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Study of motor nerve conduction of ulnar nerve in healthy individuals of different temperaments

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Abstract

Unani physicians described various parameters or signs through which the state of temperament (Bilious, Sanguineous, Phlegmatic or Melancholic) of any individual can be recognized. These parameters are related with the morphological, physiological and psychological conditions of the individual. Functions of the body (one of the parameters) is considered as important in assessing the temperament of an individual as quickness of the body in reaction to stimuli is the evidence of preponderance of heat state in the body e.g. certain people are quickly affected by cold air and winter season and cold things, while others do not get affected by them but they are affected by hot things. When the functions are rapid such as rapid movements of organs and rapid growth of hair and eruption of teeth, they show excess of heat. If the functions are dull, weak and inactive or slow, they indicate coldness. In this study, motor nerve conduction of ulnar nerve was taken to assess the swiftness/sluggishness of motor functions of individuals by observing the motor nerve conduction velocity levels and it was observed that the mean MNCV in hot temperament subjects i.e. Bilious and Sanguineous was higher i.e. 63.17843 with S.D. ± 4.585162 and mean MNCV in Cold temperament subjects i.e. Phlegmatic and Melancholic was lower i.e. 57.89882 with S.D. ± 5.055363 . It may be concluded that persons having hot temperaments (Bilious and Sanguineous) would be having faster motor functions as compared to those having cold temperaments (Phlegmatic and Melancholic), which is in accordance of ancient Unani scholars' view.

Keywords: Ulnar nerve, motor nerve conduction velocity, temperament

Introduction

When we go through the history of physiology, it has its origin way back in 4th B.C. when Hippocrates (460-377 B.C), a Greek physician, gave the concept of four humours, which includes Blood (*Dam*), Bile (*Safra*), Phlegm (*Balgham*) and Black bile (*Sauda*), which directly influence the temperament and health of the human body. The humoral theory holds that the human body is filled with four basic fluids called humours, which are in balance when a person is healthy. All diseases and disabilities supposedly resulted from an excess or deficit of one or more of these four humours. These four humours, when in appropriate quantity and quality are responsible for an internal physiological environment which is termed as Temperament. Temperament is one of the basic and fundamental concepts of Unani system of medicine. It plays a pivotal role in determining the physiological, psychological and pathological status of an individual and is the basis of Unani therapeutics. Unani physicians described various parameters or signs through which the state of temperament of any individual can be recognized. These parameters are related with the morphological, physiological and psychological conditions of the individual. These parameters or signs are known as determinants of temperament. These ten parameters are: - Palpation/ Touch, Muscles and Fat, Hair, Body Complexion, Physique, Responsiveness of organs, Sleep and wakefulness, Functions of the body, Excreta of the body, Psychic reactions. Functions of the body are considered as important parameters in assessing the temperament of an individual as 'quickness of the body in reaction to stimuli is the evidence of preponderance of heat state in the body, e.g. certain people are quickly affected by cold air and winter season and cold things, while others do not get affected by them but they are affected by hot things'. (Nafis, 1954) [6] 'When the functions are rapid such as rapid movements of organs and rapid growth of hair and eruption of teeth, they show excess of heat. If the functions are dull, weak and inactive or slow, they indicate coldness.

Among powerful functions that denote hotness are - powerful and loud voice, rapid and continuous speech, short temper, brisk movements and frequent blinking'. (Ibn Sina, 1993) [3] 'Since functions of an organ reflect its structural and functional integrity, they indicate that the organ is within physiological limits, and is having healthy temperament. Functions and actions, when accelerated become indicative of hot temperament of the organs' (Zaidi & Zulkifile, 1999) [99]. 'In healthy individuals, hyperactivity and increase responsiveness in motor functions are indicative of hot and dry temperament of brain while hypo activity and decrease responsiveness are indicative of cold and wet temperament of brain'. (Kabiruddin, 1940) [4]. Hkm. S.I. Ahmed also stated in his book *Kulliyat-e-Asri* that 'swiftness in motor functions is indicative of hot temperament and hypo activity and sluggishness in motor functions are indicative of cold temperaments'. (Ahmed, 1983) [1] So, from the above quotations, it is assumed that Unani scholars considered that individuals having hot temperaments (Bilious and Sanguineous) would be having faster motor functions as compared to individuals having cold temperaments (Phlegmatic and Melancholic). In this study, motor nerve conduction of ulnar nerve is being taken to assess the swiftness/sluggishness of motor functions of individuals by observing the motor nerve conduction velocity levels. Ulnar nerve has been chosen in this study for the measurement of motor nerve conduction velocity because of its accessible location and long straight route. For the measurement of conduction velocity, the nerve has to be stimulated at least at two points and the difference between those two points must be at least 100mm and ulnar nerve has straight route of more than 200mm, which also makes it a good choice in measuring motor nerve conduction velocity. The aim of the present study was to determine the motor nerve conduction velocity in different temperament and then to relate the levels of motor nerve conduction velocity with different temperament whether the individuals possessing hot temperaments (Bilious and Sanguineous) have higher levels of motor nerve conduction velocity as compared to individuals possessing cold temperaments (Phlegmatic and Melancholic) or not.

Nerve conduction study

In the past two decades, major advances have taken place in the field of peripheral nerves, especially, in relation to its ultra-structure, histo-chemistry, neuro-physiology and axonal transport system. These advances have not only contributed to a better understanding of normal peripheral nerve structure and function but also in relation to various diseases. (Misra, 2012) [5]. Nerve conduction study is done to assess whether a nerve which has suffered compression or injury is degenerating or not. The nerve is stimulated directly by a short duration stimulus along its course. When it is stimulated it conveys impulses to the muscles it supplies and the muscles contract (Downie, 1992) [2]. The principal use of nerve conduction studies is to identify damage to peripheral nerves, and to determine whether the pathological process is focal or diffuse and whether the damage is principally axonal or demyelinating. It is also possible to obtain some information about nerve roots by more sophisticated analysis of responses to impulses initially conducted anti-dromically to the spinal cord, and then orthodromically to the stimulation point (F wave). (Walker *et al.*, 2013) [7].

Nerve conduction velocity

By stimulating a motor nerve at two different points along its course and by recording from an appropriate muscle the motor unit potentials so produced, it is possible to measure the stimulus contraction delay interval in each case and hence to calculate the rate of conduction of the impulse along the nerve. (Walton, 1979) [8].

Conduction Velocity = $D / (PL-DL)$ m/s

PL= Proximal latency in ms

DL= Distal latency in ms

D= Distance between proximal and distal stimulation in mm.

For accurate motor nerve conduction velocity measurements, the distance between two points of stimulation should be at least 10cm. (Misra, 2012) [5].

Material and Methods

The study was conducted in the Department of Physiology, A & U Tibbia College, Karol Bagh, New Delhi, on one hundred (100), randomly selected, both male and female students from Ayurvedic and Unani Tibbia College, Karol Bagh, New Delhi, University of Delhi, during 2014-15. It was a "Randomized Descriptive Cross Sectional Study" with a sample size of 100 and duration of 9 months.

Inclusion criteria

- Healthy individuals in the age group of 18-25yrs
- Either sex

Exclusion criteria

- Person with age below 18yrs
- Person with age above 25 yrs
- Alcoholics
- Smokers and Tobacco users
- Person suffering with Diabetes mellitus
- Person with past history of any trauma
- Pregnancy

Assessment of temperament

The temperaments of volunteers were determined by the proforma based on the ten determinants for the assessment of temperament.

Measurement of motor nerve conduction velocity

The volunteers were randomly called for measurement of Motor Nerve Conduction velocity of ulnar nerve of either forearm by "Neuro-Perfect EMG 2000 EMG/NCV/EP" by Medicaid. Nerve conduction velocity was determined by applying the following formula:

Conduction velocity= $D / PL-DL$ (m/sec)

PL= Proximal latency in ms

DL= Distal latency in ms

D= Distance between proximal and distal stimulation in mm

Observation and results

This study entitled "Study of Motor Nerve Conduction of Ulnar Nerve in Healthy Individuals of Different Temperaments" was conducted in the P.G. Department of Physiology, A & U Tibbia College Karol Bagh, New Delhi, during 2014-2015. The volunteers were randomly selected and the Temperament of the volunteers was assessed on the basis of a proforma mentioned in classical Unani literature. The data obtained in this study was statistically evaluated which are as follows:

Table 1: Distribution of subjects according to temperament

S. No.	Temperament	Subjects	Percentage %
1.	Bilious	34	34%
2.	Phlegmatic	16	16%
3.	Sanguineous	49	49%
4.	Melancholic	1	1%

Table 2: Distribution of subjects according to temperament

S. No.	Temperament	Subjects	Percentage %
1.	Safravi	34	34%
2.	Balghami	16	16%
3.	Damvi	49	49%
4.	Saudavi	1	1%

Table 3: Distribution of subjects according to gender

Total	Male	Females
100	42	58

Table 4: Distribution of subjects according to hot (bilious and sanguineous) and cold (phlegmatic and melancholic) temperaments

Temperaments	Distribution
Bilious and Sanguineous (Hot entities)	83%
Phlegmatic and Melancholic (Cold Entities)	17%

Table 5: Values of mean MNCV & SD in different temperaments

S. No.	Temperament	MNCV	Standard Deviation (SD)
1.	Bilious	64.03588	± 4.831522
2.	Phlegmatic	58.51438	± 4.711875
3.	Sanguineous	62.58347	± 4.37197
4.	Melancholic	48.05	± 0.00

Table 6: One way ANOVA test was applied to test the significance of difference in results between MNCVs of different temperament and the following data was obtained:

Source of Variation	Sum Of Squares	Degree of Freedom	Variance	F	P
Between Groups	538.7096	3	179.5699	8.5305	0.0000
Within Groups	2020.8433	96	21.0505	-	-
Total	2559.5529	99	-	-	-

Since our computed F of 8.5305 is greater than 3.99 (Value of F for the 0.01 significance level) we reject H₀. Since we reject H₀, we conclude that the alternative hypothesis is true and the results are highly significant as the value of p = 0.0000.

We conclude that the four temperaments do not all have the same motor nerve conduction velocity. Tukey HSD Post hoc test was applied to determine which two groups have significant difference and test results are given below:

Table 7: Confidence Intervals

Comparison	Mean1 - Mean2	95% Ci Of Difference
Bilious vs. Sanguineous	+ 1.47041	- 1.28848 to + 4.22930
Bilious vs. Phlegmatic	+ 5.52150	+ 1.77420 to + 9.26880
Bilious vs. Melancholic	+ 15.98588	+ 3.44501 to + 28.52675
Sanguineous vs. Phlegmatic	+ 4.06909	+ 0.51006 to +7.62812
Sanguineous vs. Melancholic	+ 14.53347	+ 2.04756 to + 27.01938
Phlegmatic vs. Melancholic	+ 10.46438	- 2.27645 to + 23.20521

Table 8: Statistical significance

Comparison	Significant At P <0.05	t
Bilious vs. Sanguineous	No	1.436
Bilious vs. Phlegmatic	Yes	3.970
Bilious vs. Melancholic	Yes	3.434
Sanguineous vs. Phlegmatic	Yes	3.080
Sanguineous vs. Melancholic	Yes	3.136
Phlegmatic vs. Melancholic	No	2.213

As shown in the table, by applying post hoc test, we conclude that the statistical significant groups were Bilious vs. Phlegmatic, Bilious vs. Melancholic, Bilious vs. Phlegmatic and Sanguineous vs. Melancholic are significant at p < 0.05 with 95% confidence.

When bilious and sanguineous temperament subjects were

considered together as hot temperaments and phlegmatic and melancholic were as cold temperaments, the mean MNCV in hot temperament subjects i.e. bilious and sanguineous was higher i.e. 63.17843 with S.D. ±4.585162 and mean MNCV in cold temperaments subjects was lower i.e. 57.89882 with S.D. ± 5.055363.

Table 9: Distribution of mean ± standard deviation of mncv in hot (bilious and sanguineous) and cold (phlegmatic + melancholic) temperament

Temperament	MNCV (Mean S.D.)
Hot (Bilious + Sanguineous)	63.17843 ± 4.585162
Cold (Phlegmatic + Melancholic)	57.89882 ± 5.055363

Hot temperaments (Bilious + Sanguineous) vs. Cold temperaments (Phlegmatic +Melancholic)

Student t test was applied to test the significance of the result and it was found that the difference between the mean MNCV of hot temperaments (bilious + sanguineous) i.e.63.1783 ±

4.585162 and cold temperaments (phlegmatic + melancholic) i.e. 57.89882 ± 5.055363, was extremely statistically significant with value of t = 4.2511, df = 98 and standard error of difference 1.242 and value of p <0.0001.

Conclusion

Motor Nerve Conduction Velocity mean was highest in individuals having Bilius temperament, then in sanguineous temperament followed by phlegmatic temperament and MNCV mean was least in melancholic temperament, and the difference in results were highly significant and the statistical significant groups were bilious vs. phlegmatic, bilious vs. melancholic, sanguineous vs. phlegmatic and sanguineous vs. melancholic.

Also, after merging MNCVs of bilious with sanguineous, and phlegmatic with melancholic as hot and cold entities respectively, it was found that persons having hot temperaments (bilious and sanguineous) were having higher levels of MNCV as compared to those having cold temperaments (phlegmatic and melancholic) and the difference in results were extremely significant. As it is very much clear that the motor nerve conduction velocity represents the motor functions of an individual, so, we can conclude that persons having Bilius temperament, would be having fastest motor functions followed by Sanguineous and Phlegmatic and Melancholic temperament individuals seem to have sluggish motor functions. Also, we can conclude that persons having hot temperaments (Bilious and Sanguineous) would be having faster motor functions as compared to those having cold temperaments (Phlegmatic and Melancholic), which is in accordance of ancient Unani scholars' view.

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