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Musculoskeletal Disorders of Gardening Labour Due To Hand Tools

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ABSTRACT
Hand tools are commonly encountered; and it has caused our daily tasks to be performed with ease and effectiveness. The design of hand tools has a significant influence in the development of upper limb musculoskeletal disorders. By improving the ergonomic properties of hand tools the health of users and their job satisfaction might be positively affected (Kadefors et al., 1993). Hand tools have been ergonomically evaluated extensively by the researchers (Chang et al., 1999; Felloows & Freivalds, 1991). Tool design may play an important role in the development of work related problems in the hand and forearm. By improving the ergonomic properties of hand tool the health of users and their job satisfaction might be positively affected. Hand tools are commonly encountered, and it has caused our daily tasks to be performed with case and effectiveness. The design of hand tools has a significant influence in the development of upper limb musculoskeletal disorder. The designs of basic tool have not changed very much over the past century, which is a matter of concern to improve working condition of the gardening labour. The main aim of present study is to assess the MSD related problem of the gardeners due to hand tools. This cross sectional research study was conducted on 120 sample inclusive 30 gardeners from each park by using multistage random sampling. Data was collected through interview method by using Nordic Musculoskeletal Questionnaire (developed by Dickinson C.E.K., A.F. Foster and S.J. Newman, 2006). The results showed that the large number of gardeners use grass cutter. Consequently, they feel (11.66%) high comfort with grass cutter, (9.16%) moderate comfort with grass cutter and low comfort with shovels. Majority of the gardeners (28.33%) feel ache, pain and discomfort once every day in area d of right hand. Majority of the gardeners (3.33%) feel very uncomfortable in area c and d of left hand when during work with hand tools. And majority of the gardeners (96.66%) feel experiences ache; pain and discomfort slightly interfered in area d of left hand in their ability to work. It was concluded that MSD among the gardeners might be related to the stressful work, proper work-rest schedules and awareness program may be helpful for reducing the MSD and proper handling of hand tools.
Key word– Gardeners, Musculoskeletal Disorder, Hand Tools.

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I. INTRODUCTION

Musculoskeletal problems are a broad umbrella term to include a wide variety of disorders involving the joints and the soft tissues involved in moving those joints. It involves the muscles, ligaments, tendons and joints. The term includes such diverse problems as low back pain, repetitive strain injuries of various sorts and joint injuries. This problem occurs when the body part is called on to work harder, stretch farther, impact more directly or otherwise function at a greater level than it is prepared for. The immediate impact may be minute but when it occurs repeatedly the constant trauma cause damage. People with musculoskeletal pain sometimes complain that their entire bodies ache. Their muscles may feel like they have been pulled or over worked.

Tool design may play an important role in the development of work related problems in the hand and forearm. By improving the ergonomic properties of hand tool the health of users and their job satisfaction might be positively affected (Kadefors et al., 1993). Hand tools are commonly encountered, and it has caused our daily

tasks to be performed with case and effectiveness. The design of hand tools has a significant influence in the development of upper limb musculoskeletal disorder. The designs of basic tool have not changed very much over the past century, which is a matter of concern to improve working condition of the gardening labour.

Many hand tools such as rakes, shovels, pruners are used widely in lawncare operations. While these non–powered tools do not cause major injuries, there is potential for injuries requiring absence from work and/or hospital treatment when they are used improperly. Examples of such injuries from hand tools are bruises, cuts, sprain, back problems and carpal tunnel syndrome.

The US Bureau of Labor Statistics (2006) reported approximately 205,000 wrist, hand and finger injuries that required absence from work in 2006. The rate of these injuries per 10,000 full-time workers in all private industries is approximately 29.6 incidences. Similar information published by the US Consumer Product Safety Commission (CPSU) show nationwide over 28,000 receiving hospital treatment for injuries sustained from the use of hand tools such as rakes and shovels **(University of Calif., 2010).**

A general purpose garden shovel is about 8 – 9 inches wide. Wider blades will have higher capacity; but, they will require considerably more strength during continuous use. If the user is not physically strong, a six inch wide shovel will be ideal.

A garden spade with a flat, sharp edge works well for uses such as cutting out sod, breaking apart crowded root stocks and smoothing off the sides of a trench. A trenching spade works exceptionally well for digging narrow trenches for underground sprinkler or drainage lines. The blade width varies only slightly in spades.

Objective

To assess the MSD (musculoskeletal disorders) related problem of the gardeners due to hand tools.

II. MATERIALS AND METHODS

This study was conducted between the years July 2012 to May 2013 in Lucknow district. Purposive sampling was used to select the Lucknow district. The methodological approach to this study was based on primary data through face to face interview. This study included these four parks din dayal, eco-garden, smiriti upwan and rama bai park. This cross-sectional study was conducted on 120 samples, 30 samples were selected from each park aged between 20-50 above years by using multistage random sampling. Data were collected from December 2012 to February 2013. Research design of study was cross sectional research.

Demographic data of respondents were collect by using self made questionnaire. To assess their hand problems **Cornell Hand Discomfort Questionnaires (CHDQ)** developed by **Dr. Alan Hedge** were used. Data was collected through face to face interview method. Statistical Package and System Software (SPSS) was used in the analysis. The Pearson Chi-square test and F-test were used to test the strength of association between various categorical variables. Simple frequency distribution and cross tabulation were used to facilitate presentation of the findings.

III. RESULTS & DISCUSSION

Table No-1- Hand tools used by the respondents.

S.no	Hand tools	No. of respondent N (%)
1-	Grass cutter	**75 (62.5)**
2-	Knives	51 (42.5)
3-	Harvester	30 (25)
4-	Shovels	56 (46.66)
5-	Scissors	68 (56.66)

(Figures in parenthesis in indicates percentage)

Above table depicts that 62.5 percent gardeners were using grass cutter, 42.5 percent gardeners were using knives, 25 percent gardeners were using harvester, 46.66 percent gardeners were using shovels, 56.66 percent gardeners were using scissors and 43.33 percent gardeners were using khurpi. Above table clearly shows that the majority of the gardeners were using grass cutter.

John M. (2009), found that the they mainly complained about their tools handles (63.2%) and hand grips (78.4%). These two aspects relate to the working position and control on the tool, respectively. Yet, only slightly more than one third of them (36%) mentioned working position as their major concern. The latter response does not reflect the real situation as more women in the group discussion complained of the working position and demanded longer handles that enable them to work more in an upright position.

Table No 2 - Assessment of comfort level according to respondent of hand tools.

		Comfort level			
Sr. no	**Name of hand tools**	**High**	**Moderate**	**Low**	**Total**
1-	Grass cutter	**14 (11.66)**	**11 (9.16)**	7 (5.83)	32 (26.66)
2-	Knives	5 (4.16)	9 (7.5)	11 (9.16)	25 (20.83)
3-	Harvester	6 (5)	9 (7.5)	11 (9.16)	26 (21.66)

4-	Shovels	5 (4.16)	8 (6.66)	**12 (10)**	25 (20.83)
5-	Scissors	4 (3.33)	7 (5.83)	1 (0.83)	12 (10)
6-	Total	34 (28.33)	44 (36.66)	42 (35)	120 (100)

(Figures in parenthesis in indicates percentage)

Above table depicts that the majority of the gardeners (11.66%) feel high comfortable when working with grass cutter, majority of the gardeners (9.16%) feel low comfortable when working with knives, majority of the gardeners (9.16%) feel low comfortable when working with harvester, majority of the gardeners (10%) low comfortable when working with shovels and majority of the gardeners (5.83%) feel moderate comfortable when working with scissors.

Table No 3 - Assessment of experience of ache, pain, discomfort of right hand and left hand according respondents.

S.no	Experience of ache, pain, discomfort	Right hand					Left hand				
		Never	1-2 week	3-4 week	Once every day	Several time	Never	1-2 week	3-4 week	Once every day	Several time
1-	**Area a** 	**8 (6.66)**	40 (33.33)	28 (23.33)	32 (26.66)	**12 (10)**	**8 (6.66)**	42 (35)	31 (25.83)	29 (24.16)	11 (9.16)
2-	**Area b** 	**8 (6.66)**	40 (33.33)	28 (23.33)	32 (26.66)	**12 (10)**	7 (5.83)	42 (35)	31 (25.83)	29 (24.16)	11 (9.16)
3-	**Area c** 	5 (4.16)	40 (33.33)	**31 (25.83)**	32 (26.66)	**12 (10)**	5 (4.16)	41 (34.16)	**34 (28.33)**	29 (24.16)	11 (9.16)
4-	**Area d** 	5 (4.16)	41 (34.16)	30 (25)	**34 (28.33)**	11 (9.16)	5 (4.16)	41 (34.16)	31 (25.83)	**32 (26.66)**	11 (9.16)
5-	**Area e** 	5 (4.16)	**42 (35)**	29 (24.16)	32 (26.66)	**12 (10)**	6 (5)	**43 (35.83)**	31 (25.83)	29 (24.16)	11 (9.16)
6-	**Area f** 	6 (5)	**42 (35)**	28 (23.33)	32 (26.66)	**12 (10)**	7 (5.83)	42 (35)	31 (25.83)	29 (24.16)	11 (9.16)

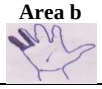
(Figures in parenthesis in indicates percentage)

Above table depicts that the majority of the gardeners (35%) feel ache, pain and discomfort in last 1-2 week in area e and f of right hand and majority of the gardeners (25.83%) feel ache, pain and discomfort in last 3-4 week in area c of right hand and majority of the gardeners (28.33%) feel ache, pain and discomfort once every day in area d of right hand. And majority of the gardeners (35.83%) feel ache, pain and discomfort in last 1-2 week in area e of left hand and majority of the gardeners (28.33%) feel ache, pain and discomfort in last 3-4 week in area c of left hand and majority of the gardeners (26.66%) feel ache, pain and discomfort once every day in area d of left hand.

Gupta D. A.K (1996), found that the soft tissue wasting or the wasting of the small muscles of the hands and fingers by fingers circumference measurements by matched comparison (30 drillers and blasters) revealed that mean circumference of the proximal phalanxes of right index fingers, the left thumb and left ring fingers were thinner than the control population. These findings were completely different from the findings of Pelmear et al., which showed that the mean finger circumference measurements of the proximal phalanges of the index and middle fingers were significantly larger in subjects in nine groups of vibration-exposed population compared to controls.

Barbe F. (2004), found that the hand and wrist WMSD (Work-Related Musculoskeletal Disorders) represent a substantial proportion of work-related illnesses and are associated with relatively high medical costs and loss of work. All of these pathways, either in isolation or in combination, may cause pain, discomfort and/ or loss of function in patients with WMSDs.

Table No 4 - Assessment of uncomfortable level of right hand and left hand according to respondent.

S.no	Uncomfortable feeling	Right hand			Left hand		
		SU	**MU**	**VU**	**SU**	**MU**	**VU**
1-	**Area a** 	**87 (72.5)**	31 (25.83)	2 (1.66)	86 (11.66)	33 (27.55)	1 (0.83)
2-	**Area b** 	85 (70.83)	**33 (27.55)**	2 (1.66)	83 (69.16)	**36 (30)**	1 (0.83)
3-	**Area c** 	84 (70)	**33 (27.55)**	2 (1.66)	83 (69.16)	33 (27.55)	**4 (3.33)**
4-	**Area d** 	84 (70)	**33 (27.55)**	**3 (2.5)**	83 (69.16)	33 (27.55)	**4 (3.33)**
5-	**Area e** 	85 (70.83)	32 (26.66)	2 (1.66)	**85 (70.83)**	34 (28.33)	1 (0.83)
6-	**Area f** 	**87 (72.5)**	31 (25.83)	2 (1.66)	86 (11.66)	33 (27.55)	1 (0.83)

(Figures in parenthesis in indicates percentage)
SU- Slightly uncomfortable, **MU**- Moderate uncomfortable, **VU-** Very uncomfortable

Above table depicts that the majority of the gardeners (72.5%) feel slightly uncomfortable in area a and f of right hand, majority of the gardeners (27.55%) feel moderate uncomfortable in area b, c, d of right hand, area c of right hand feel (2.5%) very uncomfortable during work with hand tools, and majority of the gardeners (70.83%) feel slightly uncomfortable in area e of left hand, majority of the gardeners (30%) feel moderate uncomfortable in area b of left hand, and majority of the gardeners (3.33%) feel very uncomfortable in area c and d of left hand when during work with hand tools.

Table No 5 - Assessment of discomfort level interferes in ability of work of right hand and left hand according to respondent.

S.no	Interfere with your ability to work	Right hand			Left-hand		
		Not at all	**Slightly interfered**	**Substantially-interfered**	**Not at all**	**Slightly interfered**	**Substantially-interfered**
1-	**Area a** 	5 (4.16)	**115 (95.83)**	---	**6 (5)**	114 (95)	---
2-	**Area b** 	**6 (5)**	113 (94.16)	1 (0.83)	**6 (5)**	114 (95)	---
3-	**Area c** 	4 (3.33)	**115 (95.83)**	1 (0.83)	4 (3.33)	115 (95.83)	1 (0.83)
4-	**Area d** 	**6 (5)**	113 (94.16)	1 (0.83)	3 (2.5)	**116 (96.66)**	1 (0.83)
5-	**Area e** 	**6 (5)**	113 (94.16)	1 (0.83)	**6 (5)**	114 (95)	----
6-	**Area f** 	5 (4.16)	**115 (95.83)**	---	**6 (5)**	113 (94.16)	1 (0.83)

(Figures in parenthesis in indicates percentage)

The above table reveals that the majority of the gardeners (95.83%) feel experiences ache; pain and discomfort slightly interfered in area a, c, and f of right hand in their ability to work and majority of the gardeners (0.83%) feel experiences ache; pain and discomfort substantially interfered in area b, c, d, and e of right hand in their ability to work. And majority of the gardeners (96.66%) feel experiences ache; pain and discomfort slightly interfered in area d of left hand in their ability to work.

IV. CONCLUSION

It was concluded that the maximum gardeners (62.5%) use grass cutter and 56.66 percent gardeners use scissor some of the gardeners (25%) use harvester hand tool. Majority of the gardeners (11.66%) reported that they feel high comfort with grass cutter, they (9.16%) feel moderate comfort with grass cutter and they (10%) feel low comfort and face many problems with shovels.

It can conclude from the study the health of the gardeners was highly affected by different awkward postures and they suffer from shoulder-related discomfort primarily affecting the low back region. Moreover, they have to work for a prolong period of time remaining in such gardening and awkward posture, which further amplifies their discomfort feeling.

Gardeners work in unfavorable working condition with the high stress of occupation. It was concluded that musculoskeletal disorders (MSD) among the gardeners might be due to the stressful work posture. Proper training of better posture, well designed tools and proper work schedules may help the gardeners work comfortable, safe and efficient.

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