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| **COMPARISON OF LATENCY, AMPLITUDE & CONDUCTION VELOCITY OF MEDIAN MOTOR NERVE IN PRE-OVULATORY & POST-OVULATORY PHASE OF NORMAL REGULARLY MENSTRUATING FEMALES**  **Shailja Tiwari 1\*, Ashutosh Garg2 , Kiran patel3,S.P. Garg4**  1 , 3.Department of Physiology, N.S.C.B. Medical College, Jabalpur MP, India  2. Department of pathology ,SS medical cillege rewa (M.P.),india  4. Department of Forensic medicine ,SS medical cillege rewa (M.P.),india  **\*Email id of corresponding author- s**[**hailjatiwari3@gmail.com**](mailto:hailjatiwari3@gmail.com) | | |
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| **ABSTRACT:**  **Objective:** Several factors may contribute towards determination of accurate nerve conduction velocity like age, temperature, height etc. Temperature has a major influence on nerve conduction and it has been also proved that there is temperature variation found in different phase of menstrual cycle of female. Objective: Our study aimed to find out whether this temperature fluctuation in pre-ovulatory and postovulatory phase may interfere the conduction parameters of median motor nerve or not**. Material method:** It was a prospective study and was conducted in the Department of Physiology, Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur (M.P.) after obtaining ethical clearance. Median motor nerve were examined in 25 regularly menstruating female medical students, aged between 17-25 years, having no signs or symptoms of neurological impairment. Observations were taken in both pre-ovulatory and postovulatory phase of menstrual cycle and recording done by using surface electrodes. Different temperatures i.e. hot and cold were maintained with the help of water bath and skin temperature measured by using Digital Mercury Thermometer. **Results:** The pre-ovulatory phase latency and amplitude was more than that in post-ovulatory phase. In pre-ovulatory phase nerve conduction velocity was lesser than that in post-ovulatory phase. But on statistical analysis this difference was found non-significant (p>0.05). **Conclusion:** Our study concluded that the conduction parameters i.e. latency, amplitude and conduction velocity of median motor nerve is not affected by temperature variation in different phase of menstural cycle of female.  **KEYWORDS:** Amplitude, Latency, Conduction velocity, Median nerve, Preovulatory & postovulatory phase, Temperature. | | |

**INTRODUCTION**

Nowadays, electromyography and nerve conduction study are established methods not only for the diagnosis of neuromuscular disorders, but since the recording of cortical and spinal evoked potentials has been intro-

duced, disease of the central nervous system also lies within its scope.

In the past two decades, major advances have taken place in the field of peripheral nerves; especially in relation to its ultrastructure, histochemistry, neurophysiology, and axonal transport systems. These advances have not only contributed to a better understanding of normal peripheral nerve structure and function, but also improved our understanding of various peripheral neuropathies.**(1)**

Nerve conduction studies (NCS) are one of the two major components of the electro-diagnostic (EDX) assessment, the other being the needle electrode examination (NEE). There are three types of NCS- motor, sensory, and mixed. Because of differing technical aspects in their performance, these must be performed sequentially, rather than simultaneously, whenever the same mixed nerve is being assessed (i.e., motor and sensory NCS cannot be done on a nerve trunk at the same time). Similar to the NEE and the various special studies, all three types of NCS assess only large, heavily myelinated nerve fibers. **(2, 3, 4)** With steady improvement in recording apparatuses; nerve conduction studies have become a simple and reliable test of peripheral nerve function. **(5)**

Nerve conduction studies are being increasingly used in diagnosis and prognosis of various neurological diseases. Nerve conduction studies assess the peripheral motor and sensory functions by recording the evoked response to stimulation of peripheral nerves. They have an important role in evaluation of peripheral and entrapment neuropathies by confirming the clinical suspicion of neuropathy and identifying the predominant patho-physiology such as conduction block, axonal de-myelination, and temporal course of the disease i.e. Acute, subacute or chronic, the nerve conduction studies provide an objective and qualitative measure of nerve function and also help in predicting the prognosis of neuropathy.

There is a unique relationship between an individual, the environment and the building he or she inhabits. Everyday experiences tell us that there are a host of factors which are relevant to this concept. Air and surface temperatures, humidity, air movement have an important role. The variations in thermal comfort and well being were influenced by temperature changes. The indoor thermal environment will directly influence human physical and psychological health, sense of comfort, as well as human’s well being **(6)**.

Our study attempts to determine the effect of skin temperature on latency, amplitude and conduction velocity of motor branch of median nerve in preovulatory and post ovulatory phase of normal regularly menstruating females. It will help to plan the treatment required for any neuropathies in female by knowing the effect of temperature on conduction median motor nerve in both phases of menstrual cycle.

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**MATERIALS AND METHODS**

Present study was conducted in the Department of Physiology, Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur (M.P.) 25 regularly menstruating female healthy volunteers aged between 17-25 year were recruited from the First M.B.B.S batch of N.S.C.B. Medical College, Jabalpur (M.P.), having no signs or symptoms of neurological impairment. Nerve conduction study of Median motor nerve bilaterally was performed with help of computerized machine RMS Aleron 201 EMG and NCV, using surface. Different temperature i.e. hot and cold was maintained with the help of water bath and skin temperature measured by using Digital Mercury Thermometer.

**Surface stimulation was performed as per steps following steps:**

**S1 –**First stimulus placed at the wrist between the Palmaris Longus and Flexor Carpi Radialis tendon at the second crease.(Approximately 1cm proximal to the most distal crease.)

**S2 -** Second stimulus placed at the elbow crease, medial to the Biceps tendon and Brachial artery.

The nerve was stimulated supramaximally with the wave pulses of 0.2ms duration for every recording of sensory median nerve conduction velocity and motor median nerve conduction velocity.

In preovulatory phase after obtaining the first motor record at a room temperature the forearm including the elbow was cooled in a thermo stated water bath at 320 C for 10 minutes. The upper extremity was then lifted from the bath and dried, the electrodes were reapplied over the marked points and recording was performed again. Then the arm was immersed in the water again and cooled the forearm including the elbow at 290 C for 10 minutes. Similarly recording was done at 390 C. Hence, the temperature was changed stepwise to 320 C, 290 C and 390 C. **(7)**

Above same procedure were repeated in post ovulatory phase. At each temperature the arm was in water bath for 10 minutes before the nerve conduction examination, the skin temperature was measured just before the stimulation at site of the recording and stimulating electrode at the wrist with the digital mercury thermometer.

**RESULTS**

While performing conduction study on 25 reguarly menstruating female, aged between 17-25 years, we found that latency, amplitude and conduction velocity of median motor nerve shows variation with temperature in preovulatory and post ovulatory phase of female menstrual cycle.

**Table1: Comparison between mean & standard deviation of median motor nerve latency of female pre ovulatory & post ovulatory phase of menstrual cycle recorded at various skin temperature.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Temperature | Preovulatory (n=25) | Post ovulatory (n=25) | Significance | |
| 290 c | 3.43 (+0.46) | 3.12 (+0.60) | t=2.02 | p>0.05 |
| 320 c | 3.38 (+0.45) | 3.01 (+0.61) | t =2.42 | p >0.05 |
| 370 c | 3.30 (+0.44) | 2.81 (+0.59) | t =3.29 | p >0.05 |
| 390 c | 3.25 (+0.44) | 2.75 (+0.58) | t =3.43 | p >0.05 |

We found that while increasing the temperature, the amplitude, latancy shows decrease and conduction velocity increase. In the post ovulatary phase, when body temperature had to increased, variable showed same changes.

Mean and standard deviation of latency of median motor nerve recorded at various skin temperatures in

pre ovulatory & post ovulatory phase of menstrual cycle.

**Table2- Comparison between mean & standard deviation of median motor nerve amplitude of female preovulatory & post ovulatory phase of menstrual cycle recorded at various skin temperature.**

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| --- | --- | --- | --- | --- |
| Temperature | Preovulatory (n=25) | Post ovulatory (n=25) | Significance | |
| 290 c | 11.63(+2.91) | 11.24 (+2.80) | t=0.49 | p>0.05 |
| 320 c | 11.55(+2.90) | 11.13 (+2.81) | t=0.51 | p>0.05 |
| 370 c | 11.46(+2.90) | 10.98 (+2.82) | t=0.60 | p>0.05 |
| 390 c | 11.39(+2.92) | 10.88 (+2.81) | t=0.63 | p>0.05 |

Mean and standard deviation of amplitude of median motor nerve recorded at various skin temperature in pre ovulatory & post ovulatory phase of menstrual cycle.

**Table3- Comparison between mean & standard deviation of median motor nerve conduction velocity of female pre ovulatory & post ovulatory phase of menstrual cycle recorded at various skin temperature.**

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| --- | --- | --- | --- | --- |
| Temperature | Preovulatory (n=25) | Post ovulatory (n=25) | Significance | |
| 290 c | 54.75 (+5.24) | 56.64 (+5.30) | t=1.27 | p>0.05 |
| 320 c | 57.12 (+5.32) | 58.97 (+5.30) | t=1.23 | p>0.05 |
| 370 c | 59.65 (+5.45) | 61.20 (+5.19) | t=1.03 | p>0.05 |
| 390 c | 61.93 (+5.43) | 63.37 (+5.17) | t=0.96 | p>0.05 |

Mean and standard deviation of conduction velocity of median motor nerve recorded at various skin temperature in pre ovulatory & post ovulatory phase of menstrual cycle.

**DISCUSSION**

The result of our study reveals that with increase in temperature latency, amplitude decrease and conduction velocity increase. Same changes were obtained in pre ovulatory and post ovulatory phase of menstrual cycle, but rate of decrease in latency and amplitude were more in post ovulatory phase than preovulatory phase.

The result of our study reveals that temperature has an effect on the ability of the nerve to conduct impulses. Similar result has also been reported by De Jesus et al. and Lowitzsch et al. The probable explanation for the increase in median nerve conduction velocity with increase in temperature is that on warming of the nerve there is a transient hyper-polarisation by acceleration of the electrogenic sodium pump.**(14)**

According to Kimura, cold temperatures cause slowing of sodium channel opening and also delay its activation which probably accounts for the slowing of nerve conduction and the increase in amplitude. With decrease in temperature there is consequent reduction in the sodium permeability of nerve axons during the excitation, resulting in a slower sodium influx and an increased latency. Decrease in temperature also increases the resistance to conduction of impulses which in turn increases the latency and decreases the conduction velocity.

While comparing effect of temperature (290 C -390C) on latency, amplitude and conduction velocity of median motor nerve between pre-ovulatory and post-ovulatory phase of 25 normal regularly menstruating females, showed that pre-ovulatory phase latency and amplitude was more than that in post-ovulatory phase. Also pre-ovulatory phase nerve conduction velocity was lesser than that in post-ovulatory phase. But on statistical analysis this difference was found non-significant (p>0.05).

The probable explanation for this change could be due to increased level of progesterone in post ovulatory phase. Progesteroneis a thermogenic hormone, it increases body temperature by 0.50Cto 0.10C which effects the nerve conduction parameters.**(8)**

Body temperature changes rhythmically throughout the menstrual cycle, peaking during the luteal phase in response to the surge in progesterone. A higher body temperature during the luteal phase women have a decreased ability to dilate the small blood vessels under the skin, which compromises their ability to release heat to the environment.**(13)**

Recently, various authors studied that sympathetic nervous activity in the luteal phase is significantly greater than in the follicular phase, possibly due to effect of progesterone. In the follicular phase there is a rise in oestrogenlevel, parasympathetic activity has been shown predominant. Their findings favours our study sympathetic activity increase body temperature hence increase conduction velocity in post ovulatory phase.**(9-12)**

**CONCLUSION**

Median motor nerve latency, amplitude and conduction velocity were determined in pre-ovulatory and post-ovulatory phase of normal regularly menstruating female on changing temperature. The study showed that pre-ovulatory phase latency and amplitude was more than that in post-ovulatory phase. The conduction velocity in post-ovulatory was greater than that in pre-ovulatory phase. But this difference was found insignificant (p>0.05).

Above results obtained are well supported by other researchers from different parts of the world. Though some variations in values are obtained,they may possibly be due to different climatic conditions.

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**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the institutional ethics committee

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