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Research Article

EFFECT OF ANTHROPOMETRIC FACTORS ON MOTOR NERVE CONDUCTION VELOVITY IN HEALTHY KASHMIRI POPULATION

Ali Md Ahanger[1]*, Kumar A.[2*], Roy V K[2]

1. **Professor & Head, Department of Physiology, SGT Medical College, Hospital & Research Institute, Budhera, Gurgaon**
2. **Assistant Professor, Department of Physiology, SGT Medical College, Hospital & Research Institute, Budhera, Gurgaon**

Corresponding Author: Dr. A. Kumar

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ABSTRACT

Normal values for distal nerve conduction measures are needed for clinical evaluation of individual patients and as control data for epidemiologic studies of work-related peripheral nerve compression disorders such as carpal tunnel syndrome. The measurement of nerve conduction can prove a useful tool in the assessment of extent of lesion and post treatment evaluation if any. Kashmiris form distinct ethnic group with different food habits that encourage development of different diseases responsible for peripheral neuropathies. This study describes the distribution of ulnar nerve conduction measures in a population of healthy Kashmiri population without exposure to forceful or repetitive hand exertions, or segmental vibration. The hypotheses of no association between motor nerve conduction measure and independent variables known or hypothesized to affect nerve conduction were tested. These factors included weight, height, mid-arm circumference, and wrist circumference. Nerve conduction studies were performed prospectively in upper limbs of 300 carefully screened healthy volunteers between the ages of 15 and 70 years using standardized techniques. The normal values for motor nerve conduction velocity of the ulnar nerve in normal Kashmiri population were 55.08±4.98 meters/sec for male and 55.71±4.53 meters/sec for females. No statistically significant correlation found between motor nerve conduction velocity of ulnar nerve and different anthropometric parameters (height, weight, wrist circumference and mid-arm circumference.

Key words: Conduction velocity, nerve conduction study, ulnar nerve, Kashmiri population, height, weight, mid-arm circumference, wrist circumference

INTRODUCTION

Normal values for distal nerve conduction measures are needed for clinical evaluation of individual patients and as control data for epidemiologic studies of work-related peripheral nerve compression disorders such as carpal tunnel syndrome. The measurement of nerve conduction can prove a useful tool in the assessment of extent of lesion and post treatment evaluation if any. Kashmiris form distinct ethnic group with different food habits that encourage development of different diseases responsible for peripheral neuropathies. This study describes the distribution of ulnar nerve conduction measures in a population of healthyKashmiri population without exposure to forceful or repetitive hand exertions, or segmental vibration. The hypotheses of no association between motor nerve conduction measure and independent variables known or hypothesized to affect nerve conduction were tested. These factors included weight, height, mid-arm circumference, and wrist

circumference. Nerve conduction studies were performed prospectively in upper limbs of 300 carefully screened healthy volunteers between the ages of 15 and 70 years using standardized techniques. Motor nerve conduction velocities decreases in diseases affecting the axons, cold injuries, diabetes neuropathies, nerve injuries, nerve entrapment, peripheral neuropathies, and various metabolic disorders. The measurement of the motor nerve conduction can prove a useful tool in the assessment of the lesion and post-treatment

MATERIALS AND METHODS

The permission to conduct study was taken from Institutional ethical committee. The study was conducted in 300 Kashmiri subjects of either sex includes medical students, technical and nontechnical staff and outdoor patients from department of Surgery, Govt. S.M.H.S. Hospital Srinagar. The age of the subjects ranged between 5-70 years

A detailed history and clinical examination was done to exclude out any neurological illness, chronic renal disease and diabetes.

Exclusion criteria – person giving history of Alcohol intake were excluded from the study

The cases were divided into two main groups (male and female) based on sex. These groups were further divided into different subgroup as follow

Weight wise distribution: Subjects were divided into male and female groups and each group was further divided into

1. Lower weight group – 20-50 kg
2. Middle weight group – 51-70 Kg
3. Higher weight group – 71-75 Kg

Height wise distribution: Subjects were divided into male and female and each group was further divided into

1. Group 1 – height 40”-60”
2. Group 2 – height 61” – 70”
3. Group 3 – height 71” – 73”

Mid-arm circumference: Subjects were divided into male and female and each group was further divided into

1. Group 1 – Mid-arm circumference 12-20 cm
2. Group 2 - Mid-arm circumference 21-25 cm
3. Group 3 - Mid-arm circumference 26-28 cm

Wrist circumference: Subjects were divided into male and female and each group was further divided into

1. Group 1 - wrist circumference 9-15cm
2. Group 2 - wrist circumference 16-20cm

METHODS – Ulnar nerve conduction velocity was measured in all the subjects on the right side and in 20 cases on the left side. The method of recording is based on the principal that the nerve conduction velocity can be measured by stimulating a nerve and recording the action potential either from the nerve at a distance from stimulating electrodes or by stimulating at two different site and finding the latency differences at two sites. Velocity can

be calculated by dividing the distance between two pint of stimulation by latency period difference.

The study was conducted on Dantee Neuromatie 2000C. The method used was that of Ernest W. Johnson & K. Oslen (1960).

The subject was laid in supine position with arm at 45˚ to the trunk, the elbow extended and forearm supinated. The temperature was measured in palm and mid-arm on the side of study and was between 34-27 ˚ C. The subject was grounded at the wrist by means of 13 K 93 grounding electrode. The pickup electrode 13 L 90 was placed over the abductor digiti minimi and reference electrode at the base of proximal phalanx. The site of stimulation for ulnar nerves was the wrist and elbow and recording site were motor point of abductor digiti minimi. The differences in latency period were measured with in built electronic time markers.

Following parameters were used for all the recording

Paper speed – 5cm/sec
Sweep speed – 2ms/D
Upper frequency – 2 Hz
Lower frequency – 20 Hz
Sensitivity – 2 m
Stimulus frequency – 1Hz
Stimulation duration – 200ms

STATISTICAL METHODS

Analysis was done using statistical package for social sciences (SPSS) 10.0 version. Values obtained were expressed in the form of mean and standard deviation (SD). P value was taken as significant if found to be less than 0.05.

OBSERVATIONS & RESULTS

Table –I Relationship of motor nerve conduction velocity of Ulnar nerve with height (inches) among males

Category	No of Cases	Motor nerve conduction velocity in meter/sec	
		Range	mean±SD
Group l	6 (3.06)	51.2-61.5	54.86 – 3.92
Group ll	167 (86.64)	40-67.5	55.02 -4.71
Group lll	22 (11.23)	45.0-65.7	55.60 -4.52

Note:-

Group I : Height 40” - 60”
Group ll : Height 61 “- 70”
Group III : Height 71 “-73”

Table –2 Comparison of Motor nerve conduction velocity of Ulnar nerve among males in relation to height (inches)

Comparison group	Difference of means	't' Value	'P' Value	Significance
Group l and group ll	0.14	0.07	> 0.60	Nonsignificant
Group l and group III	0.72	0.35	> 0.70	Nonsignificant
Group ll and group lll	0.58	0.65	> 0.80	Nonsignificant

Table –3 Relationship of height (inches) with motor nerve conduction velocity of ulnar nerve among females

Category	No. of cases	Motor nerve conduction velocity in meter/sec	
		Range	Mean ± SD
Group l	7 (6.67)	50.0 - 56.7	56.14 ± 3.15
Group ll	96 (91.43)	46.8 - 66.6	55.58 ± 4.48
Group lll	2 (1.90)	62.5 – 65.7	64.10 ± 2.26

Note:-

Group I : Height 40" - 60"
Group ll : Height 61 "- 70"
Group III : Height 71 "-73"

Table-4 Relationship of motor nerve conduction velocity of ulnar nerve with midarm circumference (cm) among males

Category	No. of cases	Motor nerve conduction velocity in meter/sec	
		Range	Mean ± SD
Group l	8 (4.10)	51.3 – 62.5	55.01 ± 4.25
Group ll	137 (70.26)	40.0 - 67.6	54.90 ± 4.27
Group lll	50 (25.64)	47 – 66.6	56.20 ± 3.87

Table-5 Comparison of Motor nerve conduction velocity of Ulnar nerve among males in relation to mid arm circumference (cm)

Comparison group	Difference of means	't' Value	'P' Value	Significance
Group l and group ll	0.92	0.58	> 0.50	Nonsignificant
Group l and group III	0.71	4.40	> 0.40	Nonsignificant
Group ll and group lll	0.21	0.32	> 0.70	Nonsignificant

Table-6 Relationship of motor nerve conduction velocity of ulnar nerve with midarm circumference (cm) among females

Category	No. of cases	Motor nerve conduction velocity in meter/sec	
		Range	Mean ± SD
Group l	20 (19.06)	48.7 – 60.5	54.76 ± 3.30
Group ll	68 (64.76)	47.0 – 66.5	55.31 ± 4.31
Group lll	17 (16.19)	46.8 – 62.5	56.42 ± 3.30

Table-7 Comparison of otor nerve conduction velocity of Ulnar nerve among males in relation to mid arm circumference (cm)

Comparison group	Difference of means	't' Value	'P' Value	Significance
Group l and group ll	1.06	1.03	> 0.30	Nonsignificant
Group l and group III	1,68	1.44	> 0.10	Nonsignificant
Group ll and group lll	0.60	0.53	> 0.50	Nonsignificant

Table-8 Relationship of motor nerve conduction velocity of ulnar nerve with wrist circumference (cm) among females

Category	No. of cases	Motor nerve conduction velocity in meter/sec	
		Range	Mean ± SD
Group l	36 (18.48%)	40 – 65.7	54.77 ± 4.54
Group ll	150 (81.54%)	41.1 – 67.5	55.15 ± 4.39

't' value -0.46
'p' value - 0.60 (nonsignificant)

Table-9 Relationship of Motor nerve conduction velocity of Ulnar nerve among females in relation to wrist circumference (cm)

Category	No. of cases	Motor nerve conduction velocity in meter/sec	
		Range	Mean ± SD
Group l	46 (45.71%)	47 – 66.6	55.26 ± 4.26
Group ll	57 (54.29%)	46.8 – 66.6	56.08 ± 4.31

't' value -0.99
'p' value - 0.30 (non-significant)

DISCUSSION

Fred J Gorin (1969) stated that A nerve is said to have a normal conduction function if all the fibers population within it conducts evoked response with in a normal velocity range (2). Schubort (1964) has shown that the nerve conduction velocity determination done with stimuli points closer than 10cm or with stimuli at points where the nerve trunk is not superficial are subject to considerable errors (3). In the present study superficial points have been used invariably for stimulation and stimuli points were always kept more than 10cm apart Stimulating electrodes were applied to the skin with some pressure to ensure good contact and the point of negative stimulation electrode marked with a fine pointed pen.

Nerve conduction study is an important method used in clinical practice and has been thoroughly validated (4,5,6,14,17).There are many studies and reviews on nerve conduction studies that have been published. These include the factors that affect nerve velocities. These factors can be divided into biological factors (age, weight, height, mid-arm circumference, gender and wrist circumference) and physical factors which are related to the physical state of the nerve and muscle (13, 18,19). Our focus was on the effect of biological factors (weight, height, mid-arm circumference and wrist circumference) on motor nerve conducton velocity. Other factors like temperature for instance were kept at the recommended level by most neurophysiology laboratories in order to reduce variabilities.

.Buschbacher (4) performed a study to determine the effect of body mass index on NCV. The investigator concluded that there was no correlation note between BMI and NCV plus H reflex latency.

An attempt was made to find if any relationship exists between motor nerve conduction velocity and weight of a person, which does not seems to have proposed so far. However the present study showed no significant relationship between the weight of a person and the ulnar nerve motor conduction velocity

Many studies have shown that NCV both motor and sensory are relatively slower in taller subjects. It is estimated that the velocity decreases by 2-3 m/s per 100mm in height

(10,11,16,19,24, 25). Soudmand et al (21) found that peroneal and sural nerves conduction velocities were correlated inversely with height and no significant relationship could be seen in median nerve(both motor and sensory) NCV. In comparison, we could not demonstrate any obvious trend of NCVs in ulnar nerves across different height groups

Dorfman and Beisy (1979), Campbell WW Jr, Ward LC, Swift TR (1981) found that the velocity decreases with increase in height(6,26) . The present study however , failed to establish any correlation between the height of the subject and motor nerve conduction velocity of ulnar nerve

The study did not reveal any correlation between the mid-arm circumference and motor nerve conduction velocity of ulnar nerve and no such relationship has also been reported by other studies which have been reviewed in the present study

In the present study no correlation was found between the wrist circumference and motor nerve conduction velocity of ulnar nerve. No such relationship has been published by any author reviewed. Hence comparisons are not possible

SUMMARY

The present study is the first of its kind for Kashmiri population It was observed that motor nerve conduction velocity of ulnar nerve in male was 56.08 ± 4.96 meter/sec and in female was 55.71 ± 4.53 meter/sec. no significant relationship could be established between motor nerve conduction velocity and weight , height, wrist circumference and mid-arm circumference

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