consumed for more than 20 years had dominantly severe 2(1.9%) and moderate 1(0.9%) neuropathy. Patients who drank for 2 to 5 years had borderline 4(3.8%), mild 6(5.7%), moderate 5(4.7%), severe 1(0.9%) neuropathy electro physiologically. This correlate with a study by **Vittadini G et al. in 2001(1)**; they found 44.4% of patient of severe neuropathy in group who drank alcohol for 11 to 20 years. Patients who drank for 6 to 10 years had 17.3% of moderate neuropathy, 22% of mild neuropathy and 14.3% of borderline neuropathy. Patient who drank for less than 5 years did not have neuropathy on electrophysiological studies. This again correlates with a study by **Ammendola A et al in 2001(7)**; they found a significant correlation of electrophysiological positive

study and mean duration of alcohol consumption i.e. 16.2 years with SD of 9.4 years.

Relationship between severity of neuropathy and total lifetime dose of ethanol (TLDE)

From table (7 A and 7 B)(figure 3A and 3B) In present study we found that 9 patients had severe neuropathy who had TLDE more than 40 kg/kg wt. 14 had borderline, 16 had mild, 16 had moderate, 3 had severe neuropathy who had TLDE between 5.1 to 15 kg/kg wt. those who had TLDE between 15.1 to 30 kg/kg wt, mild 4, moderate 15, severe 3 neuropathy electro-physiologically. Those had TLDE between 30.1 to 40 kg/kg wt had severe 3, moderate 3, mild 1 neuropathic changes on electro-physiologically. The mean TLDE was highest in 'Severe' category (40.68 ± 18.37 Kg) and lowest in 'Borderline' cases (6.12 ± 2.46 Kg). These findings correlate with a study by **Ammendola A et al in 2001(7)**; they found a statistically significant correlation between alcoholic polyneuropathy and TLDE. However this does not correlate with a study by **Ferdinandis T. G. H. C. et al in 2008(5)**; they did not found any significant correlation of alcoholic neuropathic parameter and TLDE. Patient who consumed country liquor for longer time and larger amount had more severe type of neuropathy

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