A Study to Assess the Knowledge Regarding Ergonomics and Its Role in Prevention of Work-Related Musculoskeletal Pain Among Nurses Working in Acute Wards of Tertiary Care Centre of Western Maharashtra

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***Abstract*—Background: Work-related musculoskeletal disorders (WRMSDs) pose a significant occupational health challenge for nurses in acute wards, driven by patient handling, prolonged standing, repetitive tasks and awkward postures. These disorders impair nurses' health, elevate absenteeism and jeopardize patient care.5,6 Ergonomics offers prevention, yet awareness and implementation remain insufficient in many settings.13,14 Objective: To evaluate nurses' knowledge of ergonomics and its role in preventing WRMSDs in acute wards of a tertiary care center in Western Maharashtra and to explore associations with selected demographic variables.**

Methods: This quantitative, descriptive cross-sectional study involved 166 registered nurses selected via non-probability convenience sampling. Data were gathered using a validated, self-administered questionnaire on demographics, ergonomics, body mechanics, safe patient handling, risk factors and prevention (Cronbach's α = 0.81)16,17Analysis included descriptive statistics (frequency, percentage) and chi-square tests.

Results: Most nurses demonstrated moderately adequate ergonomic knowledge, with fewer showing adequate levels and some inadequate. Knowledge scores significantly associated with area of work and prior ergonomic training ($p < 0.05$).

Conclusion: Nurses exhibited moderate ergonomic knowledge, underscoring the need for ongoing training, workshops and institutional policies to bolster practices, reduce WRMSDs, enhance well-being and improve patient care.11,20,21

***Index Terms*—Ergonomics, Knowledge, Nurses, Work-related musculoskeletal disorders, Acute wards, Prevention**

I. INTRODUCTION

Nursing is an intensely physical profession. Nurses face daily challenges like prolonged standing, repetitive motions, awkward postures, bending, lifting, manual patient handling—especially in acute wards where patient needs run high and workloads never let up. [1,2] The World Health Organization flags musculoskeletal disorders as a top global cause of disability and lost work capacity.[3,4]

Around the world, nurses stand out as one of the hardest-hit groups for pain in the lower back, neck, shoulders and knees. Studies peg prevalence anywhere from 40% to 80%, shaped by the demands of their settings.[5,6] India mirrors this trend; our hospital nurses grapple with serious low back, neck and shoulder pain from grueling shifts, short staffing, flawed lifting habits and weak ergonomic support.[7,8]

The fallout hits hard, fatigue sets in, productivity dips, absences mount, job satisfaction erodes and patient care suffers. Over time, it fuels stress, burnout, early exits from the field.[9,10] That's why preventing work-related musculoskeletal disorders (WRMSDs) has become a critical focus for hospitals everywhere.

A wealth of evidence points to ergonomics as a game-changer. This science matches the job to the worker, through smarter task design, better equipment, safer workspaces, to boost safety, comfort and efficiency. Proven steps like body mechanics training, safe handling techniques, assistive tools, posture tweaks and redesigned environments cut strain and injuries significantly.[3,11,12]

Yet too many nurses lack solid knowledge of these principles or how to apply them amid the daily rush. Factors like spotty training, crushing workloads and overlooked safety priorities keep unsafe habits alive.[13,14,15] The good news is education and regular

workshops can transform knowledge and practices.[16,17]

In tertiary care acute wards, the heart of high-stakes, physically taxing care, research on nurses' ergonomic awareness and its power to prevent pain is surprisingly limited, especially here in Western Maharashtra.

This study steps in to gauge that knowledge among nurses in a local tertiary center's acute wards, its link to preventing WRMSDs and ties to key demographics.

OBJECTIVES

(i) To assess the knowledge regarding ergonomics and its role in prevention of work-related musculoskeletal pain among nurses working in acute wards of a tertiary care centre; and (ii) to determine the association between knowledge scores and selected demographic variables.

II. CONCEPTUAL FRAMEWORK

This study is anchored in Ludwig von Bertalanffy's General Systems Theory (GST),[18] which posits individuals as open systems engaging their internal and external environments through inputs, throughput, outputs and feedback.

Nurses in acute wards embody this system, responsive to occupational and personal influences. Inputs encompass demographic and contextual variables—age, gender, education, experience, work hours, prior ergonomic training, workload and ward conditions that shape ergonomic awareness and competence.

Throughput involves cognitive processing, perception, comprehension, assimilation, application of ergonomic principles, body mechanics, postural adjustments, safe patient handling and preventive measures against musculoskeletal pain.

Output manifests as knowledge levels (adequate, moderately adequate or inadequate) on ergonomics' preventive role in work-related musculoskeletal disorders.

Feedback emerges from knowledge assessments and demographic associations, informing refined training, educational strategies, policy enhancements and ergonomic practice adoption.

GST thus illuminates the interplay of inputs and environment in fostering nurses' ergonomic knowledge and behaviors ultimately mitigating disorders and elevating occupational health.

III. METHODS

A. Research Design and Setting

A quantitative, non-experimental descriptive cross-sectional research design was adopted. The study was conducted in selected acute wards of a tertiary care hospital in Western Maharashtra, providing comprehensive inpatient services including emergency care, medical-surgical management and continuous nursing care.

B. Population and Sampling

The target population comprised all registered nurses working in acute wards of the selected tertiary care hospital. Non-probability convenience sampling technique was employed to select participants who fulfilled the predetermined inclusion criteria. Sample size was calculated using Cochran's formula: $n_0 = (Z^2 \times p \times (1-p) / d^2$, where Z = 1.96 (95% confidence interval), p = 0.6, q =3.4% (allowable error) that yielded a minimum sample size of 166 participants.

A total of 166 nurses were included in the study.

Inclusion criteria:

Registered nurses with BMI ≤ 30, and at least 1 year experience of working in acute wards (ICU, HDU, Acute medical, Acute surgical and emergency) and who are willing to participate after getting an informed consent.

Exclusion criteria:

Nurses diagnosed with particular musculoskeletal disease.

C. Data Collection Tools

1). Section A — Socio-demographic Questionnaire

A self-structured questionnaire was used to collect baseline information including Age, gender, educational qualification, years of clinical experience, area of work and previous ergonomic training.

2). Section B — Structured Knowledge Questionnaire on Ergonomics

A structured self-administered questionnaire was developed to assess knowledge regarding ergonomics and its role in prevention of work-related musculoskeletal pain. The tool included items related to meaning and principles of ergonomics, body

mechanics, posture maintenance, safe patient handling, risk factors and preventive strategies.

Each correct response was awarded one mark and incorrect response zero. Total scores were categorized as:

1. Adequate knowledge
2. Moderately adequate knowledge
3. Inadequate knowledge

The tool was validated by experts from Nursing, Occupational Health, and Clinical Specialties.

D. Reliability of the Tool Validity

Content validity was affirmed by a panel of experts from dept of sports medicine, ortho specialist and medical surgical nursing. Their input on item relevance, clarity, sequencing and adequacy guided in tool finalization. Reliability assessed via Cronbach's α, yielded 0.81, indicating robust internal consistency and suitability for the main study.

E. Ethical Considerations

Institutional Ethical Committee approval preceded data collection; hospital administration granted permission. Written informed consent followed comprehensive study briefings. Participant confidentiality, anonymity, privacy was rigorously upheld. Institutional ethical principles were maintained according to the Belmont report.[19]

F. Pilot Study

A pilot study with 10 nurses from comparable settings evaluated feasibility, clarity, practicality and timing. It validated the process; no substantive tool revisions ensued.

G. Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive and inferential statistics. Frequency, percentage, mean, and standard deviation were used to summarize demographic variables and knowledge scores. Chi-square test was applied to determine association between knowledge level and selected demographic variables. A p-value of <0.05 was considered statistically significant. Data were coded, tabulated and analyzed using SPSS software. Results were presented in the form of tables, graphs and charts for better interpretation.

IV. RESULTS

Description of socio demographic variables of nurses

Table 4.1: Description of Nurses According to Age Distribution (n= 166)

Age group (years)	Number of cases	Percentage (%)
≤ 30	89	53.6
31 – 40	65	39.2
> 40	12	7.2
Total	166	100.0

Table 4.1 represents the distribution of nurses according to their age group (n = 166). Most nurses, 89 (53.6%), were aged ≤ 30 years.65 (39.2%) nurses belonged to the 31–40 years age group. Only 12 (7.2%) nurses were in the age group of > 40 years. The findings indicate that more than half of the respondents were young nurses aged 30 years or below. This shows that the study population predominantly consisted of young nurses.

Table 4.2: Distribution of Nurses According to Educational Qualification (n = 166)

Education	Number of cases	Percentage (%)
BSc Nursing	93	56.0
GNM	23	13.9
PB BSc	39	23.5
MSc Nursing	11	6.6
Total	166	100.0

Table 4.2 illustrates the distribution of nurses according to their educational qualification (n = 166). Most nurses, 93 (56.0%) had completed BSc Nursing, 39 (23.5%) had Post Basic BSc Nursing qualification, 23 (13.9%) were qualified with GNM and Only 11 (6.6%) had completed MSc Nursing, representing the smallest proportion. This indicates a clear predominance of undergraduate degree holders in the study population.

Table 4.3: Distribution of Nurses According to Years of Clinical Experience (n = 166)

Experience	Number of cases	Percentage (%)
1-5 yrs	68	41.0
6- 10 yrs	38	22.9
11- 15yrs	41	24.7
> 15yrs	19	11.4
Total	166	100.0

Table 4.3 depicts the distribution of nurses according to their years of clinical experience (n = 166). Among the participants, 68 (41.0%) had 1–5 years of experience, representing the largest group. This was followed by 41 (24.7%) nurses with 11–15 years of experience and 38 (22.9%) with 6–10 years of experience. Only 19 (11.4%) nurses had more than 15 years of experience, forming the smallest proportion. The findings indicate that the majority of nurses in the study were relatively early in their professional career (1–5 years). The distribution is uneven, with a higher concentration in the lower experience category. This suggests that the workforce is predominantly composed of less experience.

Table 4.4: Distribution of Nurses According to Area of Work (n = 166)

Area of work	Number of cases	Percentage (%)
ICU	63	38.0
Medical ward	47	28.3
Surgical ward	47	28.3
Emergency	9	5.4
Total	166	100.0

Table 4.4 shows that out of 166 nurses, the majority were working in the ICU (38.0%), followed by equal distribution in the medical ward (28.3%) and Surgical ward (28.3%). A small proportion of nurses were working in the Emergency department (5.4%). This indicates that most respondents were from critical care settings. The distribution suggests a higher representation of ICU nurses compared to other departments.

Table 4.5: Distribution of Nurses According to Attendance of Workshop on Ergonomics (n = 166)

Attended any workshop for ergonomics	Number of cases	Percentage (%)
Yes	27	16.3
No	139	83.7
Total	166	100.0

Table 4.5 shows that out of 166 nurses, the majority 139 (83.7%) had not attended any workshop on ergonomics, while only 27 (16.3%) had attended such workshops. This indicates a low level of participation in ergonomics-related training among the respondents. The findings suggest a significant gap in professional exposure to ergonomics education, highlighting the need for more training programs to enhance awareness and practice.

Assessment and distribution of nurses according to the level of knowledge regarding ergonomics and its role in prevention of work-related musculoskeletal pain.

Table 4.6: Distribution of Nurses According to Knowledge Score on Ergonomics (n = 166)

Knowledge score	Number of cases	Percentage (%)
Poor Knowledge (≤ 7)	64	38.6
Average knowledge (8 – 14)	95	57.2
Good knowledge (> 14)	7	4.2
Total	166	100.0

Table 4.6 reveals that more than half of the nurses 95 (57.2%) had average knowledge, while 64 (38.6%) demonstrated poor knowledge. Only a small proportion 7 (4.2%) had good knowledge regarding ergonomics. This indicates that the majority of respondents possessed only moderate understanding, with very few having adequate knowledge. The distribution suggests a need for educational interventions to improve knowledge levels.

Association between knowledge scores and selected demographic variables among nurses using Chi-square test.

Table 4.7: Association Between Age Group and Knowledge Score on Ergonomics Among Nurses (n = 166)

Age group	Knowledge score			Total	Chi-square value (df)	p-value
	Poor	Average	Good			
≤ 30	38	47	4	89	4.23 (4)	0.376
31 - 40	24	38	3	65		
> 40	2	10	0	12		
Total	64	95	7	166		

Table 4.7 shows the chi-square analysis determining the association between age group and knowledge score on ergonomics among nurses. The calculated chi-square value was 4.23 with 4 degrees of freedom, and the p-value was 0.376, which is greater than 0.05. This indicates that there is no statistically significant

association between age group and knowledge score at the 5% level of significance. Therefore, the knowledge level of nurses regarding ergonomics does not significantly differ across different age groups in this study.

Table 4.8: Association Between Educational Qualification and Knowledge Score on Ergonomics Among Nurses (n = 166)

Education	Knowledge score			Total	Chi-square value (df)	p-value
	Poor	Average	Good			
BSc Nursing	36	55	2	93	3.95 (6)	0.683
GNM	9	12	2	23		
PBBSc	15	21	3	39		
MSc Nursing	4	7	0	11		
Total	64	95	7	166		

Table 4.8 shows the application of the chi-square test to examine the association between educational qualification and knowledge score on ergonomics among nurses. The calculated chi-square value was 3.95 with 6 degrees of freedom, and the p-value was 0.683, which is greater than 0.05. This indicates that there is no statistically significant association between educational qualification and knowledge score at the 5% level of significance. Hence, the level of knowledge regarding ergonomics does not significantly differ based on the nurses' educational qualification in this study.

Table 4.9: Association Between Years of Experience and Knowledge Score on Ergonomics Among Nurses (n = 166)

Experience (years)	Knowledge score			Total	Chi-square value (df)	p-value
	Poor	Average	Good			
1-5 yrs	32	34	2	68	7.05 (6)	0.316
6- 10yrs	10	26	2	38		
11-15yrs	16	22	3	41		
> 15yrs	6	13	0	19		
Total	64	95	7	166		

Table 4.9 depicts the association between years of experience and knowledge score on ergonomics among nurses. The calculated chi-square value was 7.05 with 6 degrees of freedom, and the p-value was 0.316, which is greater than 0.05. This indicates that there is no statistically significant association between years of experience and knowledge score at the 5% level of significance. Hence, the knowledge level regarding ergonomics does not significantly differ based on the years of clinical experience among the nurses in this study.

Table 4.10: Association Between Area of Work and Knowledge Score on Ergonomics Among Nurses (n = 166)

Area of work	Knowledge score			Total	Chi-square value (df)	p-value
	Poor	Average	Good			
ICU	24	34	5	63	12.77 (6)	0.047*
Medical ward	11	35	1	47		
Surgical ward	25	21	1	47		
Emergency	4	5	0	9		
Total	64	95	7	166		

Table 4.10 depicts the association between area of work and knowledge score on ergonomics among nurses. The calculated chi-square value was 12.77 with 6 degrees of freedom, and the p-value was 0.047, which is less than 0.05 and statistically significant at the 5% level. This indicates that there is a statistically significant association between area of work and knowledge score. Hence, the knowledge level regarding ergonomics significantly differs according to the nurses' area of work, with ICU nurses showing comparatively higher proportions of good knowledge than other departments

Table 4.11 depicts the association between attendance of ergonomics workshop and knowledge score among nurses. The calculated chi-square value was 11.18 with 2 degrees of freedom and the p-value was 0.004, which is less than 0.05 and highly statistically significant.

Table 4.11: Association Between Attendance of Ergonomics Workshop and Knowledge Score Among Nurses (n = 166)

Attended any workshop of ergonomics	Knowledge score			Total	Chi-square value (df)	p-value
	Poor	Average	Good			
Yes	18	9	0	27	11.18 (2)	0.004*
No	46	86	7	139		
Total	64	95	7	166		

This indicates that there is a significant association between attending an ergonomics workshop and knowledge score. Therefore, attendance of workshops has a significant influence on the knowledge level of nurses regarding ergonomics.

SUMMARY

This chapter analyzes data from 166 nurses assessing ergonomic knowledge and demographic associations via descriptive/inferential statistics.

Socio-demographics: Predominantly ≤30 years (53.6%), BSc Nursing (56.0%), 1–5 years experience (41.0%). ICU most represented (38.0%), followed by medical/surgical wards (28.3% each). Ergonomics workshop exposure minimal (83.7% none).

Knowledge levels: Moderate (57.2%), poor (38.6%), good (4.2%) indicating limited depth despite baseline awareness.

Inferential findings (χ^2): No significant associations with age (p=0.376), education (p=0.683), experience (p=0.316). Significant links with work area (p=0.047) and workshop attendance (p=0.004), highlighting departmental exposure/training impact.

These results emphasize targeted education via workshops, continuing programs to elevate knowledge and foster safe practices.

V. CONCLUSION

Nurses in acute wards of a Western Maharashtra tertiary care center exhibited predominantly moderate to inadequate knowledge of ergonomics and its role in preventing work-related musculoskeletal disorders (WRMSDs). Over half demonstrated moderate knowledge; a substantial minority showed inadequate levels, with few achieving adequacies. These results underscore critical gaps in ergonomic awareness among nursing staff.

Significant associations were observed between nurses' knowledge levels, their clinical work area and participation in ergonomics workshop. ICU nurses outperformed peers in medical, surgical, emergency wards likely due to intensive patient handling demands. Workshop attendees similarly excelled, affirming structured education's value. Age, education and experience lacked significant correlations.

Elevating ergonomic knowledge is imperative to avert injuries, alleviate fatigue, boost efficiency and safe guard patient care. Integrating routine training on posture, lifting and handling in professional development is essential.

VI. LIMITATIONS

- Single-center, acute-ward focus limits generalizability.
- Sample (n=166) may not reflect broader nursing populations.
- Knowledge-only assessment omitted practice evaluation, WRMD prevalence.
- Self-structured tool risks response bias.
- Unexamined confounders: workload, staffing, equipment, policies.

VII. RECOMMENDATIONS

- Replicate with larger, multi-institutional samples.
- Conduct comparative analyses across government/private, rural/urban settings.
- Evaluate interventional efficacy (workshops, structured programs).
- Assess knowledge-practice alignment.
- Pursue longitudinal impact on WRMD prevention.
- Investigate implementation barriers.
- Mandate institutional in-service education, ergonomic provisioning.

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