Original Article

Upper extremity and neck disability in male hairdressers with concurrent changes in pinch strength: an observational study

Abhishek Kaushik[1], Prosenjit Patra[2]
[1]Physiotherapist,Dolphin (P.G) Institute of Biomedical & Natural Sciences,Dehradun Uttrakhand,India, [2]Asstt Prof &HOD, Physioherapy,Dolphin (P.G) Institute of Biomedical & Natural Sciences,Dehradun Uttrakhand,India
Correspondance to Prosenjit Patra, email id: pro.pats@gmail.com

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Abstract:
Background: Hair-stylists and barbers face the risk of musculoskeletal disorders (MSDs) due to awkward postures, repetition, and static loading combined with the high customer turnover.
Study Objectives: The purpose of the study was to assess upper extremity and neck disability in male hairdressers. And to study the relationship of pinch strength with duration of exposure.
Methodology:A total of 59 subjects were recruited from various salons in and around Bihar and Dehradunfor the study on the basis of inclusion and exclusion criteria after signing the informed consent form**.**
Outcome measures: Disabilitywas measured by Neck Pain Disability Index (ICC = 0.68) and Disability of Arm, Shoulder, HandQuestionnaire (ICC=.92) Pinch Strength was measured by Pinch Gauge.
Results: There was increasing disability with increase in age and increase in work experience. Pinch Strength was affected with increasing disability and because of repetitive work by hand and wrist.
Conclusions: It can be concluded that awkward neck posture and repetitive work done by upper extremity exacerbates degenerative changes and increases risk of disability in hairdressers with increase in age and experience. In addition there is also a loss of pinch strength on the dominant side with increase in age and experience.

KEY-WORDS: Hairdressers, Pinch Strength, Neck Pain Disability, Disability of arm, shoulder and hand.

Introduction

The US Department of Labor defines work-related musculoskeletal disorders (WMSDs) as injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs associated with exposure to risk factors in the workplace. WMSDs do not include disorders caused by slips, trips, falls, motor vehicle accidents, or similar accidents.[1]Most hairstylists who have been practicing for 5-10 years, complain of pain or numbness in the upper extremities—the hand, wrist, and shoulder. As is usually the case with ergonomic risk, some of the cause can be seen as equipment-related, while a portion may be attributed to personal technique.[2]Typical postural issues in hairdressers include excessive shoulder flexion and shoulder abduction, often caused by working with the elbow at or greater than shoulder height, trunk flexion (bending forward at the waist) because the chair may not be at the proper height for the hairdresser,forward neck flexion which is considered excessive if the angle of flexion is more than 20°. Wrist deviation using scissors or hand shears. Awkward wrist postures include radial deviation (to the thumb side) and ulnar deviation (to the little finger side), extension (wrist bent up), flexion (wrist bent down), pronation (palm down), and supination (palm up)A survey on Brazilian hairdressers done to verify the prevalence of WMRDs in hairdressers through

symptoms stated that the prevalence of WRMDs was 71%. Risk factors were associated with psychosocial factors and factors related to discomfort and work fatigue such as lack of acknowledgement of work and uncomfortable posture at work, not feeling comfortable with body/neck/shoulders while working.[3] A study to investigate the risk factors of WMSDs for hairdressers by identifying the body regions associated with significant discomfort showed that 91.7% of subjects reported shoulder discomfort as the most frequent problem followed by discomfort in the lower back (83.3%) and in the neck region (75%).[4] Hairdressers are also exposed to a variety of hazards in thework place .These include chemical agents (products for hair), physical agents (noise, temperature) and ergonomic hazards (inappropriate posture during work, demands for service quality, long work hours without breaks, etc.).[5]If muscle is fatigued repeatedly without sufficient recovery being allowed for, muscle disorders are likely to occur. If there is occurrence of damage daily, long-lasting impairment can develop due to work activity, the capacity of the muscle may be insufficient to repair the damage as fast as it occurs.[6]The ability to grip and manipulate objects is essential in performing various activities of daily living. Assessment of hand strength has proved to be reliable and valid as an objective parameter to evaluate the functional integrity of the hand as part of the musculoskeletal system. [7]

According to onsite observations, hairdressers used their non-dominant hands to comb, hold hair with their fingers and wave/curl hair while cutting and/or blow-drying.Musculoskeletal symptoms of hairdresser are highly prevalent, and associated with job strain and their health habits. A high prevalence of work-related musculoskeletal disorders has been recorded among workers who are exposed to manual labor, work in unusual and restricted postures, repetitive and static work, vibrations, and poor psychological and social conditions.[8]The activity of professionals working in salons is one of the least studied in occupational health.

Objectives of study

1. To assess upper extremity and neck disability in male hairdressers.
2. To study relationship of upper extremity and neck disability with duration of exposure.
3. To study relationship of pinch strength with duration of exposure

Material &Methods

Study Design: Cross Sectional Observational Study

Type Of Sampling: Convenient Sampling

Study Duration: 3 months

Protocol:

59 participants were selected from various salons in Patna and Dehradun according to the inclusion and exclusion criteria. Participants selected were informed about the purpose and procedure of the study. The subjects signed an informed a consent form, following which Nordic pain questionnaire was administered for assessment of pain and discomfort. Then the participants' responses to Neck Pain Disability Index(NPDI) andDisability of Arm, Shoulder, Hand Questionnaire(DASH) was recorded to check the progression of disability[25,26]. After that pinch strength was measured.

Instrumentation:

The Neck Pain Disability Index (NPDI) is a 10-item quesionnaire that measures a patient's self-reported neck pain related disability. Each question is measured on a scale from 0 (no disability) to 5, and an overall score out of 100 is calculated by adding each item score together and multiplying it by two. A higher NDI score means the greater a patient's perceived disability due to neck pain.[25]

The Disabilities Of The Arm, Shoulder And Hand (DASH) questionnaire

is a self-administered region-specific outcome instrument developed as a measure of selfratedupper extremity disability and symptoms. The DASH consists mainly of a 30itemdisability/symptomscale, scored 0 (no disability) to 100.[26].The other tools used included a

Pinch Guage, Digital Camera , Pen and paper

Subjects with the following criteria were included age- 20 to 35 years, Minimum 70 haircut in a week,minimum experience of 2 years.

Subjects were excluded in the presence of any.musculoskeletal deformity, range of motion deficit and neurological disorders that affect neck and upper limb function. Hairdressers using adjustable chairs were also excluded.

Procedure:

Pre-participation data [i.e. Age, Sex, years of experience, job nature, and hand dominance] were collected from all the selected subjects.In order to assess physical exposure to musculoskeletal risk, Nordic pain questionnaire for area of pain assessment, neck pain disability index and disability of arm,shoulder,hand questionnaire were used. Following the questionnaire survey, pinch strength was checked by pinch gauge.

Measurement Of Pinch Strength:

The subjects were seated with their shoulder adducted and neutrally rotated, elbow flexed at 90 degree, forearm in neutral position and wrist between 0-30 degree of dorsiflexion and between 0 and 15 degree of ulnar deviation. The pinch gauge was held by the examiner at the distal end to prevent dropping.[9]The subjects were then asked to press the pinch meter increasing theforce moderately to avoid muscle fatigue. A rest period of 15 seconds were given to alternate hands and to record the score .Tip, key and palmer pinch measurements were recorded.

Data analysis:

- Data analysis was done by using SPSS 16.0 version.
- Descriptive analysis was done to check the mean for NPDI, DASH, Pinch Strength values.
- Karl Pearson's test was used to find correlation between NPDI, DASH and Pinch Strength values.
- Results were obtained by using 0.05 level of significance.

Results

The mean and standard deviation of age, weight, and height was calculated. (Table 1),there was a positive correlation of both DASH and NPDI with experience (Table 2).

Table 1: Demographic data of Participants

	MEAN	SD
Age (Yrs)	30.72	3.94386
Ht(Cm)	5.53	0.19725
WT(Kg)	61.83	4.73054

Table 2: Correlation between Work Experience , DASH and NPDI scores

Variable	MEAN	SD	R	P
Work Exp	8.8136	4.15009	.774	.000
DASH Score	17.559	17.12759		
NPDI scores	18.017	17.68351	.698	.000

Table 3: Group Comparison for DASH Score

Work Exp	N	MEAN	SD	F	P
0-5 Yrs	17	.0000*	.00000*	29.1	.00
6-9 Yrs	17	14.941	12.43347		
10-14 Yrs	9	29.105	10.93869		
>15 Yrs	6	38.167	4.49073		

When DASH and NPDI scores are grouped according to years of experiance 0-5,6-9,10-14 and more than 15,analysis revealed a increase in scores with age and also a statistical significant difference between the groups (table 3and 4).

Table 4: Group Comparison for NPDI Score
*none of the participants with 0-5 years of experience complained of pain or disability

Work Exp	N	MEAN	SD	F	P
0-5 Yrs	17	.0000*	.00000*	23.121	.000
6-9 Yrs	17	16.588	18.51708		
10-14 Yrs	9	29.684	11.62876		
>15 Yrs	6	36.167	4.49073		

Table 5: : Group Comparison for pinch strength dominant side

Work Exp	N	MEAN mm Hg	SD	F	P
0-5 Yrs	17	17.529	1.28051	19.4	.00
6-9 Yrs	17	16.235	2.10741		
10-14Yrs	9	13.421	2.43392		
>15 Yrs	6	12.167	1.32916		

Table 6: Group Comparison for pinch strength Non dominant side

Work Exp	N	MEAN mm Hg	SD	F	P
0-5 Yrs	17	16.882	.99262	1.51	.22
6-9 Yrs	17	16.118	1.53632		
10-15 Yrs	9	16.842	1.46299		
>15 Yrs	6	17.167	.98319		

Table 7: Correlation between work experience and pinch strength dominant side

Variable	MEAN	SD	R	P
Work Exp (yrs)	8.8136	4.15009	-.675	.000
Pinch Strength(mmHg)	15.237	2.68674		

Similarly when pinch strength on dominant side are grouped according to years of experiance,analysis revealed a progressive decrease in strength with age and also a statistically significant difference between the groups (table 5).But on the non dominent side there was no statistically significant difference (table 6).Further on the dominant side a negative corelation was found between grip strength and years of experiance (table 7) while on the non dominant side no such corelation was found (table 8). Lastly comparison of pinch strength on the dominant and non dominant side revealed higher values on the non dominant side which was statistically significant (table 9).

Table 8: Correlation between work experience and pinch strength non dominant side

Variable	MEAN	SD	R	P
Work Exp (yrs)	8.8136	4.15009	.191	.148
Pinch Strength(mmHg)	16.661	1.33404		

Table 9: Comparison of Pinch Strength on dominant and non dominant side

Variable	MEAN mm Hg	SD	T	P
Dominant	15.237	2.68674	-3.890	.000
Non dominant	16.661	1.33404		

Discussion

The present study was done to assess the level of disability in male hairdressers. Out of 59 hairdressers 61%had minimal disability. of shoulder, arm and hand.17% had mild disability,19% had mild to moderate disability, only 3% showed moderate to severe disability(Fig 1). While in case of NPDI,61% had minimal disability,17% had mild disability,19%had moderate disability, only 3%showed more disability (Fig2s).We also found positive correlation between years of work experience and level of disability.

This is in agreement with available literature[10] which indicates that hairdressers are at risk of cumulativetrauma. It has long been recognized that workers with predominantly repetitive work tasks, or those maintaining fixed postures for long periods, have increased risk of developing work related musculoskeletal illness.

In 2009, a study by Jens wahlstrom on Upper Arm Postures and Movements in

Female Hairdressers, showed that Hairdressers may be at risk of developing musculoskeletal disorders in the neck and shoulders due to a considerable occurrence of highly elevated arms, especially during customer tasks.[11]

Hairdressers reported significantly higher level of musculoskeletal problems including work related shoulder pain, work related shoulder and wrist pain, work related upper back pain, work related lower back pain.[12]

Working with the upper arms elevated is considered a generic risk factor for neck/shoulder disorders and symptoms, as well as for rotator cuff tendonitis [13,14,15]Studies[16] have shown high degree of neck shoulder pain in hairdressers. Previous studies have already established the various risks for cumulative trauma disorder such as forceful exertion and mechanical stress for long period. High repetitive work may be regarded as causative factor for the occurrence of cumulative trauma disorders. In workers who are exposed to repetitive work for a long time the occurrence of cumulative trauma disorders had found to be very high[16]

The repetitive stereotyped work is typically performed on nonadjustable workstations and chairs. The task demands and lack of adjustability of the work stations may lead to awkward postures such as cervical and thoracic spine flexion, shoulder elevation and abduction which may result in elevated rates of shoulder and neck pain.[17]

Using tools in the same way over and over again can lead to obvious injuries such as misuse of tools and serious bodily harm but can also cause injury simply by the repetition of movement. Repetitive motion disorder is actually a muscular condition. This muscular condition is caused when motions are repeated over and over again in every day work or every day activities. Repetitive motion disorder is actually umbrella term for a no of specific disorders like CTS, tendinitis, ganglion cyst, bursitis, tenosynovitis, tennis elbow. What actually causes repetitive motion disorder is too many repetition of a motion without interruption or unnatural motions, overexertion, musle fatique,or incorrect posture. The places in the body where we most often see repetitive motion disorder occurring are the shoulder, elbow hand and the wrists. Symptoms of these disorders are intense pain, swelling.numbness; loss of strength, less flexibility, which if untreated can cause permanent damage to muscle, tendons, nerves and ligaments[18.]

A study on Ergonomic Risk Factors for the Wrists of Hairdressers by Hsieh-Chingshow that the average time to finish a woman's haircut (51.4 min) is significantly longer than that for a man's haircut (35.6 min) ($p<0.005$). Female hairstylists had significantly greater EMG activitythan male hairstylists. The non-dominant hands of hairdressers have significantly higher overall wrist velocity than those of barbers. Analytical results suggest that the relatively higher force exertion and wrist velocity of female hairstylists combined with prolonged exposure may account for the higher rate of hand/wrist pain in female hairdressers than in male barbers[19]

Veiersted *etal.* (2008) showed thathairdressers typically worked with their arms elevated at $\geq 60°$ for approximately 13% of totalwork time.[20]

In present study a positive correlation was found between neck pain disability and work experience. The greater the average time per work cycle spent in neck flexion, the greater the association with symptoms in the neck area. A statistically significant association was also obtained from the job analysis describing neck forward flexion and upper arm elevation and neck and neck or shoulder disorders[21]

Harms-Ringdahl found that previously asymptomatic individuals all experienced pain after various periods of

prolonged flexion loading of cervical spine.[22]

In the present study positive correlation was found between work experience and disability of shoulder, arm and hand. National Institute for Occupational Safety and Health(1997).concluded that there was evidence for a relationship between repeated or sustained shoulder postures, with greater than 60 degrees of flexion or abduction and shoulder musculoskeletal disorders.[23] We found decreased pinch strength in dominant hand with increase in experience; this may be explained by cumulative trauma suffered by subjects over the years resulting in increased pain and disability. This is in agreement with a study which showed increased two point discrimination and reduced pinch strength between thumb and index finger and thermal thickening over the thumb.[24] There was a significant increase in pinch strength on the non dominant side when compared to the dominant side, this may be attributed to the fact that hairdressers constantly use the non dominant hand to comb, hold hair with their fingers and wave and curl hair and the concomitant decrease in pinch strength on dominant side due to pain and cumulative trauma.

Limitations

Only upper extremity and neck disability is assessed, only male hairdressers participated in the study, Sample size was small.Future studies could include a larger sample size and focus on other areas of the body which are exposed to high degree of stress in repetative work such as the back.

Conclusion

It can be concluded that awkward neck posture and repetitive work done by upper extremity exacerbates risk of disability in hairdressers with increase in age and experience. In addition there is also a loss of pinch strength on the dominant side with increase in age and experience.

Clinical Significance

Since this study showed there was significant disability in hairdressers because of repetitive work so it is need to screen them more thoroughly for musculoskeletal disorders and adapt appropriate rehabilitation measures including their awareness of proper posture and if possible to develop assistive devices and to modify the workstation.

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