Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(7C):2464-2467 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2016.v04i07.032

Original Research Article

Prospective Study of Alcohol Use and Effect of Acoustic Stimulus with Different Tone in Alcoholic Men

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Abstract: National Sample Survey (NSS) reported that top most reason of sensory deficit and second most common cause of disability in Indian households is hearing disability. The development of hearing loss is influenced by various factors and role of alcohol consumption has been reported in previous studies but inconsistent results were found in the past related studies. So the present study was planned to study response to acoustic stimuli with different tone on alcoholics using a reaction time apparatus. It was done on 60 subjects of which 30 were included in study group and 30 were in control group. The chronic alcoholics were diagnosed on basis of history examination and Alcohol Use Disorder Screening Test. The findings revealed that the reaction time to acoustic stimuli significantly increased (p- 0.0001)in the study group compared to the control. It can be concluded that there is an increased response when acoustic stimuli with different tone is presented .This increase can be attributed to the nerve damage caused by dietary deficiencies as well as because of the direct damage of ethanol by oxidative stress on tissues .Thus we can say that there is a need to highlight the steps towards motivating and developing a positive attitude for abstinence.
Keywords: chronic alcoholics, hearing loss, acoustic stimuli, oxidative stress

INTRODUCTION

Significant hearing loss is seen in 63 million (6.3%) of Indian population [1]. National Sample Survey (NSS) reported that top most reason of sensory deficit and second most common cause of disability in Indian households is hearing disability. This survey also reported that of all disabilities the hearing loss was 9% in urban areas and 10% in rural areas. In the same survey, they also found that about 32% of the individuals were suffering from profound hearing disability i.e. the individual was not able to hear at all or could hear only loud sounds and 39% were suffering from severe hearing disability i.e. they could hear ,only when words were shouted [2].

In the Western world as the evening matures the parties get noisier by the passing hour and the phenomenon of alcohol consumption with tolerance to loud sounds is very commonly observed. This condition is easily diagnosed as “cocktail party deafness” and is the reason for increased referrals to the "hearing aid clinic" .The reason for such decrease in hearing is not necessarily noise induced hearing loss or presbycusis [3].

Previous studies have reported that alcohol intoxication in humans, results in a temporary reduction in distortion product otoacoustic emissions amplitude when frequency is high but this all is without affecting the auditory thresholds [4]. Verma *et al*. in their study compared the audiovestibular functions of individuals who had long term alcohol dependence with those who had alcohol socially or were complete abstainers. Their study showed an increase in threshold for higher frequencies in individuals who were alcohol dependent [5].

Though the development of hearing loss is influenced by alcohol consumption but inconsistent results were found in the past related studies [6-10]. A moderate amount of alcohol intake has been shown to have cardioprotective effect which is mediated by increasing the levels of HDL and its anti-thrombotic activity [11]. This protective response also decreases the disturbances in cochlear blood flow and hence decreases the risk of hearing loss [12]. The association of hearing loss with consumption of low or moderate levels of alcohol is still unclear. Inspite of a known relation of increased risk of hearing loss with alcohol abuse which has been reported in many studies [13].

Several studies have also indicated that hearing loss can compromise communication and safety and can lead to social isolation, depression, and poorer quality of life [14-19]. So in view of complications regarding the alcohol intake and hearing loss the present study was planned to assess the reaction of alcoholic men to acoustic stimuli with different tone.

MATERIAL AND METHODS

The study was conducted on 60 subjects taken from gastroenterology OPD and ward, DMC Hospital Ludhiana. Approval for study was taken from institutional ethical committee. The subjects were divided into two groups study and control, each group comprising of 30 subjects. Study group comprised of chronic alcoholics based on detailed history including information of daily intake , frequency and duration of alcohol intake.

Subjects were diagnosed as chronic alcoholics on basis of Alcohol Use Disorder Screening Test (AUDIT) [20]. Subjects showing alcohol dependent withdrawal symptoms or physical signs and symptoms that were useful in identifying alcoholism i.e. mild and fluctuating hypertension, repeated infections etc. were also included in the study group.

Subjects suffering from any clinical disease likely to affect hearing, hearing pathway, having any other addiction, hepatic encephalopathy or head injury, patients on drugs known to produce adverse effect on hearing system were excluded from the study group. The purpose, procedure and noninvasive nature of the study were explained and written informed consent was taken from each subject. A complete clinical examination was done.

Auditory functions and response to different acoustic stimuli with different tone was done by recording auditory reaction time. Auditory reaction time (ART) was recorded using digital display response time apparatus (Model No. RTM 608. Medicaid: Ambala) equipped with three acoustic stimuli with different pitch/tone (low, medium and high) [21]. All the subjects were thoroughly acquainted with the apparatus and three practice sessions were given to every subject before taking the reading to help them get conversant with the procedure.

The subject was presented randomly with one of the three acoustic stimuli by the observer and subject responded by pressing the knob of digital display apparatus to switch off the produced sound . Reaction time displayed on apparatus in milliseconds was recorded. Lowest of three readings was considered for each stimulus. Reaction time was reported as mean ±SD.

Mean and standard deviation was computed. The comparison of means was done by using unpaired t - test.

RESULTS

The study comprised of 60 subjects which were divided into two groups. Group I included the study group i.e. the subjects diagnosed as chronic alcoholics with a mean age of 48.13 and group II included the controls or the apparently healthy subjects with a mean age of 43.1. The auditory reaction time a response to acoustic stimuli with different tone was recorded in milliseconds and was compared with the control group. Results of the study indicated a statistically significant p value for response to acoustic stimuli with different pitch/tone as shown in the table 1.

Table 1: Showing ART sounds in study and controls Comparison of different types of ART sounds in cases and controls

Acoustic stimuli	study		Control		
	Mean	**SD**	**Mean**	**SD**	**P value**
Tone 1 (low)	205.61	89.33	63.51	19.47	0.0001*
Tone 2 (medium)	193.88	117.62	55.73	20.81	0.0001*
Tone 3 (high)	203.75	119.93	68.58	28.52	0.0001*

*Highly significant

DISCUSSION

Hazardous drinking is a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others. Harmful use, on the other hand, refers to alcohol consumption which results in harm to physical and mental health. The social consequences are often included among the harms caused by alcohol [9].

Thus this study was done to see the harmful consequences of prolonged use of alcohol on reaction to acoustic stimuli with different pitch/tone, which in our study was shown as increased auditory reaction time. Previous studies have also indicated that consumption of higher levels of alcohol, specifically liquor (spirits) was associated with an increased risk of hearing loss. Results of our study further prove that with chronic consumption of alcohol there occurs a delay in processing of CNS and co- ordination between sensory and motor functions. Results similar to our study have indicated the adverse effect of alcohol on auditory function and CNS [10, 11].

In our study the increase in the reaction time to acoustic stimuli can be attributed to damage to the nerves which includes both the autonomic and peripheral nerves. This may be explained by neuropathies caused due to chronic intake of alcohol which leads to a decrease in the speed of impulse conduction that in turn causes increase in the reaction time which involves both sensory and motor pathways [12, 13].

In chronic alcoholics the nerves damages occur which include both the autonomic and peripheral nerves and also affects the sensory motor pathways. The neuropathies can thus reduce the speed of the impulse conduction and lead to the increase in the reaction time. Studies have indicated that the extent of neuro-degeneration and potential for recovery and regeneration varies by brain region and is also dependent on many factors, including pattern of intake, genetics and age [14].

Studies have shown that ethanol can cause direct damage because of oxidative stress from pro inflammatory enzymes [15]. In another study it was revealed that alcohol causes inhibition of ongoing genesis of neurons and glia[16] , resulting in brain / tissue loss or neurodegenration [17]. Studies have shown that chronic ethanol consumption produces an increase in lipid peroxidation products and a decrease in antioxidant factors and its related enzymes which can eventually induce apoptosis mediated cell death [18].

Though consumption of alcohol has long been part of everyday life in the society, it can be concluded from the results of this study that exposure to chronic alcohol is harmful for the health of an individual especially to the sensorimotor functioning which has been shown in our study as an increase in the response to acoustic stimuli. There is no doubt that alcohol misuse is a serious risk factor for increased morbidity and mortality. But this study still has limits as the effect could not be correlated with the duration and the amount of hearing loss related to age, diet and occupational or environmental noise exposure and requires more research with more number of subjects.

CONCLUSIONS

Thus the results of our study concludes that such problem drinking as seen in chronic alcoholics has a negative impact on the person himself and also on the society; which is of public health importance. Efforts should be taken to make people aware about the harmful effects caused due to consumption of alcohol on the health of an individual, by showing the results of simple physiological procedures like reaction time. Increased time taken to respond to a sensory stimulus like hearing may hamper the day today life of the person and as well may put the person in great danger as in driving. This all not only endangers the individual only but is also a public havoc. Thus a small effort can be put which may help in changing the psyche of the person along with a motivating positive attitude for abstinence and hence can reduce the risk of future adverse outcomes.

REFERENCES

1. Garg S, Chanda S, Malhotra S, Agarwal AK; Deafness: burden, prevention and control in India. Natl Med J India, 2009; 22(2): 79-81.
2. National Sample Survey Organization. Disabled persons in India. NSS 58th round (July-December 2002) Report no. 485 (58/ 26/ 1). New Delhi: National Sample Survey Organization, Ministry of Statistics and Programme Implementation, Government of India, 2003.
3. Upile T, Sipaul F; The acute effects of alcohol on auditory thresholds. BMC Ear nose and throat disorders, 2007; 7(4):1-5.
4. Hwang JH, Tan CT, Chiang CW, Liu TC; Acute effects of alcohol on auditory thresholds and distortion product otoacoustic emissions in humans. Acta Otolaryngol., 2003; 123(8):936-40.
5. Verma RK, Panda NK, Basu D, Raghunathan M; Audiovestibular dysfunction in alcohol dependence. Are we worried? Am J Otolaryngol., 2006; 27(4):225-8.
6. Brant LJ, Gordon-Salant S, Pearson JD, Klein LL, Morrell CH, Metter EJ, Fozard JL; Risk factors related to age-associated hearing loss in the speech frequencies. J Am Acad Audiol., 1996; 7:152–60.
7. Fransen E, Topsakal V, Hendrickx JJ, Van Laer L, Huyghe JR, Van Eyken E, Lemkens N, Hannula S, Maki-Torkko E, Jensen M, Demeester K, Tropitzsch A, Bonaconsa A, Mazzoli M, EspesoA,Verbruggen K, Huyghe J, Huygen PL, Kunst S, Manninen M, Diaz-Lacava A, Steffens M,Wienker TF, Pyykko I, Cremers CW, Kremer H, Dhooge I, Stephens D, Orzan E, Pfister M, Bille M, Parving A, Sorri M, Van de Heyning P, Van Camp G; Occupational noise, smoking, and a high body mass index are risk factors for age-related hearing impairment and moderate alcohol consumption is protective: a European population-based multicenter study. J Assoc Res Otolaryngol., 2008; 9:261–3.
8. Rubin SM, Simonsick EM, Tylavsky FA, Newman AB; Race and sex differences in age-related hearing loss: the Health, Aging and Body Composition Study. J Am Geriatr Soc., 2005; 53:2119–27.
9. Itoh A, Nakashima T, Arao H, Wakai K, Tamakoshi A, Kawamura T, Ohno Y; Smoking and drinkinghabits as risk factors for hearing loss in the elderly: epidemiological study of subjects undergoingroutine health checks in Aichi, Japan. Public Health, 2001; 115:192–6.
10. Popelka MM, Cruickshanks KJ, Wiley TL, Tweed TS, Klein BE, Klein R, Nondahl DM; Moderate

alcohol consumption and hearing loss: a protective effect. J Am Geriatr Soc., 2000; 48:1273–8.
11. Mukamal KJ, Rimm EB; Alcohol consumption: risks and benefits. CurrAtheroscler Rep 2008;10:536–43.
12. Seidman MD, Quirk WS, Shirwany NA; Mechanisms of alterations in the microcirculation of thecochlea. Ann N Y Acad Sci., 1999; 884:226–32.
13. Rosenhall U, Sixt E, Sundh V, Svanborg A; Correlations between presbyacusis and extrinsic noxiousfactors. Audiology, 1993; 32:234–43.
14. Gordon-Salant S; Hearing loss and aging: new research findings and clinical implications. J Rehabil Res Dev., 2005; 42:9–24.
15. Girard SA, Picard M, Davis AC, Simard M, Larocque R, Leroux T, Turcotte F; Multiple work-related accidents: tracing the role of hearing status and noise exposure. Occup Environ Med., 2009; 66:319–24.
16. Dalton DS, Cruickshanks KJ, Klein BE, Klein R, Wiley TL, Nondahl DM; The impact of hearing losson quality of life in older adults. Gerontologist., 2003; 43:661–8.
17. Gates GA, Mills JH; Presbycusis. Lancet, 2005; 366:1111–20.
18. Gates GA, Cobb JL, Linn RT, Rees T, Wolf PA, D'Agostino RB; Central auditory dysfunction, cognitive dysfunction, and dementia in older people. Arch Otolaryngol Head Neck Surg., 1996; 122:161–7.
19. Uhlmann RF, Larson EB, Rees TS, Koepsell TD, Duckert LG; Relationship of hearing impairment todementia and cognitive dysfunction in older adults. JAMA, 1989; 261:1916–9.
20. Reinert DF, Allen GP; AUDIT: the alcohol use disorders identification test: guidelines for use in primary care. Alcoholism: Clinical and experimental Research, 2002; 26:272.
21. Walia L; effect of cold pressor test on visual reaction time and auditory reaction time. Indian J Exp Biol., 2000; 38(8):831-3.
22. Lemon J, Chesher G, Fox A, Greeley J and Nabke C; Investigation of the hangover effects of an acute dose of alcohol on psychomotor performance. Alcoholism: Clinical and Experimental Research, 1993; 17: 665–8.
23. Miles C, Porter K, Jones DM; The interactive effects of alcohol and mood on dual-task performance. Psychopharmacology, 1986; 89: 432–5.
24. Oscar-Berman M; Alcoholism and the brain: an overview. Alcohol Research and Health, 2003; 27(2):125-133.
25. Parekh N, Gajbhiye IPR, Wahane M, Titus J; The Study of Auditory and Visual Reaction Time in Healthy Controls, Patients of Diabetes Mellitus on Modern Allopathic Treatment, and those Performing Aerobic Exercises. JIACM, 2004; 5(3): 239-43.
26. Niruba R, Maruthy KN;Assessment of Auditory and Visual Reaction Time in Type 2 Diabetics –A Case Control Study. AlAme en J Med Sci., 2011; 4(3) :274 -9.
27. Rosenbloom M, Sullivan EV; Using magnetic resonance imaging and diffusion tensor imaging to assess brain damage in alcoholics. Alcohol Research and Health, 2003; 27(2):146-152.
28. Götz ME, Janetzky B, Pohli S, Gottschalk A, Gsell W, Tatschner T, Ransmayr G, Leblhuber F, Gerlach M, Reichmann H, Riederer P; Chronic alcohol consumption and cerebral indices of oxidative stress: is there a link?. Alcoholism: Clinical and Experimental Research, 2001; 25(5):717-25.
29. Harper C, Dixon G, Sheedy D, Garrick T; Neuropathological alterations in alcoholic brains. Studies arising from the New South Wales tissue resource centre. Progress in Neuro-Psychopharmacology and Biological Psychiatry, 2003; 27(6):951-61.
30. Pfefferbaum A, Sullivan EV, Adalsteinsson E, Garrick T, Harper C; Postmortem MR imaging of formalin-fixed human brain. Neuroimage, 2004; 21(4):1585-95.
31. Sun YA, Sundberg MI; Ethanol and oxidative stress; Alcoholism. clinical and experimental research, 2001; 25(1):237-243.