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NERVE CONDUCTION VELOCITY IN TOBACCO SMOKERS AND TOBACCO CHEWERS-A COMPARATIVE STUDY

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ABSTRACT

Introduction: The Indian subcontinent's population is accustomed to smoking tobacco (cigarette, bidi, and hookah) or using smokeless tobacco (tobacco in pan, in *gutkha*, or *khaini).* Both chewing tobacco and smoking tobacco have negative impacts on human health because of harmful chemicals in them including tar, nicotine, and other substances that may change the myelination of peripheral neurons.

Materials and Methods: Participants were divided into three groups, 40 were male tobacco chewers and smokers (aged 20 to 60), 30 were tobacco smokers only, and 30 were tobacco chewers exclusively. The Physiolab-PL 2005was used to do the NCV. Subjects had their median and ulnar nerves' motor and sensory nerve conduction velocities (MNCV and SNCV) measured.

Results: We found statistically significant changes ($p<0.05$) in MNCV &SNCV of median and ulnar nerve between tobacco smokers& chewers and only tobacco chewers. While comparing with individuals of tobacco smoking and chewing habit and only tobacco smoking habit have statistically significant changes only in MNCV of median nerve.

Conclusion: From this study we conclude that individuals who were having a habit of smoking as well as chewing are on highest risk for reduction in conduction velocity in both motor as well as in sensory nerve. According to this study, both sensory and motor nerve conduction velocities showed statistically significant changes. Demyelinating neuropathies, such as those caused by smoking and chewing, typically result in reduce conduction velocity.

Key words: *Gutkha*, Nerve conduction velocity, *Pan*, Tobacco Smokers, Smokeless tobacco.

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INTRODUCTION: According to WHO, usage of tobacco is like a pandemic, and it is one of the biggest threats to public health.About 8 million people die in the world every year, out of which about 7 million people either use tobacco directly and some indirect forms (passive smoking), usage of in any form is injurious to health.[1] Archaeological studies suggest that tobacco has been in use since 1st century BC. The Maya people of Central America used tobacco leaves to smoke in sacred and religious ceremonies.[2]The main producers and consumers of tobacco are China, the United States, the former Soviet Union, India, and Brazil. It is integrated into the regional traditions of South and Southeast Asia through the chewing of betel quid (paan).[3]In India, the prevalence of tobacco usage overall is 10.38%, while the use of smokeless tobacco is 21.38%, according to the Global Adult Tobacco Survey (GATS) performed in 2016–17.[4]Smoking cigarettes poses a serious risk to human health, particularly with regard to the multisystem involvement and vascular hemodynamics. Nicotine, tar, carbon monoxide, and other chemicals found in cigarette smoke have been linked to subclinical alterations in the myelin sheaths of peripheral nerves, which lead to demyelination and impaired neuro transmission,[5]the use of smokeless tobacco has a significant role in the development of oral cancers (mouth, lip, tongue), and throat cancers. Therefore, it is not surprising that India has one of the highest incidences of oral cancer worldwide. These rates are constantly rising, and younger people are experiencing oral cancer more frequently.[6]Conduction velocity was observed to be lower in smokers and gutka chewers, demonstrating the involvement of sensory and motor nerves in the former and smokers in the latter. Additionally, sensory nerves were involved early in both groups[7]. There are many studies which evaluated the effect of smoking on NCV, and there is only one study which assesses the effect of tobacco smoking and tobacco chewing. Hence, this present study was conducted to evaluate the effect of tobacco smoking and tobacco chewing on nerve conduction study.

MATERIALS AND METHODS

This comparative study was conducted in the Department of Physiology, Career Institute of Medical Sciences and Hospital, Lucknow, from August 2021 to June 2022, after obtaining ethical approval from National Institute of Medical Sciences and research, NIMS University Rajasthan, Jaipur(Letter no. NIMSUR/IEC/2021/0132 dated 11.03.2021) and also from Institutional Ethical Committee Career Institute of Medical Sciences and Hospital, Luck now (Letter no. Pharma/2021/Jul/01 dated 27.07.2021). Total 120 subjects were recruited. After detailed history and physical examination subjects were categorized into three groups: -

All the subjects (120) were divided in four groups:

Distribution of various groups with reference to Tobacco used

Group	Description	Sample size
Group 1	Non-tobacco users	30
Group 2	Tobacco Smokers and tobacco chewers,	30
Group 3	Tobacco Smokers	30
Group 4	Tobacco Chewers	30

They were advised for nerve conduction velocity assessment and were asked to report in research laboratory after an overnight abstinence of tobacco smoking and tobacco chewing.

INCLUSION CRITERIA:

- Age group between 20-60 years.
- History of tobacco smoking as well as tobacco chewing for more than 5 years.
- Only smokers with history of smoking cigarettes for more than 5 years.

- Only tobacco chewers with history of tobacco chewing for more than 5 years.
- No H/O tobacco smoking as well as tobacco chewing since last 5 years.

EXCLUSION CRITERIA:

- History of asthma, hypertension, carcinoma, diabetes, cardiovascular diseases, or renal disease, oxidative stress.
- Smokers or chewers with history of smoking cigarettes less than 5 years.
- History of altered nerve conduction.
- History of any cause of neuropathy like Vitamin B12 deficiency.
- Subjects having medical or surgical trauma.
- Subjects not willing to give written consent.

Analysis of Nerve Conduction Velocity (NCV) Test

NCV was done in the Research Laboratory of the Department of Physiology, CIMS&H, using NEURO-STIM software (Medicaid system, Chandigarh, India), which had default settings. The NCV study was conducted on the subjects in a sitting position. Sensory nerve conduction velocity and motor nerve conduction velocity was observed in both median and ulnar nerves.

Motor nerve conduction Velocity (MNCV): -In this study MNCV was done by the recording of antidromic conduction study. For recording median motor nerve conduction velocity, the recording cup electrode was placed close to the motor point of abductor pollicis brevis and reference electrode 3 cm distal to active electrode at the 1st metacarpophalangeal joint. The ground electrode was placed between stimulation and recording electrode. Supramaximal stimulus was giveninitially on wrist and then at elbow.

Sensory nerve conduction Velocity (SNCV): -In this study SNCV was done by the recording of antidromic conduction study, ring electrodes were positioned at the proximal and distal interphalangeal joints of the index finger. These were used as electrodes for recording. Cathode and anode of the stimulating electrodes were positioned at the wrist. Over the palm, a ground electrode was positioned. Antidromic conduction was detected after a sub-maximal stimulus was administered with the use of stimulating electrodes.

STATISTICAL ANALYSIS

The data were analyzed, using SPSS 23.0 of IBM, New York, USA. BAEP waves were compared, using One Way ANOVA with appropriate *post hoc* test.

RESULTS

Subjects having a history of tobacco used were selected and divided into three groups namely tobacco smokers and tobacco chewers, only tobacco smokers and only tobacco chewers. The mean average age of tobacco smokers was 38.88±10.16 years, only tobacco smokers' group having an average age of 38.57±9.61 years and only tobacco chewers groups having an average age of 36.00±9.33 years, which was statistically non-significant among all four groups The anthropometrical values namely height, weight and BMI were also statistically non-significant among all three groups **(Table 1).**

Mean of systolic blood pressure was significant different in all four groups with lowest in nonsmokers (128±9.37) and highest in smokers and chewers (135.20±4.72). Mean of diastolic blood pressure was significant different in all four groups with lowest in nonsmokers (78±6.24) and highest in smokers and chewers (83.05±3.73). Similarly, there is no significant difference in the pulse rate of all four groups **(Table 02).**

There is a significant difference found in motor nerve conduction velocity (MNCV) of both median and ulnar nerves similarly there is also significant difference found in Sensory nerve conduction velocity (SNCV) of both

median and ulnar nerves among tobacco smokers with chewing and tobacco smokers'groups (**Table 3).**

There is also significant difference found in motor nerve conduction velocity (MNCV) of both median and ulnar nerves similarly there is also significant difference found in Sensory nerve conduction velocity (SNCV) of both median and ulnar nerves among tobacco smokers and tobacco chewers groups

(Table 4).

There is also significant difference found in motor nerve conduction velocity (MNCV) of both median and ulnar nerves;similarly there is also significant difference found in Sensory nerve conduction velocity (SNCV) of both median and ulnar nerves among tobacco smokers with chewing and tobacco chewers groups **(Table 5)**

There is no significant difference found in motor nerve conduction velocity (MNCV) of both median and ulnar nerves in between tobacco chewers groups and no tobacco user group similarly there is no significant difference found in Sensory nerve conduction velocity (SNCV) of both median and ulnar nerves in between tobacco chewers groups and no tobacco user group **(Table 6)**

DISCUSSION

That smoking can cause cancer almost anywhere in our body[8] , but it also effects the peripheral nerves and may develop neuropthies.[9]Hilmi Uysal et al[10] in 2019, found statistically significant difference in the relative refractory period and super excitability parameters in chronic smokers, the delay in NCV may be due to blocking of inward rectifying channels by the metal Cesium present in cigarette. From these results, it is observed that statisticallysignificant changes were found in conductionvelocity of motor as well as in sensory nerves among tobacco smokers **(Table no 1, 2 & 3)**. When subjects were classified and compare according to their use of tobacco it is observed that subjects who were smokers as well as tobacco chewers (like using gutkha or khaini) had more decrement in NCV (both motor and sensory). Those who are only smokers when compared to only chewers also show statistically significant in their NCV (both motor sensory and) (**Table 4).** While comparing only tobacco chewers with the no tobacco user group we find no such statistically significant **(Table 6)**

Various studies done by various researchers like P. Gupta and D. Agarwal[11] in 2006 stated that there is clinical evidence of peripheral neuropathy and electrophysiological abnormalities among tobacco smokers. Tayade[12] et al in2012, Suman Sharma[13] et al in 2016 and Abha Shrivastava[14] et al. in 2017 also found significant changes in sensory NCV of median nerve but no significant changes seen in motor NCV in smokers. Sagar R. Chavan and Sneha H. Sathe[15] in 2019 studied nerve conduction velocity in Sural nerve and Peroneal nerve in smokers, they found Smoking reduction in nerve conduction velocity in sensory (Sural) nerve while it no such significantly affect found in nerve conduction velocity inmotor (Peroneal) nerve in smokers. Bipin Kumar and Meenakshi Gupta[6] in 2021 also studied on tobacco smokers and gutkha chewers, according to them decreased NCVin both smokers and gutkha chewers, showing.

CONCLUSION: From this study we conclude that individuals who were having a habit of smoking as well as chewing are on highest risk for reduction in conduction velocity in both motor as well as in sensory nerve. Both sensory and motor nerve conduction velocities showed statistically significant changes. Demyelinating neuropathies, such as those caused by smoking and chewing, typically result in reduce conduction velocity.

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Tables and graphs

Table 1 Anthropometric Data					
Parameter	**No tobacco user (n=30)**	**Tobacco Chewers (n=30)**	**Tobacco Smokers (n=30)**	**Tobacco Chewers& Smokers (n=30)**	**Significance (<0.05)**
Age	33.43±5.89	36.00±9.33	38.57±9.61	38.88±10.16	**NS**
Height	1.69±0.03	1.66±0.05	1.63±0.09	1.66±0.09	**NS**
Weight	79.50±6.49	65.57±10.45	58.30±9.82	61.00±11.41	**NS**
BMI	27.83±2.41	23.60±3.77	22.16±4.19	22.09±4.09	**NS**

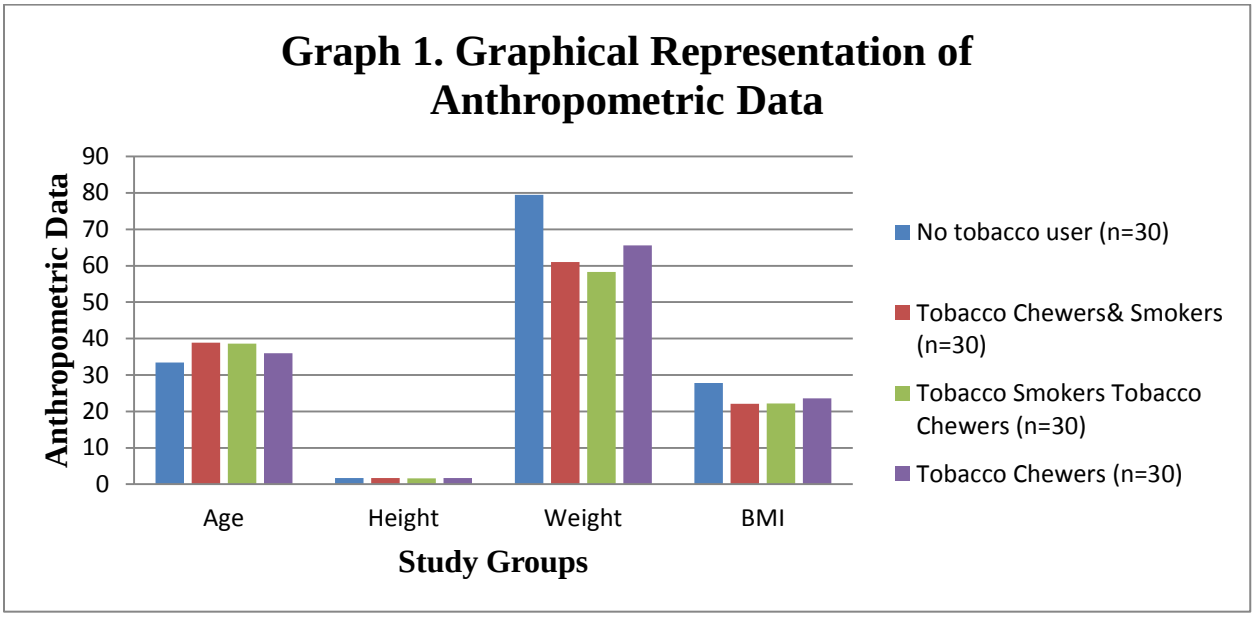

Table 2 Blood Pressure and Pulse					
Parameter	**No tobacco user (n=30)**	**Tobacco Chewers (n=30)**	**Tobacco Smokers (n=30)**	**Tobacco Chewers& Smokers (n=30)**	**Significance (<0.05)**
SBP	128±9.37	131.37±6.35	133.67±4.17	135.20±4.72	**S (p valve=0.01)**
DBP	78±6.24	80.87±4.38	82.67±3.58	83.05±3.73	**NS (p value 0.06**
Pulse	78.17±8.28	81.87±9.00	83.00±5.35	85.45±7.41	**NS (p value 0.73)**

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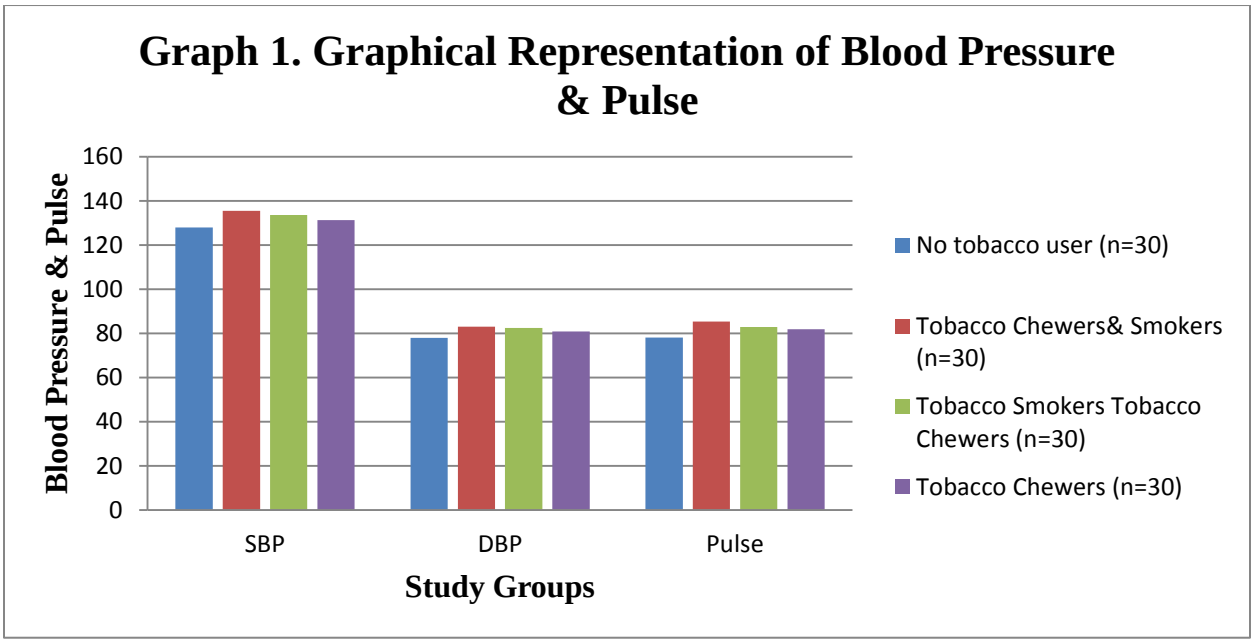


Table 3 NCV between tobacco smokers with chewing and only tobacco smokers

Parameters	Tobacco Smokers & chewers	Tobacco smokers	Significance Pvalue (<0.05)
Median motor nerve conduction velocity (MMNCV)	54.21±1.07	57.03±1.24	S (pvalue=0.0001)
Ulnar motor nerve conduction velocity UMNCV	54.65±1.25	56.78±2.86	S (pvalue=0.0001)
Median sensory nerve conduction velocity (MSNCV)	53.77±1.00	56.75±2.02	S (pvalue=0.0001)
Ulnar sensory nerve conduction velocity (USNCV)	53.57±1.15	56.21±1.59	S (pvalue=0.0001)

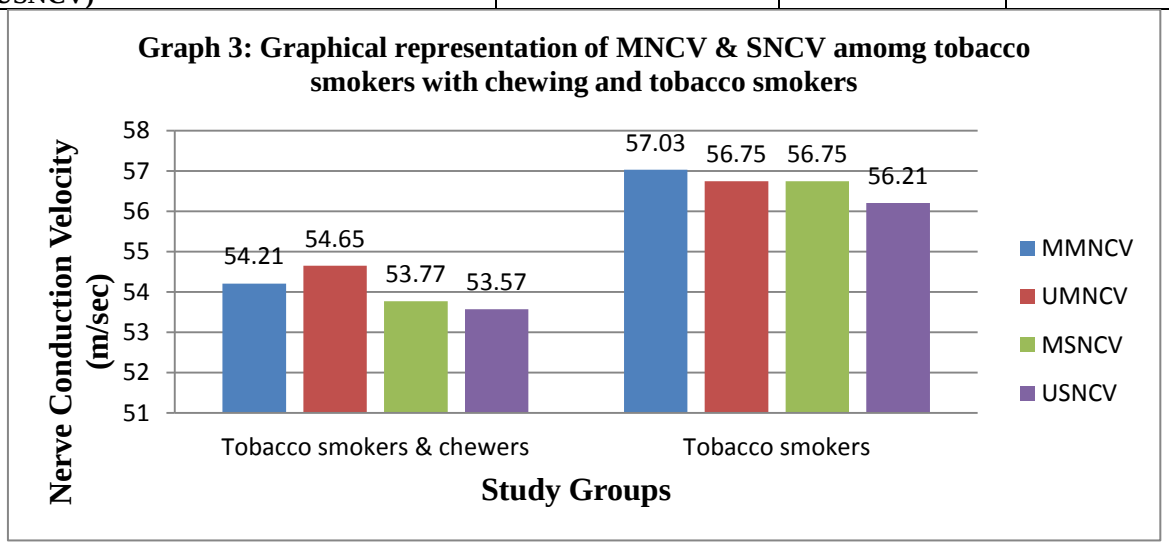


Table 4 NCV between tobacco smokers and tobacco chewers			
Parameters	**Tobacco Smokers**	**Tobacco chewers**	**Significance Pvalue (<0.05)**
Median motor nerve conduction velocity (MMNCV)	57.03±1.24	58.93±2.56	S(pvalue=0.0005)
Ulnar motor nerve conduction velocity UMNCV	56.78±2.86	58.79±1.75	S(pvalue=0.0017)
Median sensory nerve conduction velocity (MSNCV)	56.75±2.02	58.41±1.83	S(pvalue=0.0015)
Ulnar sensory nerve conduction velocity (USNCV)	56.21±1.59	58.37±1.74	S(pvalue=0.0001)

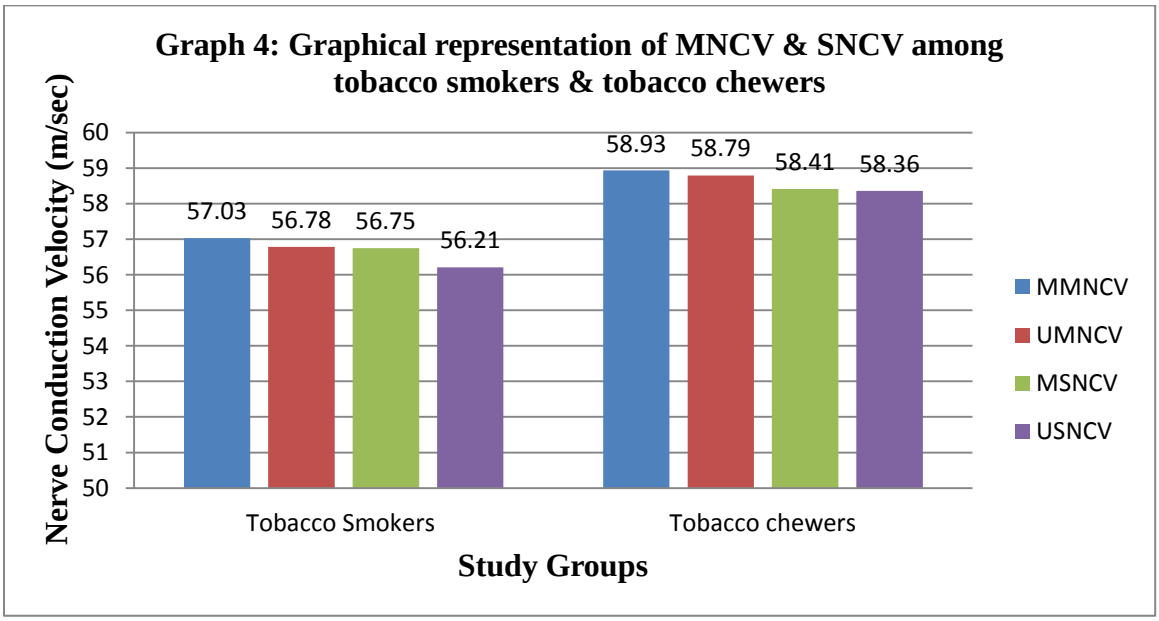


Table 5 NCV between tobacco smokers with chewing and tobacco chewers			
Parameters	**Tobacco Smokers & chewers**	**Tobacco chewers**	**Significance Pvalue (<0.05)**
Median motor nerve conduction velocity (MMNCV)	54.21±1.07	58.93±2.56	S (pvalue=0.0001)
Ulnar motor nerve conduction velocity UMNCV	54.65±1.25	58.79±1.75	S (pvalue=0.0001)
Median sensory nerve conduction velocity (MSNCV)	53.77±1.00	58.41±1.83	S (pvalue=0.0001)
Ulnar sensory nerve conduction velocity (USNCV)	53.57±1.15	58.37±1.74	S (pvalue=0.0001)

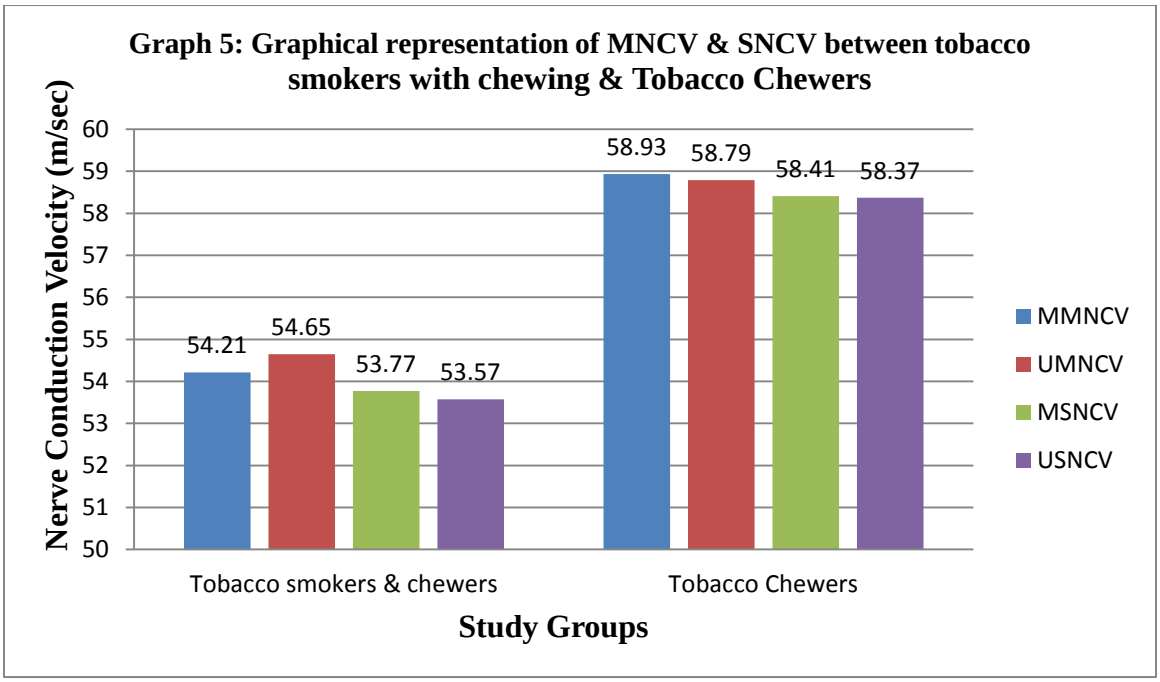
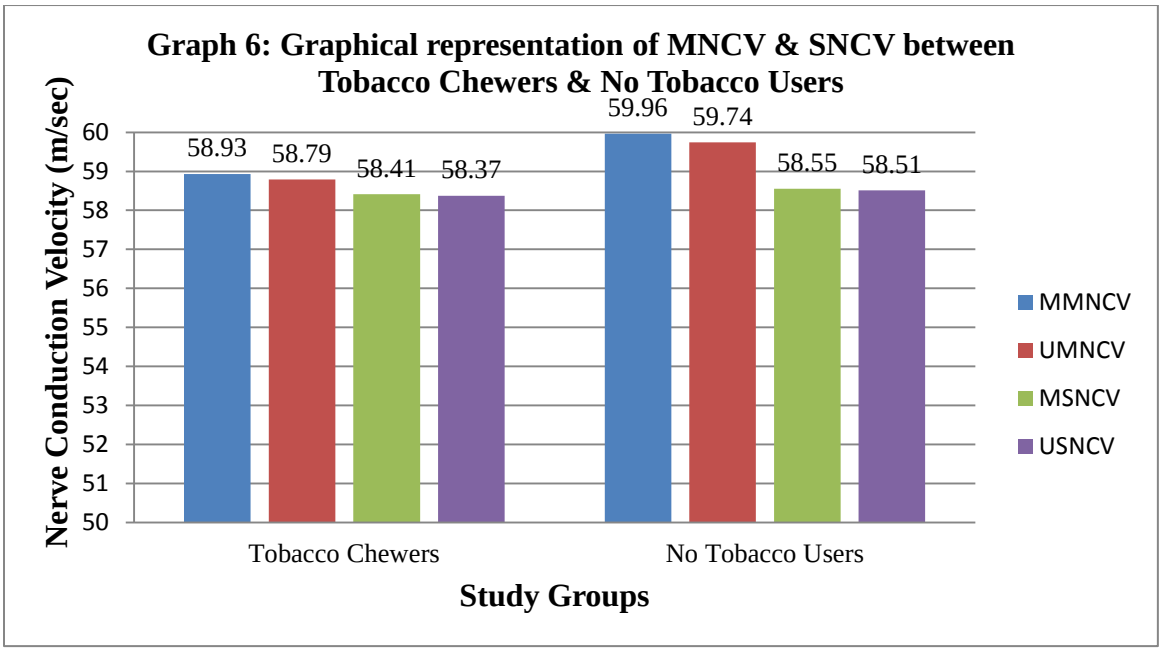


Table 6 NCV between tobacco chewers and no tobacco user

Parameters	Tobacco Chewers	No Tobacco Users	Significance Pvalue (<0.05)
Median motor nerve conduction velocity (MMNCV)	58.93±2.56	59.96±1.19	NS(pvalue= 0.0504)
Ulnar motor nerve conduction velocity UMNCV	58.79±1.75	59.74±1.57	NS (pvalue=0.0308)
Median sensory nerve conduction velocity (MSNCV)	58.41±1.83	58.55±1.27	NS (pvalue=0.7319)
Ulnar sensory nerve conduction velocity (USNCV)	58.37±1.74	58.51±1.47	NS (pvalue=0.7376)



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