

# A Study on Hand Arm Vibration Syndrome in Body Shop Workers in Pune Area

Kavita Gandhi, Tushar Palekar, Ajay Malshikhare

MSK And Hand Conditions , Dr Dy Patil College Of Physiotherapy, Pune, Maharashtra, India

## ABSTRACT

**Background:** Vibration is defined as oscillatory motion. Oscillatory movements involves velocity in the opposite direction alternate velocity in one direction and then a velocity in the opposite direction. This change of velocity means that the object is constantly accelerating, first in one direction and then in the opposite direction. The oscillatory motion from a source, e.g., a vehicle or a tool, may be simple harmonic sine wave or a multiple wave complex differing in frequency and acceleration; or a random non-repeating series of complex waves. The human response of vibration depend on the part of the body that is exposed. There are two broad types of vibrations that workers are exposed to i.e vibration transmitted to the whole body (whole-body vibration or WBV) through a supporting surface, for example, the feet of a standing person or the buttocks of a seated person and vibration applied to a part of the body, i.e. segmental vibration. vibration is applied to the hand, it is called as 'hand-arm vibration' or HAV.

**Objective:** To find out the effect of HAVS on hand of car mechanics using vibration machines. To find how many car mechanics are affected with HAVS .

**Materials And Methods:** Age group:20-40. Only males Work experience of more than 1 years.. Workers using hand arm vibratory tools . Working hours: 8hours per day with 2hrs minimum of vibration exposure. Questionnaire, Jamar., Aesthesiometer were used. Visual analogue scale, Stockholm scale, Quick DASH and Patient Specific Functional Scale. Two point discrimination,. Superficial and deep sensations, Grip strength were assessed.

**Result:** , out of 217 subjects 142 subjects had no discomfort and were working healthily. on the other side 50 subjects had pain in hand while working, 22 subjects suffered from tingling during work and only 3 subjects showed symptom of numbness during work.. 156 doesn't have pain on activity and 181 doesn't have pain on rest. no significant difference is seen in grip strength when compared right and left.. on dash scale 167 subjects had no difficulty , 28 subjects had mild , 3 subjects had moderate and 3 were unable to perform any activity.

**Conclusion:** The study concludes that there is very less prevalence of hand arm vibration syndrome in body shop workers using hand arm vibratory machines in pune area.

**Keywords:** Havs, Body Shop Wokers.

## I. INTRODUCTION

Vibration is defined as oscillatory motion. Oscillatory displacement involves alternate velocity in one direction and then a velocity in the opposite direction. This change of velocity means that the object is

constantly accelerating, first in one direction and then in the opposite direction.<sup>[1]</sup> The oscillatory motion from a source, e.g., a vehicle or a tool, may be simple harmonic sine wave or a multiple wave complex differing in frequency and acceleration; or a random non-repeating series of complex waves.<sup>[2]</sup>

The earliest literature available on health impact of vibration chiefly refers to the miners. The widespread use of jackhammers in the mining industry is a potential source of hazardous vibration affecting limbs in the human body. Jackhammers are used both in opencast and underground mines; and the operators, popularly known as drillers, are regularly exposed to hand-arm vibration (HAV). Vibrating hand tools like hand drills, chipping machine, riveting guns; control systems of modern large drill machines, locomotive handles; and hand-held grinders, scrapers, etc., are other sources of HAV exposure in mines.

Hand-arm vibration syndrome (HAVS) is a disabling clinical condition characterised by a complex of signs and symptoms in the vascular, neurological and musculoskeletal systems of the upper limbs due to prolonged exposure to hand transmitted vibration. The prevalence of HAVS ranged from 5% to more than 80% globally depending on the types of tools, extent of vibration exposure and climatic factors<sup>(4-12)</sup>. The condition is widely recognized in temperate zones due to the presence of its well known clinical feature vibration white finger (VWF) which is now known to be provoked by low ambient temperature<sup>(13-16)</sup>. Its prevalence in warm countries is not well established because VWF does not typically occur and the available literature on HAVS in tropical countries is limited<sup>(17)</sup>. Recent data from South Africa showed that the prevalence of HAVS among gold miners exposed to hand transmitted vibration from rock drills in warm environments was 15%. An overview of epidemiological studies shows that sensorineural disorders tend to appear earlier than vascular disorders and that these disorders develop independently of each other at different rates<sup>(18)</sup>. Neurological and musculoskeletal signs of HAVS are more common than vascular symptoms in tropical countries because the critical ambient temperature for the provocation of VWF is around 15°C<sup>(19)</sup>. The low rate of VWF could explain the low disease prevalence

in tropical countries since the classical diagnosis of HAVS includes VWF.

## II. METHODS AND MATERIAL STUDY

**DESIGN:** cross sectional study

**STUDY SETTING :** place approved by guide and college in pune

**SAMPLING METHOD:** simple random sampling

**TARGET POPULATION:** workers using hand vibration tools

**SAMPLE SIZE:-** 172

### MATERIALS:

- ✓ 1. Questionnaire
- ✓ 2. Jamar
- ✓ 3. Aesthesiometer

4. Scales: Stockholm scale, Patient specific functional Scale and Quick DASH scale

5. Cotton , needle , thermometer , thermos , goniometer test tube , weights and different shape object

### INCLUSION CRITERIA:

1. Age group: 20-40
2. Only males
3. Work experience of more than 1 years
4. Workers using hand arm vibratory tools
5. Working hours: 8 hours per day with 2 hrs minimum of vibration exposure

### EXCLUSION CRITERIA:

1. Workers having whole body vibration
2. Recent upper limb fracture, any pathological condition or already diagnosed condition of upper limb and cervical spine.

### ➤ OUTCOME MEASURE:

1. Visual analogue scale
2. Stockholm scale

3. Quick DASH and Patient Specific Functional Scale
4. Two point discrimination
5. Superficial and deep sensations
6. Grip strength

### III. RESULTS AND DISCUSSION

The study was carried out in pune area in garages on 217 body shop workers using vibratory machines. This study was to find out the prevalence of hand arm vibration syndrome in body shop workers.

This study shows that prevalence of hand arm vibration syndrome in workers using hand arm vibratory equipment is very low. The diagnostic criteria used is occurrence of symptoms in all three components of the hand (vascular, neurological and musculoskeletal). ) as there is no gold standard diagnostic criteria. The prevalence is found to be low in this study as the vascular component is not found predominantly in pune area. Previous studies in tropical countries such as Papua New Guinea, Indonesia, India and Vietnam did not report VWF among vibration exposed workers which supports the result. According to a review report the clinical features of HAVS in tropical countries differ from those in temperate countries. Vibration white finger was not seen in studies conducted in pune area. . Rather, the more prevalent condition, which was consistent across all reviewed studies, was finger tingling and numbness, this study shows very less prevalence for tingling and numbness in topical areas like pune india.

This study does not show prevalence of HAVS in body shop workers as their working hours are less as compared to other countries , also the number of years of experience are less . Therefore the exposure to the vibrations is less for the occurrence of HAVS. Reviewed studies shows that prevalence of HAVS is

more in jack hammer user as compared to drillers and tile cutters. The prevalence is more in jack hammer users as the frequency of vibration per minute is more than body shop workers. Kakosy T et al did a study on Hand arm vibration syndrome in foundry workers and found that using chipping hammers in foundry is one of the most dangerous hand arm vibration exposure in Hungary. The prevalence rate of HAVS is high in them. Makoto F et al did a study on rock drill operators and found that 5-10% suffer from HAVS. Also reports from Canada, Europe, Korea and America suggest that prevalence ranges from 12.5 – 30% in drillers. Bovenzi et al in 1998 surveyed stone cutters and found prevalence of HAVS 35.5% in them. But here the above results does not support this study as the working material is different , the frequency and vibration per minute is different. So the results in this study vary with all the studies.

The study does not show presence of neural and vascular symptoms by using Stockholm workshop scale in body shop workers using hand arm vibration syndrome. The abnormalities result in numbness sensations and tingling in the fingers which is present even when not exposed to the cold.

That is why neural symptoms are more common than vascular symptoms (McGeoch and Gilmour 2000; Palmer et al. 2001; Strömberg et al. 1996). Neurological symptoms also have a shorter latency period than vascular symptoms (Pelmeare and Leong 2000) and recovery, if achieved, takes longer (Futatsuka et al. 1985; Pelmeare and Leong 2000). Neurological symptoms are often the reason why persons exposed to vibration seek medical care, change jobs or quit work altogether (Lundborg 1994). Ting Anselm et al also did a study on HAVS among group of construction workers in Malaysia in which they found that neurological symptoms are more prevalent than vascular symptoms.

The study shows that workers complain of pain during activity and also at rest. Vibrations from a hand-held vibrating tool are transferred to the hand where they may have a negative influence on mechanoreceptors, nerve fibres, blood vessels and muscles. In the nerves, an intraneural oedema may occur and myelin sheaths as well as nerve fibres may be damaged. High frequency vibrations may exert their effect distally in the fingers while low frequency vibrations may be transmitted proximally in the arm. In muscle tissue there may be degenerative as well as regenerative cellular changes causing pain<sup>(64)</sup>. The vibratory effect causes symptoms in vessels, nerves, muscles and joints which can result in weakness, clumsiness, pain and loss of hand coordination as stated by Futatsuka and Oka 2001; Haines et al. 2000; Åkesson et al. 1995. Discomfort and pain in upper limb is a frequent complaint in workers.

The study also shows normal grip strength in workers. This may be because of the break patterns taken by the body shop workers during work. Or the type of tools they use or the way of pattern of work. The other reason may be less repetitive strain and number of years of experience. Decreased grip strength was reported over 30 years ago by Farkkila in workers with high exposure to hand-arm vibration and this was confirmed in subsequent studies although not all studies have shown consistent findings.

The study shows that the two point discrimination in all fingers of both hands shows significant result statistically. Right hand two point discrimination value is more as compared to the left hand. The reason behind this being that all workers in this study were right hand dominant only 3 being left hand dominant. The reason being the effect of electrical vibration altering the sensation pathway. When we touch an item or a texture, the sensory impulses from the hand are transmitted to the brain. The act of touch is controlled by the hand but the perception of sensation is processed in the brain. The sensory impulses are transmitted via nerve trunks in the hand and brain to the spinal cord, and via the long nervous

pathways in the cord, they reach the sensory cortex of the brain. Also in brain cortex there may be functional reorganizations resulting in overlapping of cortical areas corresponding to individual fingers.

The study shows that there is affection of ADL's in very few body shop workers. The reason being they show pain on activity as well as rest as per VAS score. The medical consequences of HAVS have been thoroughly described, but the social consequences have seldom been studied, with the exception of a study by Haines, which showed that HAVS affects sleep and social life (Haines et al. 2000). Cederlund found a decrease in the quality of life, which included everyday activities, subjective well-being and symptoms of ill health among vibration injured men (Cederlund et al. 1999). The everyday activities that were most difficult to perform were e.g. being outdoors in cold weather, working with vibrating machines, lifting and carrying objects, writing by hand and picking up small items

#### IV. CONCLUSION

The study concludes that there is very less prevalence of hand arm vibration syndrome in body shop workers using hand arm vibratory machines in pune area.

#### V. REFERENCES

- [1]. Griffin MJ Encyclopedia of occupational Safety and Health, 4th ed Geneva: ILO; 1998p50.2-12
- [2]. Palmear PVibration (Hand Arm and Whole Body) Hunters' diseases of occupation 9th ed Arnold: London; 2000p307
- [3]. Mandal BB, et al.: Risk from vibration in Indian mines; Indian Journal of Occupational and Environmental Medicine - August 2006 - Volume 10 - Issue 2
- [4]. Raynaud M Local Asphyxia and symmetrical Gangrene of the extremities (MD Thesis, Paris, 1862) In: Selected Monographs, New Sydenham Society: London; 1888

- [5]. Hamilton AE. Effect of Air hammers on the hands of stone cutters. *Industrial HygSet Bull* 236, No19. Bureau of Labour Statistics: Washington DC, US; 1918. p1-4
- [6]. Palmear PL. Clinical picture (vascular, neurological and musculoskeletal). *Hand-arm vibration: A comprehensive guide for occupational health professionals* 2nd ed. OEM Press: Beverly Farms, MA; 1998. p27- 55
- [7]. Dias B, Sampson E. Hand arm vibration syndrome: Health effects and mitigation. *IOHA: Pilanesberg, South Africa*; 2005. pB1-4
- [8]. Donald WW, Wasserman. Occupational Vibration: Are you at risk? Quest Technologies special report. Quest Technologies: Oconomowoc, WI 53066; 2005. p2
- [9]. Dasgupta AK, Harrison J. Effects of vibration on the hand-arm system of miners in India. *Occup Med* 1996;46:71-8
- [10]. Liss GM, Stock SR. Can Dupuytren's contracture be work-related? Review of the evidence. *Am J Ind Med* 1996;29:521-32
- [11]. Thomas PR, Clarke DV. Vibration white finger and Dupuytren's contracture: Are they related? *Occup Med* 1992;42:155-8
- [12]. Center for Disease Control. Criteria for a recommended standard: occupational exposure to hand-arm vibration. Cincinnati: US Department of Health and Human Services (DHHS), Public Health Service, 1989