



## OCCURENCE OF HAND ARM VIBRATION SYNDROME IN SUGAR CANE JUICE VENDORS.

### Physiotherapy

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### ABSTRACT

**Background:** Sugarcane juice vendor are exposed continuously to 50-60Hz vibration through motor. The nature of these tools involves vibration which is transmitted from tools to the hand and arm of the person holding the tool. Due to continuous exposure of vibration through machine this may cause hand arm vibration syndrome. This study aims to identify occurrence of hand arm vibration syndrome in sugarcane workers.

**Method:** In this study 30 sugarcane juice vendors were selected according to selection criteria, the patient were evaluated in sitting position. Vascularity was checked using Allen's test, Vibration perception was checked using tuning fork and Grip strength using jamar dynamometer.

**Results:** In our prevalence was found to be 63%. Vascularity was found to be reduced in 80% while vibration perception in 77% and grip strength in 63% of population.

**Conclusion:** The study concludes that there is decrease in vascularity, vibration perception and grip strength.

### KEYWORDS

hand arm vibration syndrome, vibration, grip strength, vascularity, sugarcane workers.

### INTRODUCTION:

India is a country of wide variety of fruits and their extracts, among them sugarcane juice is highly consumed. The sugarcane juice is usually extracted by using a semi-automated sugarcane crusher is commonly seen in market. <sup>(3)</sup>Sugarcane juice vendor are exposed continuously to 50-60Hz vibration through motor. <sup>(4)</sup> Vibration is periodic back and forth motion of the particles of the elastic body or medium commonly resulting when any physical system is displaced from equilibrium.

The nature of these tools involves vibration which is transmitted from tools to the hand and arm of the person holding the tool. Due to continuous exposure of vibration through machine this may cause hand arm vibration syndrome.

The development of these symptoms depends on several factors such as intensity and duration of exposure, the type of process involved and the tool used as well as agent and ergonomic factor. <sup>(1)</sup> Hand arm vibration syndrome is an occupational disease in workers who are exposed to vibration due to usage of vibratory tools such as drills, jackhammers and chain saws.

Vibration injuries are subdivided into three subgroups that are neurological, vascular and musculoskeletal disorders. Neurological injuries persist early symptoms such as tingling and numbness in the hand and fingers. Damaged caused by fully developed neurological vibration is irreversible which leads to high level of disability and work impairment. <sup>(1)</sup>

Vascular injuries affect the capillaries in the hand and finger, causing these to constrict, and this causes Blanching and numbness. During this episode of blanching caused by vasoconstriction; to the finger or the hand, the person experience numbness. <sup>(1)</sup>

Musculoskeletal injuries may take form of arthritis, tendinitis and changes in muscle fibres.

The Jamar dynamometer is the gold standard in grip strength testing equipment. It is an instrument for measuring isometric strength of hand and forearm muscles. It was introduced in 1954 (Bechtol; 1954) and consists of a sealed hydraulic system with adjustable hand strength and tracking progress with strength training and during rehabilitation. <sup>(1)</sup>

It is found to be highly reliable (0.98) and valid (0.99) for measuring hand grip strength. <sup>(1)</sup>

In 1929, Egar.V.Allen described a non-invasive evaluation of the patency of arterial supply to the hand. The patient was asked to clench both hand tightly for 1 minute, while the examiner compresses one

artery of each hand. This method is used to assess vascularity of hand. Tuning fork a two prolonged steel device which vibrates when struck. It provides an easy and inexpensive test of vibratory sensation. <sup>(2)</sup>

### METHODOLOGY:

#### Participants:

Individuals were taken who were willing to participate in the study were taken. All the subjects were screened as per the inclusion and the exclusion criteria. The subjects were explained about the procedure and the purpose of this study. A written consent form was taken from all the subjects prior to the study. All the subjects were interviewed and evaluated to understand their work/tasks and demands. Inclusion criteria was individuals in the age group of 20-40 years, participants willing to participate and participants having minimum exposure of 1 year with vibratory tool. Those with Recent trauma to the upper limb, Diabetic neuropathy, Cervical radiculopathy, Congenital deformity of hand, unwilling to participate were excluded.

#### Procedure:

Total of 30 individuals were been taken. The participants were evaluated for vascularity using Allen's test. <sup>(1)</sup> The participants were asked to repeatedly clench the fingers of one hand then the examiner compresses ulnar and radial artery. Then it was been told to open hand. Then the palm and finger should look pale since the blood supply to hand was cut-off. Then the artery should be released and should be checked does normal colour comes back to hand within 5-15 seconds. If normal colour comes back within 5-15 seconds means vascularity of hand is normal. If it does not appear within 5-15 seconds it means vascularity is affected. <sup>(1)</sup>

Then the participants were then evaluated for vibration perception which was also been done in sitting position. In this procedure 128hz tuning fork was used. <sup>(5)</sup> The participants were instructed verbally when they felt vibration and then when they perceived the vibration has stopped. The results were been noted as per the participants verbal command. <sup>(5)</sup>

Then the participants were evaluated for grip strength which was done using dynamometer. <sup>(8)</sup> In this procedure the participant hold the dynamometer in hand being tested with the arm at right angle with the elbow by the side of the body. Adjust the handle of dynamometer as necessary making sure that the base rests on the first metacarpal while the handle rests on middle of 4 fingers.

The patient then squeezes the hand dynamometer with maximum isometric efforts for at least 5 seconds. <sup>(8)</sup> The participant is required to not move any other part of the body and is encouraged to use maximum efforts. 3 readings were been taken and mean of 3 readings were been noted.

Normal range was 40-50kg/wt. in healthy individuals of age group 20-40 years.

Occurrence was studied using formula: -

$$\text{Occurrence} = \frac{\text{No of people in sample with characteristics}}{\text{Total number of people in sample}}$$

#### Materials:

- PEN
- PAPER
- TABLE
- JAMAR DYNAMOMETER
- 128HZ TUNING FORK



#### RESULTS:

A total of 30 samples has been collected for "Occurrence of hand arm vibration syndrome in sugarcane juice vendors".

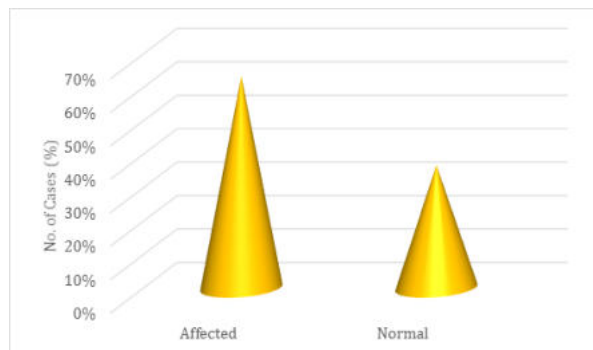
The mean age of collected sample is 30.7, with its standard deviation is 3.05.

The occurrence of our study is 63%.

#### Data Analysis:

##### Distribution of Hand-Arm Vibration Syndrome Based on Grip Strength.

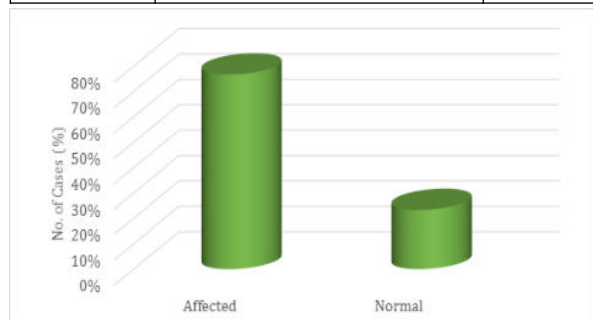
| Grip Strength | No Of Sugarcane Juice Vendors | %   |
|---------------|-------------------------------|-----|
| Affected      | 19                            | 63% |
| Normal        | 11                            | 37% |



Grip strength is reduced in 63% of population.

##### Table 2: Distribution Of Hand-arm Vibration Syndrome Based On Vascularity

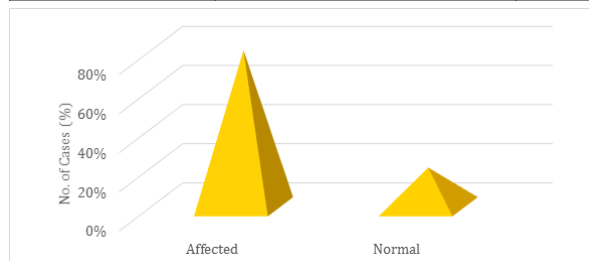
| Vascularity | No of sugarcane juice vendors | %   |
|-------------|-------------------------------|-----|
| Affected    | 23                            | 77% |
| Normal      | 7                             | 23% |



Vascularity is affected in 77% of population.

##### Table 3: Distribution Of Hand-arm Vibration Syndrome Based On Vibration Perception.

| Vibration Perception | No of sugarcane juice vendors | %   |
|----------------------|-------------------------------|-----|
| Affected             | 24                            | 80% |
| Normal               | 6                             | 20% |



Vibration Perception is affected in 80% of population.

#### DISCUSSION:

The study documented that grip strength was reduced in 63% sugarcane juice vendors which may be due to thenar muscle which may undergo necrosis, fibrosis and fiber-type regrouping, indicating that vibratory tools may cause damage to muscles as well as never supply.<sup>(7)</sup>

The study also documented that vibration perception is reduced in 80% of the sugarcane juice vendors which was assessed by tuning fork a two prolonged steel device which vibrates when struck. The absorption of vibration may be associated with tissue shear and bending stresses that may increase in oxidative stress and inflammation which concluded that vibration is affected. Supporting the present study, a study reported by Roh JH<sup>(7)</sup> showed that there is accuracy of vibration syndrome in rock drillers using vibratory tools.

The study states that there are vascular changes in workers working on sugarcane crusher device due to which there is vascularity reduced in 77% sugarcane juice vendors which may be due to affection of large myelinated nerves (A beta) that respond to touch, pressure and vibration exposure. Vascularity was checked using Allen's test.<sup>(2)</sup>

In present study objective instrument like Jamar dynamometer which was found to be highly reliable (0.98) and valid (0.99) for measuring hand grip strength<sup>(6)</sup> tuning fork for vibration perception and Allen's test were used to assess the hand function.

The probable cause in reduction in sensory and vibration perception of hand may be due to chronic micro traumatism and perivascular and peripheral vegetative formation leading to disturbance in tissue tropism and blood supply. It also affects the nerve trunk as well as on the skin receptor apparatus. A study conducted by Buhaug et al<sup>(10)</sup> which used DASH questionnaire to describe the disability in the upper limb of hand arm vibration syndrome patients which is a self-report questionnaire that interprets the affection of the whole upper limb and not particularly the hand. DASH cannot be computed if greater than three items are missing. Hence the objective instruments were used in the present study.

#### CONCLUSION:

It can be concluded that there is decrease in grip strength, vascularity, vibration, and perception in sugarcane juice vendors.

#### Limitations

Small sample size.  
Covid-19 pandemic.

#### Conflicts Of Interest: None

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