Archives of Current Research International

Volume 25, Issue 1, Page 151-158, 2025; Article no.ACRI.129370
ISSN: 2454-7077

Musculoskeletal Discomfort Faced by Workers in Cauliflower Production Through Traditional or Conventional Method

Reena Solanki [a++*], Manju Mehta [a#] and Anju Khichar [b++]

[a] Resource Management and Consumer Science, COCS, HAU, Hisar, India.
[b] Extension Education and Communication Management, COCS, HAU, Hisar, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/acri/2025/v25i11046

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/129370

Original Research Article

Received: 16/11/2024
Accepted: 18/01/2025
Published: 23/01/2025

ABSTRACT

This study was conducted with an aim to analyze the musculoskeletal discomfort faced by the workers while performing different activities through traditional/conventional method. For the field survey,30 healthy workers were selected. The musculoskeletal discomfort was evaluated through human body map, VAD scale and pain symptoms. The results revealed that out of different activities involved in cauliflower production, hands suffered the intensity of musculoskeletal discomfort with weighted mean score of 3.8 followed by thigh (3.6), neck (3.5), lower back (3.4) got rank I with mean score of 35.7 in transplantation activity. The least intensity of musculoskeletal

[++] Ph.D. Research Scholar;
[#] Professor;
**Corresponding author: Email: reenasolanki911@gmail.com, gauravsolanki007@yahoo.co.in;*

Cite as: *Solanki, Reena, Manju Mehta, and Anju Khichar. 2025. "Musculoskeletal Discomfort Faced by Workers in Cauliflower Production Through Traditional or Conventional Method". Archives of Current Research International 25 (1):151-58. https://doi.org/10.9734/acri/2025/v25i11046.*

discomfort was found in manure and fertilizers spreading activities. According to VAD scores, majority of the respondents faced highest discomfort in transplanting activity, which had a scored rank I with score of 8.2. And also indicated that pain symptom perceived rating scale by workers involved in transplanting activity got Ist rank with score of 5.1.

Keywords: Pain symptoms; quality of life; heavy lifting; musculoskeletal discomfort.

1. INTRODUCTION

Pain, stiffness or discomfort in the muscles, bones, joints, tendons, ligaments and other connective issues leads to musculoskeletal discomfort. It is an major issue that can significantly impact on person quality of life. It can exist in two forms: short term (acute) and long term (chronic). Falls, sports activities, accidents or overexertion sprains, strains, fractures and dislocations are the common cause of musculoskeletal discomfort. Repetitive movements or postures, especially in the workplace or during certain physical activities for a longer period in any type of occupation can lead to conditions like carpal tunnel syndrome, tendonitis and bursitis. Longer duration of activities like heavy lifting, long distance running or any type of vigorous exercise without proper rest push the muscles and joints beyond their normal limits can lead to discomfort. In addition, poor posture could affect the neck, shoulders, lower back and hips contributing to conditions like muscle strain, tension headaches and chronic back pain (Hou and Shiao, 2006; Sethi et al., 2011; Shariat et al., 2016). According to increasing age, our musculoskeletal system undergoes changes. Bone density decreases and muscles lose strength and flexibility. These type of changes in the body more susceptible to discomfort, osteoporosis and arthritis. Sometimes sedentary workstyle can weaken muscles and reduce joint flexibility and contributing to musculoskeletal discomfort. Major symptoms of musculoskeletal discomfort are pain, stiffness, stress, anxiety and depression, inflammation in joints and pain, feeling of fatigue in muscles and reduced range of motion.

In India, agriculture sector is considered as laborious industry because it is a time consuming activity. In this sector, constantly awkward posture for longer duration and repetitive nature of task leads to musculoskeletal disorders in farm workers, which affects their daily activities of life. Under this, cauliflower production is also included. Most of the activities in cauliflower production are done by conventional or traditional method which involves more physical effort such as land preparation, transplanting, weeding and harvesting etc. According to Saha and Lama (2024), workers report high incidence of pain in various body parts especially in shoulders, back, wrists and hands due to repetitive motions and adoption of uncomfortable postures in different activities like transplanting, weeding, threshing, cutting and carrying. To mitigate the problem of musculoskeletal discomfort, early intervention, proper ergonomics, healthy lifestyle habits and regular exercise is the right method. Therefore, the present research was conducted to analyze the highest musculoskeletal discomfort in different body parts which is caused due to cauliflower production.

2. METHODOLOGY

A sample size of 30 healthy workers was randomly selected from Hisar district in Haryana for experimental work with average height, weight and body mass index of 159cm, 64.2Kg and 21.8Kg/m² respectively. Moreover, these workers had good health status in terms of body temperature, blood pressure, pulse rate, pulse pressure and mean pressure.

Human body map: Body part discomfort score is obtained through Human body map given by Corlett and Bishop, 1976. A 5- point continuum ranging from 1-5 i.e. very light exertion (1), light exertion (2), moderate to heavy exertion (3), heavy exertion (4) and very heavy exertion (5) and after performing the activities involved in cauliflower production, respondents were asked to indicate discomfort in different body parts as shown in Fig. 1.

Visual analogue discomfort: A ten point rating scale is mentioned by Corlett and Bishop in 1976 as given in Table 1 was used to assess the overall discomfort in which 0 represents no discomfort and 10 represents the highest discomfort.

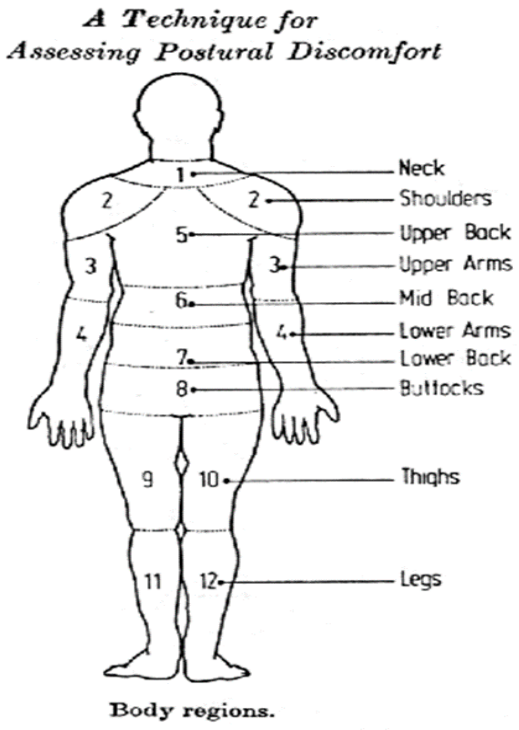

Fig. 1. Human body map

Table 1. VAD Scale

0	1	2	3	4	5	6	7	8	9	10
No discomfort										**Highest discomfort**

Table 2. AICRP 2013 scoresheet

Activities	Pain symptoms					
	Itching	**Burning**	**Numbness**	**Stiffness**	**Swelling**	**Pain**
	1	2	3	4	5	6

Pain symptoms: AICRP 2013 scoresheet was used to analyze the symptoms of pain in various body regions during cauliflower production activities as indicated in Table 2.

3. RESEARCH FINDINGS AND DISCUSSION

Intensity of musculoskeletal pain experienced by workers based on Human Body Map: The intensity of musculoskeletal pain experienced by cauliflower production workers based on human body map was presented in Table 3.

The highest intensity of musculoskeletal discomfort was reported in land preparation at three body parts such as upper back, lower back and wrist with weighted mean score (3.6), followed by hands (3.5), neck (3.2), shoulders (3.2), upper arm (3.2) and lower arm (3.0).

For the activity of nursery raising, maximum intensity of musculoskeletal discomfort in wrist, neck, lower back and hands with weighted mean score of 3.6, 3.5, 3.4 and 3.3 followed by same weighted mean score (3.2) in upper back, upper arm and lower arm and in shoulder it was 3.1.

Most of the workers faced significant pain in their hands in irrigation with weighted mean score 3.4 followed by lower back and wrists, both with a score of 3.3 and discomfort was also noted in feet (3.2), shoulders (3.1), upper back (3.1), lower arm (3.0) and upper arm (3.0).

Table 3. Intensity of musculoskeletal pain experienced by workers based on human body map

Activities	Neck	Shoulder	Upper back	Upper arm	Lower back	Lower arm	Buttock	Wrist	Hands	Thigh	Feet	Total	Rank
Land Preparation	3.2	3.2	3.6	3.2	3.6	3	2.8	3.6	3.5	2.2	2.7	34.6	III
Nursery Raising	3.5	3.1	3.2	3.2	3.4	3.2	2.7	3.6	3.3	1.6	2.6	33.4	VI
Irrigation	2.8	3.1	3.1	3	3.3	3	2.7	3.3	3.4	1.8	3.2	32.7	VII
Spreading of manure and fertilizers	3.2	2.9	3.2	3.3	3	2.7	3.3	3.4	2.8	1.2	3.2	32.2	VIII
Transplanting	3.5	3.1	3.2	3.2	3.4	3.2	2.7	2.9	3.8	3.6	3.1	35.7	I
Insect Pest Management	3.5	3.1	3.2	3.2	3.4	3.2	2.7	2.9	2.8	2.4	3.1	33.5	V
Weeding	2.9	2.6	2.6	2.8	3.2	3.2	3.9	3.1	3.6	2.6	3.2	33.7	IV
Harvesting	3.5	3.1	3.2	3.2	3.4	3.2	2.7	2.9	3.8	3.4	3.1	35.5	II
Handling and Transportation	3.2	3.6	3	2.8	3/6	3.1	2.8	3.4	2.7	3.3	3.1	34.6	III

During spreading of manure and fertilizers, maximum intensity of musculoskeletal discomfort in wrist (WMS-3.4), buttock (WMS-3.3), upper arm (WMS-3.3) followed by neck, upper back, feet, all having a same weighted score of 3.2 and in lower back it was 3.0.

In transplanting activity, the highest intensity of musculoskeletal discomfort was found in their hands with WMS-3.8 followed by thigh (3.6), neck (3.5), lower back (3.4), upper back (3.2), upper arm (3.2), shoulder (3.1) and feet (3.1).

For the activity of insect pest management, the maximum intensity of musculoskeletal discomfort was in neck and lower back with weighted mean score of 3.5 and 3.4 followed by upper back, upper arm, lower arm, all having a same weighted score of 3.2 and in shoulder and feet it was 3.1.

The maximum intensity of musculoskeletal discomfort in weeding was highest in buttock and thigh with weighted mean score of 3.9 and 3.6 followed by lower back, lower arm, feet all having a same weighted mean score of 3.2 and in wrist it was 3.

During harvesting, maximum intensity of musculoskeletal discomfort was observed in hands with weighted mean score of 3.8 followed by neck (3.5), lower back (3.4), thigh (3.4), upper back (3.2), upper arm (3.2), lower arm (3.2), shoulder (3.1), and feet (3.1).

Most of the workers facing intensity of pain in hands (WMS-3.4), lower back (WMS-3.3), wrist (WMS-3.3) followed by feet (WMS-3.2), shoulder (WMS-3.2), upper back (WMS-3.1), lower arm(WMS-3.0) and upper arm (WMS-3.0) in handling and transportation.Results in accordance to Gupta and Sharma (2017) highlighted that severe pain was reported in the lower back by 66.7 percent of respondents followed by upper back (46.7%), and same was in fingers and feet (43%).Rani et al.(2020) also identified that level of discomfort in specific body part was highest in lower back with mean score 3.74 followed by moderate in upper back with mean score 2.76 and light was in head with mean score 1.40 during grain collection.Similarly Varghese and Panicker (2022) also reported that the frequency of highest discomfort were identified in lower back with maximum percent of 74%,in shoulder it was found in 63% and in wrist/hand it was identified as 62% followed by other body parts.

Correlation between independent variable and discomfort in different body parts of workers in cauliflower production: Table 4 displayed correlation between different independent parameters (work duration and body weight) of workers and discomfort in body parts. It was found that neck was significantly correlated with duration of work and weight of the body (r = 0.865, r = 0.761). Upper arm was significantly correlated with body weight (r = 0.672). Discomfort in lower back, hands and thigh was significantly correlated with duration of work (r = 0.661, r = 0.774 and r = 0.855) and weight of the body (r = 0.946, r = 0.906 and r = 0.793). However, there was no correlation of shoulder, upper back, lower arm, buttock, wrist and feet with duration of work and weight of the body.

Table 4. Correlation between independent variable and discomfort in different parts of the body in cauliflower production

Body Parts	Work duration	Body weight
Neck	0.865**	0.761*
Shoulder	0.187	0.611
Upper back	0.202	0.453
Upper arm	0.523	0.672*
Lower back	0.661*	0.946**
Lower arm	0.403	0.694
Buttock	0.265	- 0.084
Wrist	0.449	0.428
Hand	0.774*	0.906**
Thigh	0.855*	0.793*
Feet	0.420	0.747

**Significant at 5% level, ** Significant at 1% level*

Table 5. VAD scores

Activities	VAD Score	Ranking
Land Preparation	8.0	II
Nursery Raising	5.1	V
Irrigation	5.8	III
Spreading of manure and fertilizers	3.0	VII
Transplanting	8.2	I
Insect Pest Management	5.6	IV
Weeding	3.0	VII
Harvesting	8.0	II
Handling and Transportation	5.0	VI

Table 6. Pain Symptoms

Activities	VAD Score	Ranking
Land Preparation	4.8	III
Nursery Raising	4.6	IV
Irrigation	3.1	V
Spreading of manure and fertilizers	2.3	VI
Transplanting	5.3	I
Insect Pest Management	2.1	VII
Weeding	4.6	IV
Harvesting	5.1	II
Handling and Transportation	5.1	II

VAD scores of workers in several activities of cauliflower production: Table 5 indicates the VAD score for several activities in cauliflower production. According to the data, majority of the respondents faced highest discomfort in transplanting scored rank I with VAD score of 8.2 followed by both land preparation and harvesting which got II rank with VAD score of 8.0.However, irrigation got III rank with VAD score of 5.8,insect pest management got IV rank with VAD score of 5.6, nursery raising got V rank with VAD score of 5.1, and handling transportation got VI rank with VAD score of 5.0, all of them indicating moderate discomfort. Furthermore, both spreading of manure and fertilizers and weeding got VII rank with score of 3.0 depicting as mild discomfort. Promila (2014) found that activities like field preparation, sowing, pruning, and harvesting had high VAD scores, ranging from 7 - 8, indicating significant discomfort in different parts of the body of the workers.

Pain Symptoms perceived by the workers involved in different activities of cauliflower production: Table 6 indicated that the pain symptom perceived rating scale by workers involved in different activities of cauliflower production. Out of different activities of cauliflower production, transplanting got Ist rank with highest pain symptoms score of 5.3 followed by both harvesting and handling and transportation activity which got II rank with pain symptoms score of 5.1 depicting the swelling symptoms perceived by workers. However, land preparation got III rank with pain symptoms score of 4.8 and both nursery raising and weeding got IV rank with pain symptoms score of 4.6 depicting the stiffness in body parts in pain symptoms rating. Data showed that irrigation activity got V rank with pain symptoms score of 3.1 which depicted the numbness symptoms perceived by workers. In total sample, workers got VI and VII rank with pain symptoms score of 2.3 and 2.1 in spreading of manure and fertilizers and insect pest management which highlighted the burning symptoms in different body parts. Ojha and Kwatra (2017) also noted that joint stiffness, cuts and wounds, forearm pain, calf muscle pain, finger numbness, and trunk pain were the different types of health hazards faced by working women in the city of Uttarakhand.

Correlation between independent variable with pain symptoms among workers in cauliflower production: The correlation between different independent variables (body posture, fat weight and lean body weight) with pain symptoms among workers in cauliflower production is indicated in Table 7.

Table 7. Correlation between independent variable with pain symptoms in different activities

Pain symptoms	Posture	Fat weight	Lean body weight
Land Preparation	0.919**	0.853**	0.974**
Nursery raising	0.738	0.77*	0.813*
Irrigation	0.73	0.714	0.732
Spreading of manure & Fertilizer	0.841*	0.676	0.863
Transplanting	0.893**	0.782**	0.941**
Insect pest management	0.289	0.243	0.215
Weeding	0.598	0.493	0.745
Harvesting	0.857*	0.761*	0.915**
Handling & transportation	0.488	0.221	0.595

**Significant at 5% level, ** Significant at 1% level*

The results revealed that land preparation was significantly correlated with body posture fat weight and lean body weight of the body (r = 0.919, r = 0.853 and r = 0.974). Nursery raising was significantly correlated with fat weight and lean body weight (r = 0.77, r = 0.813). Spreading of manure and fertilizer was significantly correlated with body posture (r = 0.841).Pain symptoms in transplantation activity was significantly correlated with body posture, fat weight and lean body weight (r = 0.893, r = 0.782 and r = 0.941).In addition , the pain symptoms in harvesting activity was significantly correlated with body posture, fat weight and lean body weight(r = 0.857, r = 0.761 and r = 0.915).However ,there was no correlation of irrigation, insect pest management, weeding and handling & transportation with body posture, fat weight and lean body weight of the body.

4. CONCLUSION

Based on the findings of the study, the hands with WMS-3.8 experienced the highest intensity of musculoskeletal discomfort followed by thigh (3.6), neck (3.5),lower back (3.4),upper back (3.2),upper arm (3.2),shoulder (3.1) and feet (3.1) in transplantation activity and least in spreading of manure and fertilizers, maximum intensity of musculoskeletal discomfort in wrist (WMS-3.4),buttock (WMS-3.3),upper arm(WMS-3.3) followed by neck, upper back, feet, all having a same weighted score of 3.2 and in lower back it was 3.0. Discomfort in lower back, hands and thigh was significantly correlated with duration of work (r=0.661, r=0.774 and r=0.855) and weight of the body (r=0.946, r=0.906and r=0.793). According to analysis of VAD score, majority of the respondents faced highest discomfort in transplanting activity scored rank I with VAD score of 8.2 followed by both land preparation and harvesting activity which got II rank with VAD score of 8.0. transplanting got Ist rank with highest pain symptoms score of 5.3 followed by both harvesting and handling and transportation activity which got II rank with pain symptoms score of 5.1. Land preparation activity was significantly correlated with body posture fat weight and lean body weight of the body (r= 0.919, r =0.853and r=0.974). Conclusively we can say that amongst the three parameters i.e. Human body map, VAD scale and in pain symptoms, major musculoskeletal discomfort was found in transplantation activity.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models and text- to-image generators have b een used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

AICRP 2013.Scoresheet for characterization of drudgery, Department of Family Resource Management, I.C. College of Home Science, CCS HAU, Hisar.

Corlette, E.N. and Bishop, R.P. 1976. A technique of assessing postural discomfort. *Ergonomics.*19(2):175-182.

Gupta, R. and Sharma, A. 2017.Sapling transplanter: An effective tool for drudgery mitigation of women in vegetable production system. *Asian Journal of Home Science.*12(2):609-613.

Hou J.Y., Shiao, J.S. 2006. Risk factors for musculoskeletal discomfort in nurses.*Journal of Nursing Research.*14(3):228-36.

Ojha, P. and Kwatra, S. 2017. Comparative ergonomic assessment of the male and female farm workers involved in rice cultivation. *International Journal of Current Microbiology and Applied Sciences*.6(9): 3439-3446.

Promila, 2014. Risk assessment of workers in polyhouses of Haryana. *Ph.D. thesis*, Department of Family Resource Management, I.C. College of Home Science, CCS HAU, Hisar.

Rani, K., Rani, M., Devi, S. and Mehta, M. 2020.Occupational health hazard assessment of grain collection workers in Hisar.*The Pharma Innovation Journal*.9(1):108-111.

Saha, A. and Lama, I. L.N. 2024.Problems faced by rural women in the field of agriculture in Koch Bihar district, West Bengal. *International Journal of Agriculture Extension and Social Development.*7(4):389-397.

Sethi, J.,Sandhu, J.S., Imbanathan, V. 2011.Effect of Body Mass Index on work related *Sports Medicine, Arthroscopy ,Rehabilitation, Therapy and Technology*.3:1-7.

Shariat, A. Tamrin, S.B. Arumugam, M., Danaee, M. Ramasamy, R. 2016. Prevalence rate of musculoskeletal discomforts based on severity level among office workers. *Acta Medica Bulgarica.* 43(1):54-63.

Varghese, A. and Panicker,V.V. 2022.Impact of musculoskeletal disorders on various agricultural operations:A systematic review.*Sadhana Indian Academy of Science*.47(46):1-10.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/129370