RESEARCH ARTICLE

WORK POSTURE ANALYSIS FOR FARMERS AMONG KALLAKURICHIDISTRICT

Dr. G. Suganya[1] and Miss. V. Suruthi[2]
1. Senior Occupational Therapist, GCMC & H, Chidambaram.
2. Occupational Therapy student, GCMC & H, Chidambaram.

Manuscript Info	Abstract
	The word agriculture fundamentally refers to the practice of cultivating land, growing crops, and raising livestock (animals) to produce food, fiber, and other products for human use. Agriculture contributes about 15–18% to India's GDP. Rural population 40–45% follow agriculture. It supports rural income, also supplies raw materials for industries. In the selected kallakurichi district, of Tamilnadu, most of the people are farmers. Paddy, cotton, maize cultivation is the main occupation for farmers. This study analyses Occupational Therapy related ergonomics in agriculture essentially to protect farmers health, for reducing physical strain, and increase productivity. Working posture of farmers were analysed by Ovako work posture analysis system, splitting them into tasks involving agricultural farming, Modified Nordic Musculoskeletal Questionnaire (MNMQ) is a standardized and validated screening instrument widely used to assess the presence, severity, and functional impact of musculoskeletal symptoms. Hence, both these scales, were used for occupational health research and ergonomic evaluations in farmers.

Corresponding Author: - **Dr. G. Suganya,** *Senior Occupational Therapist, GCMC & H, Chidambaram.*

Introduction: -
Ovako work posture analysis system
OWAS was developed in Finland in a steel industry company, Ovako, in 1973. A portable computer system for coding and analysis of OWAS has been developed (Kivi 1991) OWAS identifies the most common work postures for the back (4 postures), arms (3 postures) and legs (7 postures), and the weight of the load handled (3 categories). Whole body posture is described by these body parts with a four digit-code. These 252 postures have been classified to four action categories indicating needs for ergonomic changes. The observations are made as "snapshots" and sampling has usually been with constant time intervals. The method classifies the posture of the back, arms, and legs, along with the weight of the load handled, into four-digit posture codes. Based on these, OWAS assigns the work posture to one of four Action Categories (AC1–AC4) Category 1 means no corrective action is required and Category 4 indicates that immediate changes are needed to prevent musculoskeletal problems. OWAS module can be applied to tasks with a workload distribution that is not uniform during the working day and it is easy to determine the exposure times. OWAS is particularly valuable in agricultural ergonomics because it is simple, observational, and applicable in real-field conditions.

Modified musculoskeletal questionnaire

The Modified Nordic Musculoskeletal Questionnaire (MNMQ) is an enhanced version of the original NMQ developed by Kuorinka et al. (1987). It is a standardized and validated screening instrument widely used to assess the presence, severity, and functional impact of musculoskeletal symptoms among working populations. It retains the core structure of the original tool by focusing on nine anatomical region. It expands the assessment to include intensity of pain, duration, frequency, and work interference, making it more suitable for **occupational health research and ergonomic evaluations.**

MNMQ does screening and early identification of high-risk musculoskeletal symptom patterns within specific occupational groups. It captures 12-month prevalence, 7-day prevalence. It is scored by severity, on musculoskeletal pain by Severity grading (mild/moderate/severe)
MILD (5-10)
MODERATE (11-18)
SEVERE (above19)

Agriculture and Musculoskeletal Disorders:

There is almost nil application of ergonomic approaches in design of **agricultural old tools. Hence,** it becomes essential to assess the prevalence of musculoskeletal discomfort among farmers across different body regions. Avoiding discomfort enhances productivity & increase the standard of living of workforce involved in agriculture sector.

Observation of Farming Activities in kallakurichi district
Place Elavadi village

Activity: Spading / Land Preparation

Location: **Kallanatham Village**, Kallakurichi District
OWAS Code: 4141, A3 OWAS Code Interpretation

Farmers are exposed to repetitive bending, lifting, and awkward postures for prolonged periods, which significantly increases risk of back, knee, and shoulder pain. Workers aged between 24 -50 years, who were using the traditional tool (hoe) for weeding operations were selected for the present survey.

4141A3 represents the following posture:
Back – 4, Arms – 1, Legs – 4, Load/Force – 1

Action Category – 3: Indicates a high-risk posture that should be modified to prevent long-term musculoskeletal disorders.

Task: Uprooting of cotton crop in**Moongilapadi village**

Task Description

The task involves manual uprooting of cotton plants after harvest in **Moongilapadi v**illage. Workers perform continuous bending to ground level and apply force with hands to pull out the cotton stems. The activity requires repetitive trunk flexion, forward bending, and sustained squatting. Workers usually maintain these postures for long durations due to large field areas, leading to increased musculoskeletal strain.

OWAS Code:4151Action Category: 4
Indicating a high-risk posture requiring immediate ergonomic intervention.

Activity:Carrying loads
Location: Chinnasalem
OWAS code3333. OWAS **Action Category** = **4** (Very Harmful)

Body Posture Components

Body Part	Observed Posture	OWAS Code
Back	Bent forward while carrying load-	3
Arms	Both arms raised/supporting load-	3
Legs	Walking / climbing on ramp (unstable surface)	3
Load Weight	Heavy load (>10 kg, large sack)	3

Review of Literature:-

1. Selvaraj et al. (2021): Studied working postures of vegetable farmers in Madurai district. Frequent trunk flexion during weeding was identified as a major risk. Recommended long-handled weeders to reduce bending and improve OWAS posture scores.
2. Kumar & Singh (2020): Reported that weeding activities in Indian agriculture involve trunk flexion exceeding 60°, leading to back pain and fatigue. OWAS showed high corrective urgency in manual weeding.
3. Srinivasan et al. (2019): Studied rice transplanting in Tamil Nadu and found that more than 60% postures fell under OWAS Action Categories 2 and 3, indicating significant ergonomic risk requiring corrective action.
4. Jayashree & Vasanthi (2017): Analyzed weeding postures of paddy field workers. More than half of workers experienced low back and knee pain due to prolonged bending and squatting. Suggested tool redesign and ergonomic intervention.
5. Walker-Bone & Palmer (2002): Reviewed musculoskeletal disorders among farmers. Agriculture was identified as a high-risk sector involving heavy load handling and repetitive movements. They demonstrated that frequent short rest breaks reduce fatigue and discomfort in repetitive tasks. Supported ergonomic recommendations for farmers.
6. Poskitt (2000): Reviewed BMI standards and health-related associations, relevant for assessing physical strain among workers. Recommended computerized OWAS applications for posture improvement, widely used in ergonomic field studies.

Methodology:-

Kallakurichi district in Tamil Nadu is a major agricultural region where most people depend on farming for their livelihood. The repetitive and awkward postures spend in agricultural tasks lead to musculoskeletal discomfort and injuries.Conducting an OWAS-based posture analysis in this district helps identify harmful postures, determine their risk level, and suggest ergonomic improvements

Aim:-

To Assess the working posture of farmers in kallakurichi district using the OWAS method, MNMQ method.

Objectives:-

1. To classify the work posture into tasks involving agricultural farming,
2. To analyze with OWAS method, the selected sample in various postures and tasks.
3. To allot suitable ergonomic coding with OWAS
4. To assess the prevalence of musculoskeletal discomfort among farmers across different body regions using Modified Nordic Musculoskeletal Questionnaire.
5. To suggest ergonomic fit methods of work for the needed people.

Method of Study:-

Study Design

A descriptive cross-sectional study was conducted to assess the working postures of farmers during various agricultural tasks using the Ovako Working Posture Analysis System

Duration of Study:
2 months.

Participants:
50 farmers actively engaged in farming activities

Study Setting
Location:
Elavadi,Kallanatham,Poosapadi,Moongilpadi,pandiyankoopamvillage, ofKallakurichi district, Tamil Nadu.

Farmers involved in cotton, Tomato,millet, groundnut,and maize cultivation
Study procedure
The study area and participants were first identified, and informed consent was obtained from the farmers. The researcher visited agricultural fields and observed farmers during regular activities like weeding, planting, and

harvesting. Their working postures were recorded through photographs and direct observation. Each posture was coded using the OWAS method and analyzed to determine the level of ergonomic risk. Based on the findings, recommendations were made to improve posture, modify tools, and reduce musculoskeletal strain.

CROP

- cotton 10%
- maize38%
- groundnut22%
- tomato 16%
- millet
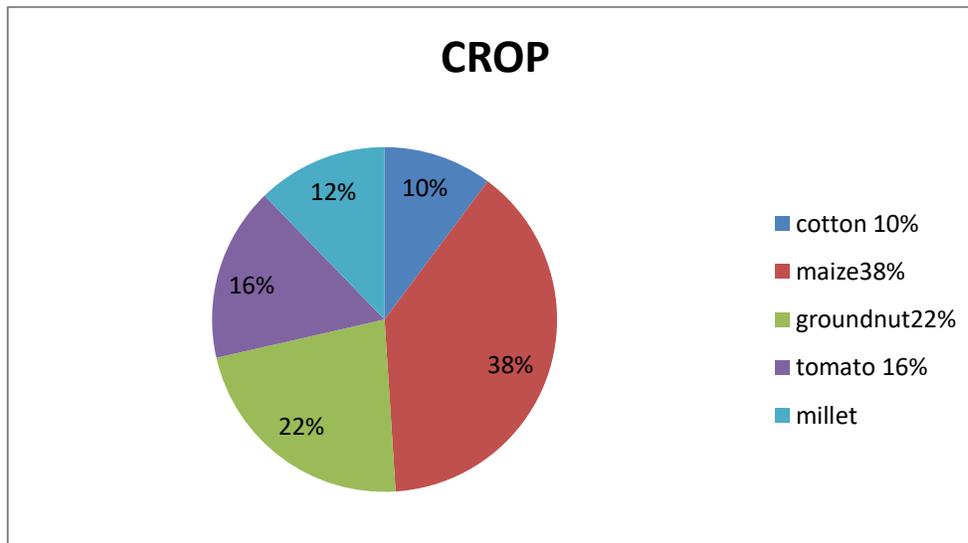
Inclusion Criteria
1. Farmers aged 18–65 years, Willing to participate in study
2. Minimum 5 years of farming experience
3.Engaged in ploughing, sowing, weeding, harvesting, etc

Exclusion Criteria
1. Farmers with acute illness due to which not actively involved in fieldwork
2. physically challenged farmers
3. Farmers with chronic illnesses that limit work (e.g., severe respiratory conditions)

Outcome Measures
Ovako Working Posture Analysis System(OWAS)
Modified Nordic Musculoskeletal Questionnaire

Data Analysis & Result:-
The following distribution gives detailed age of the participants in the study

AGE GROUP	COUNT	PERCENTAGE
25-45	18	36%
46-65	32	64%
Total	**50**	**100%**

Distribution of activities (type of work) of participants

Activity	Number	Percentage
Weeding	5	10%
Ploughing	4	8%
Carrying Loads	6	12%
Scooping Grain	5	10%
Holding Sack	4	8%
Ridging	7	14%
Spading	8	16%
Sprinkling Water	4	8%

Sowing	7	14%

The most common activities reported were spading (16%), ridging (14%), and sowing (14%). Activities such as ploughing (8%), holding sack (8%), and sprinkling water (8%) were less frequently performed. These tasks represent typical agricultural work demanding varied levels of physical effort.

Back Posture - Male And Female Comparison Total (50) Participants.

BACK CODE	MALE(n)	FEMALE(n)	TOTAL
1	0	0	0
2	11	0	11
3	10	0	10
4	4	25	29

The most observed posture was Back Code 4 (very harmful) with 29 participants (male 4 and female 25) mostly females. Back Code 2 and 3 were seen only among males. Code 2 with 11 male participants code 3 with 10 male participants.

Arms - Male And Female Comparison Total (50) Participants

ARMS CODE	MALE	FEMALE	TOTAL
1	27	23	50
2	0	0	0
3	0	0	0

Arms Code 1 was seen in 27 male23 female participants, indicating neutral arm posture for most tasks.

Leg Posture-Male-Female Comparison Total (50) Participants

LEG CODE	MALE	FEMALE	TOTAL
1	0	0	0
2	14	10	24
3	11	0	11
4	2	13	15
5	0	0	0
6	0	0	0
7	0	0	0

 Leg Code 2 was the most common (24 participants) 14 were male 10 were female.
 Leg Code 4 (stressful posture) was seen in 15 participants 2 were male 13 were females.

Load - Male-Female Comparison

| LOAD	MALE	FEMALE	TOTAL
1	6	23	29
2	11	0	11
3	10	0	10

Load Handling
Load Code 1 (light load) was commonly seen in females (23) than males (6)
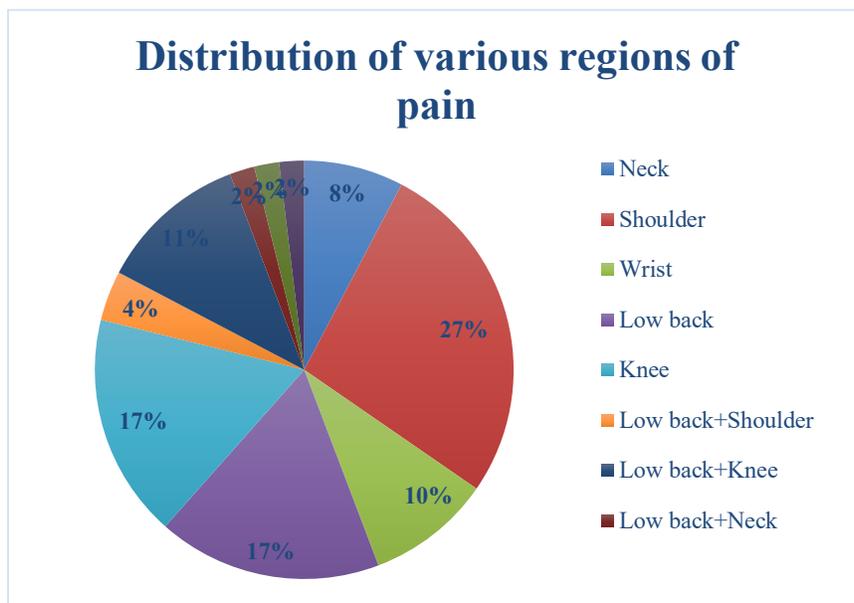Load Code 2 seen in 11 male participants
Load Code 3 (moderate-heavy load) was seen in males (10).

PIE CHART of OWAS RISK LEVEL DISTRIBUTION
Risk Level 3 (harmful) was the most frequently observed (66%), followed by Risk Level 4 (very harmful) at 32%posture in study group.
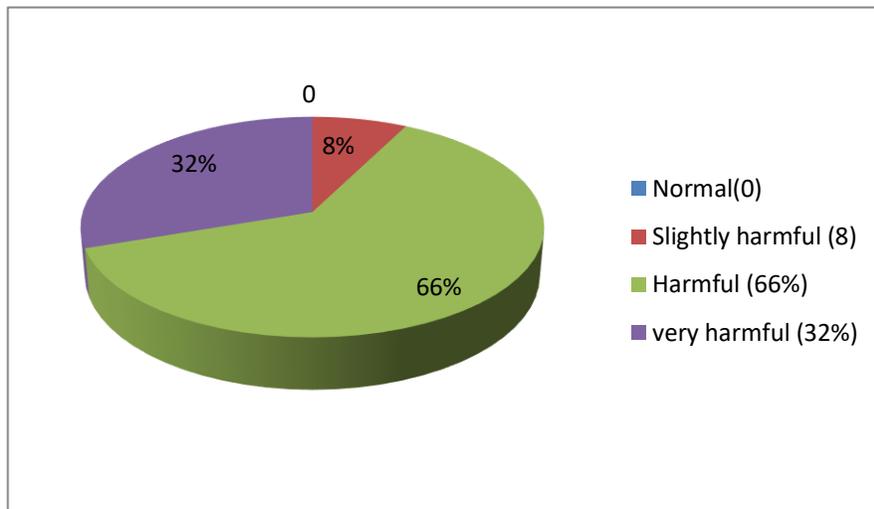
Frequency distribution of NORDIC among Farmer

Correlation of frequency and NORDIC musculoskeletal pain
Pearson's correlation analysis

Variables	Mean	Std. Deviation	Sample size	Correlation coefficient "r"	'p'
FREQUENCY	16.29	4.83	50	0.3234	0.0219
NORDIC	13.92	5.28	50		

A positive correlation (r = 0.3234) was found between frequency of work activities and Nordic musculoskeletal symptoms, with a statistically significant p-value (p = 0.0219). This means higher activity frequency is associated with more musculoskeletal pain.

Conclusion:-

A total of 50 farmers from different villages of Kallakurichi district were assessed using the OWAS method and Modified Nordic Musculoskeletal Questionnaire (MNMQ). This study reveal that farmers are continuously exposed to awkward and harmful postures, while bending, lifting, and handling loads. A considerable number of postures required corrective action either soon or immediately. OWAS analysis clearly shows that several postures fall under Risk Levels 3 and 4, indicating that immediate ergonomic improvements are necessary. Improved work tools, Training on safe lifting techniques, Introduction of mechanical aids, Work–rest cycles during peak workload seasons are mainly recommended.

Limitations:-

1. The analysis was on short-duration posture observations, which may not represent the entire workday.
2. Environmental factors such as temperature, humidity, and ground conditions were not assessed.
3. Sample size was limited to farmers available during field visits, which may not represent the entire population of Kallakurichi district.
4. The study relied on manual posture recording, which could introduce observer bias

Ergonomic recommendations by different Authors were advised appropriately

Gangopadhyay et al. stated that rest break and job rotation during work reduce fatigue and also decrease in Musculo skeletal discomfort. Balchi and Aghazadeh and Galinsky et al. also recommended some stretching exercises to reduce musculoskeletal pain. Dust mask usage during threshing, sweeping and wind blowing activity is also recommended. In addition job rotation reduces the boredom and monotony of a job and also reduces the fatigue as mentioned by Konz and Raina and Dickerson .

Applicable OWAS recommendationsas Suggestedby Occupational Therapists given to farmers

Work posture modifications to reduce musculoskeletal discomfort are separately described to each farmers like

1. Recommended "hip hinge technique" instead of bending back,
2. Use of Long-Handled Spade Tools, bending to use hip flexion instead of rounding the back,
3. Using partial squatting instead of full forward bending,
4. Supportive footwear usage(Provides better stability during force application)
5. Using Knee Pads or Ground Mats to minimize knee pressure when workers kneel ,
6. Training workers in proper lifting biomechanics
7. Conveyor belt or manual roller ramp usage for loading.