

## RESEARCH ARTICLE

# Nerve conduction velocity in median nerve of healthy adult population in Malwa region of Madhya Pradesh with respect to age, gender, and height along with the relation amongst them

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### ABSTRACT

**Background:** Nerve conduction velocities (NCV) represent the most accurate methods to study the peripheral nerves owing to their ability in diagnosing nerve-related conditions. It helps to distinguish between a true nerve disorder and conditions where muscles are affected due to a nerve injury. However, there are considerable differences in reference values for NCV in different nerves with respect to region, gender, population, and various anthropological data such as age, height, body mass index, and temperature. They have to be kept in mind while doing nerve conduction studies as these anthropological factors vary according to the different geographical areas. **Aim and Objectives:** The aim of this study is to establish the electrophysiological data NCV for the right median nerve in normal healthy adults in Malwa region of Indore, district of Madhya Pradesh, and to study the effect of age, gender, and height on it along with relation among them. **Materials and Methods:** A total 118 healthy participants (38 females and 80 males) between the ages of 20 and 60 years, with no neurological problem were investigated at Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India. All tests were performed on JAVA record management system Aleron-201 series. Statistical analysis was done using statistical package for social sciences 10.0 version. **Results:** The mean of NCV initially increases between the ages of 20-30 years and 31-40 years, followed by a decrease in the mean NCV of elbow–wrist segment significantly decreases while mean of age and NCV for males is more than that of females and height increases with advancing age. It was found that NCV was inversely related to an increase in height of the participants the mean NCV of Group 1 > Group 2, Group 3, Group 4 with  $P < 0.05$  which is highly significant. **Conclusion:** The normal conduction parameter of commonly tested peripheral nerves can be used in the investigation of peripheral nerve injury and for evaluating the peripheral nerve disorder. Age, gender, and height have a definitive effect on NCV. Hence, it could also be utilized for comparative studies and for diagnostic conclusion.

**KEY WORDS:** Nerve Conduction Velocity; Median Nerve; Age Height; Gender

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### INTRODUCTION

Electrodiagnostic evaluation refers to the physiological expansion of the neurological assessment.<sup>[1]</sup> We are already aware of the importance of these electrodiagnostic studies in evaluating patients with neuromuscular disorders. This evaluation is based on the principle of recording, displaying,

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and estimating action potentials originating from central nervous system (evoked potentials), peripheral nerves (nerve conduction assessments), and muscles (electromyography).<sup>[2]</sup>

Nerve conduction velocities (NCV) represent the most commonly used methods to study the peripheral nerves owing to their accuracy in diagnosing nerve-related conditions. It is beneficial in distinguishing between the true nerve disorder and conditions where muscles are affected by nerve injury. Some of the common disorders which can be diagnosed by NCV studies include peripheral neuropathy, carpal tunnel syndrome, ulnar neuropathy, and Guillain-Barré syndrome. Most importantly, its benefits are not only limited to diagnostic importance but also in planning therapeutic strategies.

Peripheral nerves, that is, median and ulnar nerves in upper extremity are commonly chosen for NCV as they are easily reachable. On stimulation of these nerves by a low-velocity electric current by electrodes that are placed on the skin at intervals causes a generation of nerve impulses.<sup>[3]</sup> These impulses are then recorded as motor NCV (MNCV) and compound muscle action potential (CMAP) distal to the point of stimulation.

Interestingly, NCV is affected by a number of physiological variables such as age, height, gender, and temperature along with diameter and myelination of the nerve fiber being assessed.<sup>[4]</sup> It has been reported in the previous studies that significant slowing of conduction velocities and sensory latencies occur with increasing age and more height.<sup>[5]</sup> Another study reported that the conduction velocity is 6 m/s faster in females.<sup>[6]</sup>

This goes to show that although a number of studies have been done in the past on the influence of anthropometrical parameters on NCV yet, none have been conducted in this semi-urban Malwa region of Indore district in Madhya Pradesh. This study was therefore conducted to find out the NCV in median nerve among the normal healthy adults from the local population and to evaluate the impact of anthropometric factors such as age, gender, and height on it along with relation among them.

The nerve conduction studies (NCS) comprised the following component: (a) Motor NCS (MNCS), (b) sensory NCS, (c) F-wave study, and (d) H-reflex study.<sup>[7]</sup>

### Objectives

1. To establish the normal electrophysiological data NCV for the right median in normal healthy adult population
2. To study the effect of age, gender, and height on NCV in the right median nerve and relation among them
3. The objective of the present study was to determine a reference value for MNCV in young healthy adults.

## MATERIALS AND METHODS

### Study Population

This study was carried in Neurophysiology Laboratory of Physiology Department of Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India. It was a cross-sectional study which was approved by the Institutional Ethics Committee. The study had a sample size of 118 participants (95% confidence level) as calculated from Statistical Package for Social Sciences (SPSS), version 10, open source calculator.

### Selection Criteria

Healthy individuals in different age groups (20-60) years, free of any neurological disorder, or any history of it.

### Exclusion Criteria

1. Any individual of neurological disorder or neuromuscular transmission disorder
2. Any individual suffering from diabetes or renal disorder
3. Any individual suffering from weakness of upper limb or myopathy.<sup>[8]</sup>

The participants were divided into four groups of males and females based on their ages for a comparative assessment. Group 1 included ages between 20 and 30 years consisting of 51 participants; Group 2 included 31-40 years comprised 22 participants. Group 3 and Group 4 had ages between 41-50 and 51-60 years, respectively, consisting of 25 and 20 participants for the groups, consecutively.

### Protocol

Informed consent had been obtained from the participants. The examination had been performed in a calm setting; the patient was thoroughly briefed about the procedure. Considerable gap was given between examination, so as to minimize discomforts to participant as well as to enhance their enthusiastic participation.

### Electrophysiological Methods

All tests have been done on JAVA record management system (RMS) Aleron-201 series. The JAVA RMS Aleron-201 series is a clinically customized for a quick and flexible operation. Its software and hardware are particularly designed with the consideration of actual test being done in the field machine which can be totally customized for various test, nerve muscle and size with computer choice of amplifier, filter and sweep setting, and also analytical setting like marker.

The NCS was performed in a calm setting with a room temperature between 30°C and 31°C. Further participant was made comfortable with the laboratory setup, so as to completely relax. For median nerve, the active surface

electrode should be put over the motor point of abductor pollicis brevis in the upper third of thenar eminence close to the 1<sup>st</sup> metacarpophalangeal joint and stimulating electrode was kept at the antecubital fossa proximally and wrist distally and ground electrode at the back of the palm.

For each participant, data of distal motor lat1, lat2, (MNCV), and CMAP from the distal stimulation were included from statistical analysis in this study.<sup>[9]</sup>

CMAP has the following component which is defined as:

- i. Amplitude: It is measured from baseline to the positive peak
- ii. Latency1: This is the time from the stimulus to the initial positive deflection off the baseline
- iii. Latency2: Time taken for the 1<sup>st</sup> deflection of CMAP after stimulation at S2 (site)
- iv. Duration: It correlates with the density of small fibers. It is measured from the onset to the positive peak
- v. Area: The area comes from the difference between the lat1 and lat2. However, it needs computer analyses.<sup>[10]</sup>

In each participant, an orthodromic motor parameter of the nerve was measured. Surface electrodes were used. The recording electrodes were fixed to the participant's skin using adhesive tape. No special skin preparation was needed. The targeted nerve was supramaximally stimulated using a square wave current with duration 0.2 ms and the action potential was picked up by the recording electrode. The length of each nerve was estimated with a flexible measuring tape. For safety, a ground electrode was placed in between the stimulating and recording electrode.<sup>[8]</sup>

### Principle of Motor Nerve Conduction

The motor nerve is stimulated at least at two points along its course. The pulse is adjusted to record a CMAP. It is important to ensure a supramaximal stimulation keeping the cathode close to the active recording electrode. This prevents hyperpolarization effect of anode and anodal conduction block. The surface recording electrode was commonly used and placed in belly-tendon montage, keeping the active electrode close to the motor point and reference to the tendon. A ground electrode was placed between stimulating and recording electrode. A biphasic action potential with initial negativity was thus recorded. Surface stimulation of healthy nerve requires a square wave pulse of 0.1 ms duration with an intensity of 5-40 mA. Filter setting for MNCS was 20 Hz to 3 KHz and sweep speed was 10 ms/division.

The measurements for MNCS include the onset latency, duration, and amplitude of CMAP and NCV. The latency is the time in millisecond from the stimulus artifact to the first positive deflection CMAP for better visualization of the take off; the latency should be measured at a higher gain than the one used for CMAP amplitude measurement.

The latency is a measure of conduction in the fastest conducting motor fibers. It also includes neuromuscular transmission time and the propagation time along the muscle membrane from the baseline to the positive peak. The amplitude correlates with the number of nerve fibers. The duration of CMAP was measured from the onset to the positive peak. Duration correlates with the density of small fibers. The area under CMAP was also measured. However, it was a computer-generated analysis.<sup>[9]</sup>

MNCV was calculated by measuring the distance in millimeter between two points of stimulation, which is divided by the latency difference in millisecond. The NCV was expressed as m/s.

$$\text{Conduction velocity: } \frac{D}{PL-DL} \text{ m/s}^3$$

Where PL is the proximal latency (lat1) and DL is the distal latency (DL) (lat2) and D is the distance between the proximal and DL.<sup>[3]</sup>

### Recording procedure

#### MNCS variables

Estimator with water soaked felt tips were placed at the right median nerve which was recorded.

#### Right median nerve

Median nerve is a mixed nerve derived from C5 to T1, roots through medial and lateral cords of brachial plexus. It supplies most forearm flexors and thenar muscles and provides sensory innervations to the lateral aspect of palm and dorsal surfaces of terminal phalanges along with the palmar surface of thumb, index, middle, and half of ring fingers.

#### Position

This study was performed in the supine position (Figure 1).

1. Active electrode: Placement was half way between the mid-point of distal wrist crease and first metacarpophalangeal joint<sup>[8]</sup>
2. Reference electrode: Placement was slightly distal to the first metacarpophalangeal joint<sup>[8]</sup>

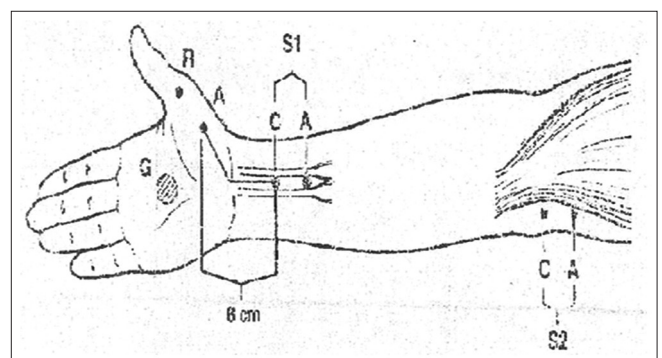


Figure 1: Electrode placement

3. Ground electrode: Placement was on the dorsum of the hand. If stimulus artifact interferes with the recording, the ground may be placed near the active electrode, between the electrode and the cathode<sup>[8]</sup>
4. Stimulation point (S1): The cathode was placed 8 cm proximal to the active electrode in a line measured first to the mid-point of the distal wrist crease and then to a point slightly ulnar to the tendon of the flexor carpi radialis. The anode was proximal<sup>[8]</sup>
5. Stimulation point (S2): The cathode was placed medial to the brachial artery pulse in the antecubital region. The anode was proximal<sup>[8]</sup>
6. Nerve fiber tested: C8 and T1 nerve root through the lower trunk of the anterior division and medial cord of the brachial plexus<sup>[8]</sup>
7. Machine setting: Sensitivity - 10 mv/division, low-frequency filter-20Hz and high-frequency filter-3 KHz, and sweep speed - 10 ms/division.

Care should be taken to concomitantly stimulate the ulnar nerve. The direction of thumb twitch would help in making sure that only median nerve was stimulated.<sup>[8]</sup>

### Applied

Entrapment of median nerve leads to three important syndromes.<sup>[9]</sup>

- i. Carpal tunnel syndrome
- ii. Anterior interosseous syndrome
- iii. Pronator teres syndrome.

### Statistical Methods

Analysis was done using SPSS 10.0 version. Values obtained were expressed in the form of mean and standard deviation. *P* value was taken as significant if it was found to be <0.05. The test used was z-test with two sample mean.<sup>[10]</sup>

## RESULTS

### Gender

A total of 118 normal adults participants with mean age of  $35.4 \pm 12.7$  in males and  $33.8 \pm 13.7$  years in females were

recruited in our study (Table 1). The gender distribution was 68% males and 32% females. The average height of the males was  $168.6 \pm 5.02$  cm and of the females was  $161.9 \pm 11.2$  cm. It revealed statically significant differences between the two genders ( $P = 0.001$ ). Tables 2 and 3 reveal a significant difference in the NCV of the right median nerve between males and females.

The average amplitude of median nerve has been observed to be greater in males than the females in the elbow region, but it was inverted in the wrist region (Tables 2 and 3). Mean duration of the median nerve in females is observed to be slightly less as compared to the males. The latency periods were of a comparable duration in both elbow and wrist regions. The amplitude of median nerve in wrist region was higher in females than males, but the inverse was true in the elbow region.

Table 1 shows that

1. Age: The mean age of male is more than that of female with  $P = 0.542$  which is non-significant. The age range is between 20 and 60 years.
2. Height: The mean height of male is more than that of female with  $P = 0.001$  which is significant. The range of height is 132-180 cm.
3. NCV right median nerve of elbow-wrist segment: The mean NCV elbow-wrist of male is more than that of female with  $P = 0.038$  which is found to be highly significant. Its range is between 29.67 and 98.36 m/s.

### Height

Table 4 reveals a significant decrease in NCV of elbow-wrist segment with an increase in mean height.

Tables 5 and 6 show the following result for the different biological parameter as:

1. Age: The mean for age increases with increasing age
2. Height: There is a significant increase in mean height with the increasing age
3. NCV right median nerve elbow-wrist segment: The mean NCV of elbow-wrist segment significantly decreases with the increasing age.

**Table 1: Comparison of mean age, height, and NCV for male and female**

| Parameter                                       | Range           | Male (n=80)  | Female (n=38) | Statistical analysis                                      |
|---|-----------------|--------------|---------------|---|
| Age   | 20-60 years     | 35.4±12.7    | 33.8±13.7     | $P=0.542$<br>Df=68<br>Non-significant                     |
| Height  | 132-180 cm      | 168.65±5.023 | 161.9±11.2    | $P=0.001$<br>$T=3.52$<br>Significant                      |
| NCV of right median nerve (elbow-wrist segment) | 29.67-93.36 m/s | 69.1±29.8    | 55.9±32.4     | $T=2.22$<br>$P=0.038>0.05$<br>Df=67<br>Highly significant |

NCV: Nerve conduction velocities

## Age

The results of the comparative data of the different age groups (Figure 2) showed an increase in NCV initially between the ages of 20-30 years and 31-40, followed by a significant decrease in the mean NCV of elbow–wrist segment with the increasing age.

Tables 7 and 8 shows the following result on comparing the different biological parameters of Group 1 versus Group 2, Group 3, and Group 4:

1. Age: The mean age for the age Group 2 (30-40), age Group 3 (40-50), and age Group 4 (50-60) is more than that of age Group 1 (20-30) with  $P < 0.05$  which is found to be statistically significant.
2. Height: The mean height for age Group 2 > age Group 1 with  $P = 0.111$  which is non-significant while mean height for age Group 3 and age Group 4 > age Group 1, with  $P = 0.023$  and  $0.004$ , respectively, which is statistically significant.
3. NCV of right median nerve elbow–wrist segment: The mean NCV of age Group 1 > age Group 2, age Group 3, and age Group 4 with  $P < 0.05$  which is highly significant.

**Table 2:** Effect of gender on MNCV CMAP of elbow region

| CMAP           | Elbow (males) | Elbow (females) |
|----------------|---------------|-----------------|
| Lat1 (ms)      | 8.34          | 8.79            |
| Lat2 (ms)      | 21.87         | 21.1            |
| Duration       | 13.5          | 12.5            |
| Amplitude (mV) | 4.63          | 4.19            |
| Area           | 19.3          | 16.6            |

MNCV: Motor nerve conduction velocities, CMAP: Compound muscle action potential

**Table 3:** Effect of gender on MNCV CMAP of wrist region

| CMAP           | Wrist (males) | Wrist (females) |
|----------------|---------------|-----------------|
| Lat1 (ms)      | 3.06          | 3.76            |
| Lat2 (ms)      | 18.55         | 16.62           |
| Duration       | 15.38         | 12.86           |
| Amplitude (mV) | 2.31          | 2.9             |
| Area           | 23.8          | 22.1            |

MNCV: Motor nerve conduction velocities, CMAP: Compound muscle action potential

**Table 4:** Variation in NCV with different heights

| Mean height (in cm) | NCV of right median nerve (elbow–wrist segment) in m/s |
|---------------------|--|
| 164.1±1.05          | 29.67-98.36 m/s (71.2±21.2)                            |
| 167.43±6.84         | 31.85-61.25 (55.5±22.8)                                |
| 168.2±4.98          | 30.93-57.15 (53.5±16.5)                                |
| 169.15±4.98         | 43.29-77.92 (52.0±14.4)                                |

NCV: Nerve conduction velocities

## DISCUSSION

Our study had aimed at obtaining the normative data for NCV in the right median nerve in normal healthy adults with respect to age, gender, and height on it, in Malwa region of Indore district of Madhya Pradesh. We studied a total of 118 healthy individuals and observed a strong correlation to biological factors, that is, age, gender, and height.

### Age

A thorough literature review showed that age affects electrodiagnostic studies only in extremes of age. The effect of age is most significant from birth to 1 year when myelination is incomplete. In the newborn, NCV is approximately 50% of adult values. By 1 year of age, the velocities reach 75%, and by 3-5 years, myelination is complete, and NCV is comparable with adult normative data.<sup>[2]</sup> NCV decreases with age owing to decreased number of nerve fiber, a reduction in fiber diameter, and changes in the fiber membrane.<sup>[11]</sup> However, the values normally change by less than 10 m/s by the 60<sup>th</sup> year or even the 80<sup>th</sup> year.<sup>[12]</sup>

On comparing our study for the adults between 20 and 60 years, the NCV for elbow–wrist segment found to be less than that of Chouhan<sup>[13]</sup> but more than that of Ginzberg et al.<sup>[14]</sup> and Kimura et al.<sup>[15]</sup> (Table 5).

In adult, NCV decreases with age; it starts to decline at a rate of 1.5%/s, more in the upper limb than the lower limb. This was related to gradual loss of neuron with aging. A similar observation was made by Flack and Stalberg<sup>[16]</sup> for MNCV. Tong et al.<sup>[17]</sup> in their study on the effect of aging on motor nerve noted that the rate of change in parameter was significantly greater in the median nerve than the ulnar nerve.

### Gender

In contrast to this study, Thakur et al.<sup>[18]</sup> found an increase in all components of CMAP for male as compared to female and was statistically significant for antecubital fossa and right popliteal fossa. While this study showed a decrease in all NCV variables, that is, CMAP except duration but they were non-significant. In this study, area was also calculated because of computer analysis. Thakur et al.<sup>[18]</sup> did not calculate area and NCV for the gender of upper and lower limb.

Soudmand et al.<sup>[19]</sup> reported that NCV is not influenced much by gender. Gender difference in nerve conduction parameter could also be due to the difference in height.

While the work of Kimura et al.<sup>[15]</sup> reveals that gender-related amplitude differences persist despite adjustment of height. As male has thicker subcutaneous tissue which provides greater distance between digital nerve and surface ring electrode as compared to female. Garg et al.<sup>[20]</sup> found that male had

**Table 5: Height and NCV of right median nerve of elbow-wrist segment of different age groups**

| Parameter                                       | Range (age group) | Number of cases | Mean±SD      | Range           | Number of cases | Mean±SD     | Range           | Number of cases | Mean±SD      | Range           | Number of cases | Mean±SD      |
|---|-------------------|-----------------|--------------|-----------------|-----------------|-------------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Age   | 20-30 years       | 51              | 22.057±2.125 | 31-40 years     | 22              | 34.739±2.24 | 41-50 years     | 25              | 45.880±2.205 | 51-60 years     | 20              | 56.000±3.293 |
| height  | 142-180 cm        | 51              | 164.1±1.05   | 147-180 cm      | 22              | 167.43±6.84 | 156-176 cm      | 25              | 168.24±4.98  | 160-178 cm      | 20              | 169.15±4.98  |
| NCV of right median nerve (elbow-wrist segment) | 29.67-98.36 m/s   | 51              | 71.2±21.2    | 31.85-61.25 m/s | 22              | 55.5±22.8   | 30.93-57.15 m/s | 25              | 53.5±16.5    | 43.29-77.92 m/s | 20              | 52.0±14.4    |

NCV: Nerve conduction velocities, SD: Standard deviation

**Table 6: Height and NCV of the right median nerve of elbow-wrist segment of different age groups**

| Parameter | Group 1 | Group 2 | Group 3 | Group 4 |
|-----------|---------|---------|---------|---------|
| Age       | 22.057  | 34.739  | 45.88   | 56      |
| Height    | 164.1   | 167.43  | 168.24  | 169.15  |
| NCV-e-w   | 71.2    | 53.6    | 53.5    | 52      |

NCV: Nerve conduction velocities

a higher CMAP and longer latencies and duration than the females.

**Height**

The present study showed the effect of height on NCV in different age groups as for Group 2 was more than that of Group 1. Again the mean of height of Group 3 was more than that of Group 1, while Group 4 was again more than that of Group 1. While comparing height of Group 1 versus Group 2, we get  $P = 0.11$  which is nonsignificant. While Group 1 versus Group 3  $P = 0.0130$  and Group 1 versus Group 4  $P = 0.004$  are both significant. The present study revealed a decrease in NCV as height increases with advancing age which is supported by Robinson et al.<sup>[21]</sup>

In favor of the present study, Awang et al.<sup>[22]</sup> found the slowing of NCV with increasing age in the median nerve. Many studies had shown the effect of age on NCV for motor nerve was relatively slower in taller participants. While it was also estimated that the NCV decreases by 2.3 m/s/100mm in height as reported by Flack and Stalberg,<sup>[16]</sup> which was later confirmed by Shehab et al.<sup>[23]</sup>

An inverse relationship exists between the height of the individual and the velocity of nerve conduction as reported by Campbell et al.<sup>[24]</sup> This is because the shorter nerves conduct faster than the longer nerve of the same age group. In tall participant, distal conduction slowing occurs due to a greater axonal tapering and lesser myelination. Tall individual is also subjected to more loss of large sized axon with aging because of higher metabolic stress related to supplying the more distal axon reported by Soudmand et al.<sup>[19]</sup>

Height is the most important factor in F wave and H – reflex studies described by Cornwall and Nelson.<sup>[25]</sup> Logically, taller participants have longer conduction time of late response because of longer conduction distance reported by Huang et al.<sup>[26]</sup>

**CONCLUSION**

In conclusion, the normative conduction parameter of commonly tested peripheral motor nerve in upper limb had been established in our neurophysiology laboratory of the department of physiology of our institute. The present study might be used for the evaluation of peripheral nerve disorder

**Table 7:** Comparison of different biological parameters of Group 1 versus Group 2, Group 1 versus Group 3, and Group 1 versus Group 4 along with statistical analysis

| Parameter                                       | Group 1 versus Group 2                        |                 |                 | Group 1 versus Group 3                        |                 |                 | Group 1 versus Group 4                        |                 |                 |
|---|---|-----------------|-----------------|---|-----------------|-----------------|---|-----------------|-----------------|
|   | Number of cases                               | Group 1 Mean±SD | Group 2 Mean±SD | Number of cases                               | Group 1 Mean±SD | Group 3 Mean±SD | Number of cases                               | Group 1 Mean±SD | Group 4 Mean±SD |
| Age   | 51 (20-30 years)<br>/22 (31-40 years)         | 22.057±2.0125   | 34.739±2.240    | 51 (20-30 years)<br>/25 (41-50 years)         | 22.057±2.0125   | 45.880±2.205    | 51 (20-30 years)<br>/20 (51-60 years)         | 22.057±2.0125   | 56.00±3.293     |
| Height  | 51 (142-180 cm)<br>/22 (147-185 cm)           | 164.1±10.5      | 167.43±6.84     | 51 (142-180 cm)<br>/25 (156-176 cm)           | 164.1±10.5      | 168.24±4.98     | 51 (142-180 cm)<br>/20 (160-178 cm)           | 164.1±10.5      | 169.15±3.88     |
| NCV of right median nerve (elbow-wrist segment) | 51 (29.67-98.36 m/s)<br>/22 (33.85-61.25 m/s) | 71.2±21.2       | 55.5±22.8       | 51 (29.67-98.36 m/s)<br>/25 (30.93-57.15 m/s) | 71.2±21.2       | 53.4±16.5       | 51 (29.67-98.36 m/s)<br>/20 (43.28-77.92 m/s) | 71.2±21.2       | 52.01±14.4      |
|   |   |                 |                 |   |                 |                 |   |                 |                 |
|   |   |                 |                 |   |                 |                 |   |                 |                 |

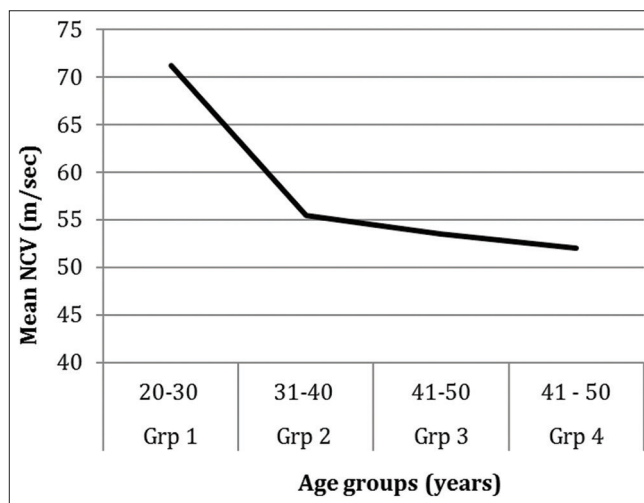
SD: Standard deviation

Statistical analysis: P<0.05 Significant; P=0.008, P=0.008, P=0.008, P=0.008 Non-significant; T=2.78, T=1.62, T=12.23, T=3.96, T=2.94, T=2.94, T=12.23, T=3.96 Non-significant; P=0.111, P=0.111, P=0.023, P=0.023, P=0.004, P=0.004 Non-significant; F=2.78, F=1.62, F=12.23, F=3.96, F=2.94, F=2.94, F=12.23, F=3.96, F=2.94, F=2.94 Highly significant; Df=39, Df=39, Df=59, Df=59 Highly significant

**Table 8:** Comparison of different parameters of Group 1 versus Group 2, Group 1 versus Group 3, Group 1 versus Group 4 along with mean NCV of elbow-wrist of same age group

| Group | Age   | Height | NCV-e-w |
|-------|-------|--------|---------|
| 1     | 22.06 | 164.1  | 71.2    |
| 2     | 34.74 | 167.43 | 55.5    |
| 1     | 22.06 | 164.1  | 71.2    |
| 3     | 45.88 | 168.24 | 53.4    |
| 1     | 22.06 | 164.1  | 71.2    |
| 4     | 56.00 | 169.15 | 52.01   |

NCV: Nerve conduction velocities



**Figure 2:** Nerve conduction velocities in different age groups

and also for the comparative studies as the anthropometrical factors, that is, age, gender, and height had shown strong correlation among them. The diagnostic conclusion could also be derived from the NCS data. The study data created preliminary normative information of our population in this Malwa region, albeit in a limited sample. A study with larger sample size will definitely add more strength. The present study concluded high NCV as compared to other workers. The probable explanation could be true differences among population and small sample sizes; the normative data could be used as preliminary working reference while reporting clinical NCS finding. In this way, these studies hold a great strength.

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