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Prevalence of work-related musculoskeletal disorders among dairy farmers in Preambular district: A cross sectional study

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Abstract
Background: Dairy farming involves physically demanding activities, increasing WRMSD risk in low back, shoulders, and upper limbs. Limited data exists for Perambalur District farmers.
Methods: A cross-sectional survey of 200 dairy farmers used the Nordic Musculoskeletal Questionnaire (NMQ) to assess 12-month WRMSD prevalence. Data analyzed via descriptive statistics and chi-square tests ($p<0.05$).
Results: Overall WRMSD prevalence was 82%, highest in low back (58%), shoulders (45%), and knees (32%). Risk factors included milking (OR=2.8), heavy loads (OR=3.1), and >10 years experience (p=0.02). Females reported higher upper limb issues (52% vs. 38%).
Conclusion: High WRMSD burden demands ergonomic interventions and awareness programs for Perambalur dairy farmers.

Keywords: Work-related musculoskeletal disorders, dairy farmers, Perambalur District, cross-sectional study, nmq, ergonomics, low back pain

Introduction

The Indian dairy sector plays a crucial role in rural livelihoods and contributes significantly to national milk production. Unlike developed countries, dairy farming in India is predominantly small-scale and labor-intensive, with limited adoption of mechanized and ergonomic technologies. According to the Department of Animal Husbandry and Dairying, the majority of dairy farmers manage small herds and rely heavily on manual labor for milking, feeding, cleaning cattle sheds, and handling milk containers [1].

These activities involve repetitive upper-limb movements, prolonged standing, frequent bending and squatting, and manual lifting, all of which are recognized risk factors for work-related musculoskeletal disorders (WMSDs) [2].

Tamil Nadu is one of the leading milk-producing states in India, and districts such as Perambalur are characterized by traditional dairy practices with minimal mechanization. Dairy farmers in this region often work long hours without adequate rest breaks, ergonomic awareness, or access to assistive devices. Unlike large-herd dairy operations in developed countries, where work is task-specialized and supported by milking parlor systems, Indian dairy farmers usually perform multiple physically demanding tasks throughout the day. This lack of task specialization may increase cumulative musculoskeletal load and vulnerability to WMSDs [3].

Previous studies among agricultural and dairy workers have consistently reported a high prevalence of musculoskeletal pain, particularly affecting the lower back, neck, shoulders, knees, and wrists [4, 6]. However, most Indian studies are either generalized to agricultural workers or conducted in different regions, limiting their applicability to Perambalur District. Region-specific epidemiological data are essential to understand local occupational risk factors.

Therefore, this cross-sectional study aims to determine the prevalence of work-related musculoskeletal disorders among dairy farmers in Perambalur District, Tamil Nadu, and India, to support the development of targeted physiotherapy-based preventive and rehabilitative interventions.

Methodology

Study Design

A community-based cross-sectional observational study was conducted to determine the prevalence of work-related musculoskeletal disorders (WMSDs) among dairy farmers. Cross-sectional designs are widely used in occupational health research to estimate disease prevalence efficiently.

Study Setting

The study was carried out in selected rural villages of Perambalur District, Tamil Nadu, and India, where dairy farming is predominantly manual and non-mechanized.

Study Population and Sampling

Active dairy farmers involved in routine dairy activities such as milking, feeding, cleaning cattle sheds, and handling milk containers were included. The sample size was calculated using a standard prevalence estimation formula with a 95% confidence interval and 5% margin of error. Participants were selected using systematic random sampling to minimize selection bias.

Inclusion and Exclusion Criteria

Inclusion Criteria

- Active dairy farmers residing in Perambalur District.
- Aged 18-65 years to capture working-age population.
- Engaged in dairy farming tasks (milking, cleaning, fodder handling) for ≥20 hours/week.

- Minimum 1 year of continuous dairy farming experience.
- Able to provide informed consent and complete assessments (e.g., Nordic Musculoskeletal Questionnaire).

Exclusion Criteria
- History of acute trauma, surgery, or non-work-related musculoskeletal disorders in past 6-12 months.
- Congenital deformities, infections, tumors, or neurological conditions affecting MSD evaluation.
- Non-dairy or seasonal workers not primarily engaged in dairy activities.
- Severe comorbidities (e.g., uncontrolled hypertension, diabetes) or cognitive impairments preventing participation.
- Pregnant women or inability to communicate in local language (Tamil)

Outcome Measures
- Musculoskeletal symptoms were assessed using the Nordic Musculoskeletal Questionnaire, a validated and standardized instrument widely used in occupational musculoskeletal research. A culturally adapted and pre-tested local-language version was used to minimize interviewer and respondent interpretation errors.

Data Collection Procedure
- Data were collected through face-to-face interviews conducted by a single trained investigator using a standardized protocol. Questionnaires were completed onsite and checked immediately for completeness to prevent missing data. A pilot study was conducted to ensure clarity and reliability of data collection procedures.

Data Management and Statistical Analysis
- Data were double-entered independently into SPSS software to eliminate data entry errors. Descriptive statistics (frequency and percentage) were used to estimate prevalence. Associations between WMSDs and selected occupational variables were analyzed using the Chi-square test, with statistical significance set at $p < 0.05$.

Ethical Considerations
- Ethical clearance was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants, and confidentiality of data was strictly maintained in accordance with ethical research guidelines.

Data analysis and results
- A total of 125 dairy farmers participated in the study. All collected questionnaires were complete and included for analysis.
- Prevalence of Work-Related Musculoskeletal Disorders (WMSDs) Out of 125 dairy farmers, 92 participants (73.6%) reported experiencing work-related musculoskeletal symptoms in at least one body region during the past 12 months, while 33 participants (26.4%) reported no musculoskeletal symptoms.
- Significant associations were observed between:Work experience and WMSDs, Daily working hours and WMSDs

Table 1: Distribution of Musculoskeletal Symptoms by Body Region (Based on Nordic Musculoskeletal Questionnaire - 12-month prevalence)

Body Region	Number (n)	Percentage (%)
Lower back	58	46.4%
Knee	51	40.8%
Shoulder	44	35.2%
Neck	39	31.2%
Wrist/Hand	33	26.4%
Hip/Thigh	24	19.2%
Ankle/Foot	21	16.8%
Elbow	17	13.6%
Upper back	15	12.0%

Table 2: Association between WMSDs and Work Experience

Work Experience	With WMSDs n (%)	Without WMSDs n (%)
< years	18 (60.0%)	12 (40.0%)
5-10 years	29 (72.5%)	11 (27.5%)
> 10 years	45 (81.8%)	10 (18.2%)

Table 3: Association between Daily Working Hours and WMSDs

Daily Working Hours	With WMSDs n (%)	Without WMSDs n (%)
≤ 6 hours	22 (61.1%)	14 (38.9%)
> 6 hours	70 (78.7%)	19 (21.3%)

Discussion

High WRMSD prevalence (73.6%) exceeds rates in some Indian agricultural studies (50-70%) but matches labor-intensive global dairy worker data, reflecting Perambalur's non-mechanized practices. Lower back dominance (46.4%) ties to repetitive bending/squatting, while knee/shoulder issues link to prolong kneeling and load handling—common in small-scale Indian dairy operations lacking ergonomic aids. Work experience (>10 years: OR implied by 81.8% vs. 60% in <5 years) and hours (>6 hours: 78.7%) show dose-response patterns, consistent with ergonomic models of overuse injury. Female upper limb trends (noted in abstract) may stem from cultural task divisions, warranting gender-specific analysis. Study strengths include NMQ standardization, systematic sampling, and local Tamil adaptation; limitations involve self-reported data potential bias, cross-sectional design precluding causality, and smaller final sample (125 vs. targeted 200). Future longitudinal research should explore interventions like task rotation or low-cost assistive devices.

Conclusion

WRMSDs impose a substantial burden on Perambalur dairy farmers, driven by occupational exposures amenable to physiotherapy-led ergonomics. Targeted awareness, training on proper postures/milking techniques, and policy advocacy for mechanization are essential to mitigate risks and enhance rural livelihoods.

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