Practice of Proper Body Mechanics Technique and Associated Factors among Nurses During Patients Care in Resource Limited Setting, Northwest, Ethiopia

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Abstract

Introduction: *Body mechanics refers to how we hold our bodies while sitting, standing, lifting, carrying, bending, and sleeping. When we do not move properly and safely, the spine is subjected to abnormal stresses, which can lead to degeneration of spinal structures such as discs and joints, injury, and unnecessary wear and tear over time. As a result, the purpose of this study was to evaluate the practice of proper body mechanics technique and associated factors among nurses at the University of Gondar Comprehensive Specialized Hospital in Ethiopia in 2022.*

Method: *A cross-sectional study was carried out at an institution. The data was gathered from the respondents using a self-administered questionnaire. The Thurstone scale was used to score the questions, which were either yes or no. The collected data were cleaned, coded, entered into epi-data software, and exported to SPSS version 26 for analysis. Bivariate and multivariate logistic analysis were used to test the significance of dependent and independent variable associations using AOR at 95% CI. In multivariate logistic analysis, p-values less than 0.05 were considered statistically significant.*

Result: *This study included a total of 258 nurses, with a 100% response rate. 37.2% of respondents practice proper body mechanics on a regular basis. Knowledge (P=0.001), equipment used for patient transfer (P=0.041), ergonomics (P=0.027), attire (shoes) (P=0.00), and nurse per patient ratio (P=0.034) were the factors associated with the practice of proper body mechanics in a multivariate logistic regression analysis.*

Conclusion: *The practice of proper body mechanics is uncommon in our study area. Knowledge, patient transfer equipment, ergonomics, attire (shoes), and nurse-to-patient ratio were all significantly associated with proper body mechanics practice.*

Abbreviations
AOR= Adjusted Odds Ratio
BM= body mechanics
BSC= Bachelor of Science
CI= Confidence Interval
COR= Crude Odds Ratio

GBM= Good body mechanics
PBM= proper body mechanics
POBM= Poor body mechanics
SPSS= Statistical Package for the Social Sciences
UOGCSH= University of Gondar comprehensive specialized hospital

Introduction

Body mechanics is describes how we move in our daily lives. It includes how we hold our bodies when we sit, stand, lift, carry, bend, and sleep [1,2]. When we do not move our body correctly and safely, the spine is subjected to abnormal stresses, which can lead to degeneration of spinal structures such as discs and joints, injury, and unneeded wear and tear over time [1,3].

Musculoskeletal disorders are an important public health problem [4-7]. Among them are back conditions are a complex problem for certain occupational groups particularly in nursing personnel [8].

The prevalence of work related musculoskeletal disorders among nurses high [9-13]. Two out of every five nurses working in public hospitals had low back pain [14]. Lifting and transferring dependent patients, wound care, working in medical wards and intensive care units, working in incorrect positions, working in the same positions for an extended period of time, working with disoriented patients, and bending or twisting back during work are all significant risk factors in nursing. The risk increases when this is combined with poor posture and incorrect application of body mechanics principles [2,15,16].

Given the current state of knowledge, instruction in proper body mechanics and back care are recommended as component parts of a research protocol examining the effectiveness of a comprehensive back injury prevention program [17]. There is evidence that shows a significant difference in pain and disability before and after the intervention of proper body mechanics among nurses with low back pain [18].

In nursing, the emphasis is no longer solely on correct standing posture; other types of posture may be equally or more important. Because a nurse's day is filled with both complex and simple bodily movements [19]. The proper use of body mechanics in the nurse's manipulation of equipment and patients, resulting in fatigue and abnormal body stress prevention [20,21].

However, the practice of proper body mechanics has not been studied so far in the study area. The purpose of this study was to determine the practice of body mechanics and associated factors among nurses.

2. Methods and Materials
2.1 Study Design and Setting

The study was conducted at the University of Gondar comprehensive specialised hospital (UOGCSH) in North Western Ethiopia. From July to August 2022, an institutional-based cross-sectional study was conducted. The hospital is located in the Amhara regional state of northwest Ethiopia, in the town of Gondar. Gondar Town is located 180 kilometres from Bahirdar and 727 kilometres from Addis Abeba, Ethiopia's capital city. The hospital was established in 1954. This is a teaching hospital at the tertiary level that serves approximately 7 million people in the surrounding areas. These health care facilities employ 600 full-time nurses.

2.2 Sample Size Determination and Sampling Technique

This study's sample was determined using the Single population proportion formula for institutional cross-sectional study. As a result, the total sample size required for this study was required.

$$n= \frac{(Z\alpha/2)^2\ (P)\ (1-P)}{d^2}$$

Where n= calculated sample size for this study.

$Z\alpha/2$ = the 95% confidence interval estimated value (Z=1.96)
  P= population proportion
  d= margin of error to be tolerated in statistical estimation (0.05 in human study).

$$n= \frac{(Z\alpha/2)2\ (P)\ (1-P)}{d2} = \frac{(1.96)2\ (0.5)\ (0.5)}{(0.05)2} = 384$$

We needed a correction formula because the reference population was less than 10,000 people. Let the first calculated sample size be ni, and the minimum sample size be nf= ni/ (1+ ni/N), where N is the total number of nurses employed at the university of Gondar comprehensive specialised hospital. Therefore, 384/ (1+384/604) ~ 235. For this study, the final calculated sample size was 258 and was chosen using a simple random sampling technique with non-respondents accounting for 10% of the population. The calculated sample size was distributed proportionally via systematic random sampling among 600 full-time employees.

2.3 Data Collection Procedures

The data was gathered from the respondents using a self-administered questionnaire. The questionnaire was created following a review of relevant literature and was based on the variables needed to achieve the study's objectives. The questionnaire used a 'Thurstone' scale, which means it included 'yes' or 'no' questions. The data was gathered by the five members of the research group. The information provided by respondents in the survey form was used to compile the data. The questionnaire was distributed while the respondents were in the wards. Respondents were free to take their time answering this survey, but they did so under the supervision of the researcher

3. Variables
3.1 Dependent Variables

Practice of proper body mechanics

3.2 Independent Variables

Sociodemographic factors (Age ,Sex,position,Years of experience). Factors of Context (Training course of body mechanics,Knowledge of proper body mechanics). Equipment (gait belt or transfer belt, slider board or transfer board, rota stand and hoist) (gait belt or transfer belt, slider board or transfer board, rota stand and hoist), Attire(shoes), Collaboration. Ergonomics (Nurse-patient ratio, working hours per day)

4. Operational Definitions

4.1 Proper Body Mechanics

Implies utilising the safest and most effective methods to lift and move patients or large items: If a responder answered 70% or more of the questions correctly as measured by the Turnstone scale, they were categorised as having Good Practise of Proper Body Mechanics, whereas those who responded less than 70% were classified as having Poor Practise of Proper Body Mechanics: A person who has a general knowledge of information, facts, ideas, truths, and principles concerning body mechanics and answers 80% or higher is considered to have good knowledge of proper body mechanics [22].

4.2 Training Course of Body Mechanics

Is instructions that provides students with basic knowledge of how to prevent musculoskeletal injuries when performing patient transfers [23].

4.3 Nurse Patient Ratio

Is the number of nurses working on a particular ward, unit or department, in relation to the number of patients they care for [24].

4.4 Nursing Equipment

Are necessary items designed to assist in the transfer and lifting of patients (e.g., sliding sheets, Rota stands, hoists) [23].

4.5 Attire-clothing (including shoes) for a particular occasion [23].

4.6 Multi-disciplinary Collaboration- consists of having professionals in different areas within the same group, such as physiotherapists, nurses and doctors [23].

4.7 Ergonomics Is designing equipment to fit the worker to reduce risk of injury [18].

4.8 Working Hours Per Day

Is the period of time that a person spends at paid labor [24].

5. Data Collection Tool/Instrument

We used a structured questionnaire with three parts, which the respondents completed. It consisted of 34 questions that described body mechanics principles and were associated with proper body mechanics as a work environment. The 'Thurstone' scale was used for scoring, which included 'yes' or 'no' answers to 29 questions. Respondents were given two statements and asked to choose one. The instrument has been modified in accordance with the study's objectives, which focus on the principles of body mechanics and their application. Researchers also chose free items as an instrument, which consists of 5 questions in which respondents were asked to express their opinions without being given a choice or category. Instruments designed to meet the goals of modifier interests and practice

6. Data Quality Control and Management

To ensure data quality, data collectors and supervisors were trained. Prior to data collection, the questions were pre-tested to ensure response accuracy, language clarity, and tool suitability. The study began with 5% of the total sample size (13 subjects). It was completed within a week of the actual data collection period for the population at Ayira hospital, which has similar characteristics to the actual study population. Routine checks are performed by the supervisor to ensure that the data is complete and consistent. The changes for the actual study were made based on the results of the pre-test.

7. Data Processing and Analysis

The collected data were cleaned, coded in epi-data software, and exported to the statistical software SPSS version 26 for analysis. AOR at 95% CI was used to test the significance of the association of dependent and independent variables using bivariate and multivariate logistic analysis. In multivariate logistic analysis, variables with p-values less than 0.05 were considered statistically significant. Finally, the study's findings are summarised and described using descriptive statistics (percentages, frequency, mean values, and standard deviations), as well as tables and pie charts.

8. Result

8.1 Socio-Demographic Characteristics

A total of 258 nurses participated in this study, with a 100% response rate to self-administered questioners. Males made up 58.5% of those who responded. 60% of those polled are between the ages of 26 and 30. The majority of participants had 1-5 years of service and were considered new, which contributed 171 (66.3%), whereas 51.2% were senior nurses. In terms of educational level, approximately 223 (86.4%) of the respondents held a bachelor's degree or higher (Table 1).

Variable	Category	Frequency	Valid percent (%)
Sex	Male	151	58.5
	Female	107	41.5
Age	20 – 25	25	9.7
	26 – 30	160	62
	31 – 35	42	16.3
	36 – 40	21	8.1
	41 and above	10	3.9
Years of service	1 – 5	171	66.3
	6 – 10	75	29.1
	11 and above	12	4.7
Education level	Diploma	15	5.8
	Degree	223	86.4
	Master	20	7.8
Position	Junior nurses	82	31.8
	Senior nurses	132	51.2
	Nurse instructor	28	10.9
	Sister	16	6.2

Table 1:Socio-Demographic characteristics of the study Participants at University of Gondar Comprehensive Specialized Hospital, Northwest, Ethiopia, 2022 (n=258)

8.2 Level of Practice of Respondent
The practise of good body mechanics among respondents is suboptimal. Only 37.2% (CI=31.4, 42.6) of respondents use proper body mechanics effectively (Figure 1).
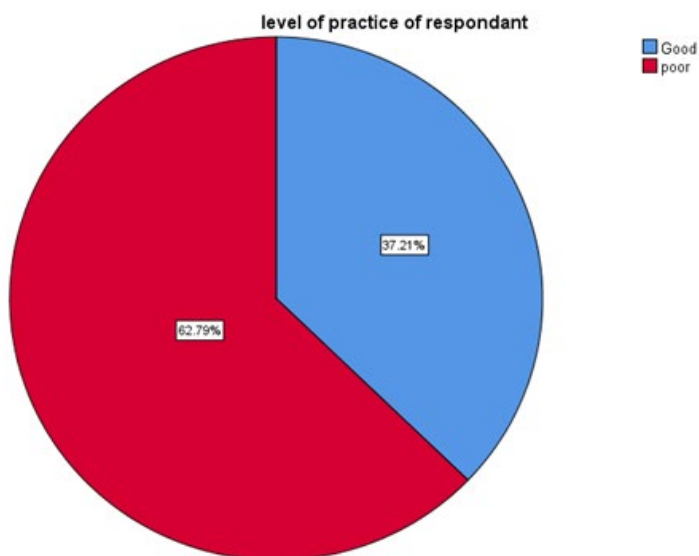

Figure 1: Practice of practice of proper body mechanics among nurses during patients care at University of Gondar Comprehensive Specialized Hospital, Northwest, Ethiopia, 2022 (n=258)

8.3 Factors Associated with Practice of Proper Body Mechanics Among Nurse

Only 54.7% of respondents have good knowledge of PBM, and only 35.3% have transfer equipment and ergonomics, which is approximately 47.7%. 40.7% of respondents have taken PBM training. 55.8% and 77.5% of those who wore attire and required assistance from a colleague, respectively. Furthermore, nurses who can work more than 8 hours per day were 71.7%, and those who can see more than 10 patients per day were 65.1% (Table 2).

Variable	Category	Frequency	Valid present
Knowledge	Good	141	54.7
	Poor	117	45.5
Equipment	Yes	91	35.3
	No	167	64.7
Training	Yes	105	40.7
	No	153	59.3
Ergonomics	Yes	123	47.7
	No	135	52.3
Attire	Yes	144	55.8
	No	114	44.2
Nurse works time per a day	Yes	185	71.7
	No	73	28.3
Nurse per patients	Yes	168	65.1
	No	90	34.9
Help	Yes	200	77.5
	No	58	22.5

Table 2: Associated factor with Practice of proper body mechanics among nurses during patients care at university of Gondar Comprehensive Specialized Hospital, Northwest, Ethiopia, 2022 (n=258)

Initially, binary logistic regression analysis was used to determine the relationship between PBM practise among nurses and various variables. Thus, PBM practise among nurses was associated with knowledge, patient transfer equipment, training of proper body mechanics techniques, ergonomics, attire (shoes), and nurse per patient and nurse works time per day. However, the association between practise and demographic data was not significant.

In contrast, multivariable logistic regression analysis was used, which included all variables with P values less than 0.05. Nurses with good GPBM knowledge were 4.22 times more likely to practise (AOR=4.22, 95% CI: 2.24, 7.97, p=0.00) than those with poor knowledge. Workplaces with patient transfer equipment were 1.92 times more likely to practise proper body mechanics than those without (AOR=1.92, 95% CI: 1.03, 3.51, p=0.04). And those who worked in a workplace with ergonomics were 2.05 times more likely to practise PBM than those who did not (AOR=2.05, 95% CI: 1.08, 3.86, p=0.02). The odds of practising proper body mechanics were 3.502 higher among nurses who wore attire (shoes) compared to those who did not (AOR=3.50, 95% CI: 1.81, 6.76, p=0.00). The likelihood of PBM practise was 2.16 times higher among nurses who had more than 10 patients per day compared to those who did not (AOR=2.16, 95% CI: 1.06,4.39, p=0.00). (Table 3)

Variable	Category	Practice		COR (95%CL)	AOR (95%CL)	p-value	CI 95%	
		Good	Poor				Lower	Upper
Knowledge	Good	73	`68	4.387	4.221	0.000***	2.235	7.971
	Poor	23	94	1	1	1	1	1
Equipment	Yes	47	44	2.572	1.921	0.041*	1.027	3.596
	No	49	118	1	1	1	1	1
Working time per day	yes	73	112	1.417	0.646	0.248	0.307	1.357
	No	23	50	1	1	1	1	1
Ergonomics	Yes	65	58	3.760	2.046	0.027**	1.084	3.861
	No	31	104	1	1	1	1	1

Attire	Yes	76	68	5.253	3.502	0.000***	1.813	6.763
	No	20	94	1	1	1	1	1
More than 10 patients per a day	Yes	76	92	2.891	2.160	0.034*	1.062	4.394
	No	20	70	1	1	1	1	1
Training	Yes	50	55	2.115	1.066	0.841	0.570	1.996
	No	46	107	1	1	1	1	1
Key *significantly associated, ** and*** very significantly associated when p value, 1 indicates reference group								

Table 3:Binar and multiple logestic regrational variables associated with practice of proper body mechanics among nurses during patients care at university of Gondar Comprehensive Specialized Hospital, Northwest, Ethiopia, 2022 (n=258)

9. Discussion

Our study has a 100% response rate. 60% of respondents are between the ages of 26 and 30. The majority of the participants had 1-5 years of service and were considered new, with 171 (66.3%) contributing, while 51.2% were senior nurses. In terms of educational level, approximately 223 (86.4%) of the respondents held a bachelor's degree or higher.

In this study, good practise PBM was found to be 37.2% (CI=31.4, 42.6)which was less than half. It is lower than that reported in studies conducted in the Philippines(23), Pakistan [25,26]. which found that 70%, 60%, and 68.2% of nurses practised proper body mechanics, respectively. This could be due to socioeconomic and health service provision differences, as Ethiopia is a developing country whereas the other countries mentioned are developed. As a result, they may have a well-organized working environment, high-quality health care, and nurses who are well-versed in ergonomics issues, education, and training programmes. Furthermore, the self-prevention strategy of PBM in Ethiopia and the other countries mentioned may differ.

The study participants with good proper body mechanic knowledge were 4.22 times more likely to practice (AOR=4.22, 95% CI: 2.24, 7.97) than those with poor knowledge.which supported by the study conducted In Indian [27]. And in Spain [28]. The reason for those similarity could be the same study design used and the more the knowledge of the participants about the body mechanic technique; the more they practice it.

In work place which had patient transfer equipment were 1.92 times more likely to practice proper body mechanics when compared to those who had not (AOR=1.92, 95% CI: 1.03, 3.51). A reason for this was found in the response of the study participants (64.7%) of them stated that there is not available material for patient handling.That means they had been manually handling patients (e.g. lifting patients from and to bed, turning patients' side to side, repositioning patients, etc.).and the equipments provided with the manuals that states how to use it.

The study participants who worked in a workplace with ergonomics were 2.05times more likely to practice proper body mechanics than those who did not(AOR=2.045, 95% CI: 1.08, 3.86). which similar to the study done in Egypt on effect of implementing body mechanics and ergonomics training program on nurses' that revealed positive correlation existed between body mechanics and ergonomics practices [18].

The odds of practice proper body mechanics were 3.50 higher among nurses who wore attire (shoes) as compared to those who did not(AOR=3.50, 95% CI: 1.81, 6.76). This finding supported study conducted in New Zealand on Providing adequate footwear as an another recommended intervention appropriate type of footwear for each individual nurse. Participants agreed that this would be an effective way to promote good posture and reduce pain and discomfort among nurses [29] .

The likelihood of proper body mechanics practise was 2.16 times higher among nurses who had more than 10 patients per day compared to those who did not (AOR=2.16, 95% CI: 1.06,4.39) The reason might be work load that lead to musculoskeletal discomfort, so they practice proper body mechanics as a prevention mechanism [27].

9.1 Limitation and Strength of the Study

This study was a cross-sectional design conducted from one hospital setting. This would require larger scale investigation from multiple settings to increase the power and generalizability. Furthermore, most of our study questionnaire have used close-ended questions. This might have limited the participants' responses regarding their knowledge and practice proper body mechanics.

Biseds those limitations the study was provide valuable data on the study population and study areas to make inference.

10. Conclusion

The practice of good proper body mechanics is low in our study area. Knowledge, equipment used for patient transfer, ergonomics, attire (shoes), and nurse per patient ratio were significantly associated with practice of proper body mechanics. Having good knowledge about body mechanics and use of equipments with its manual were helpful to practice good body mechanic techinique and for reduction of discomforts or stress of the body.

Declarations
Ethical Approval and Consent to Participate

Prior to data collection, ethical approval was obtained from the university of Gondar's college of medicine and health science school of medicine ethical board review committee. All study

participants gave their written informed consent. The objective of the study was explained to the study participants. The study participants' privacy and confidentiality were upheld. The collected data was not accessed by unauthorized individuals. The computerized data was only available to the principal investigator. All data collected for this study were collected in accordance with the Helsinki Declaration principles.

Consent to publication
N/A

Data Availability Statement
The data of this study can be available for reasonable request from the corresponding author

Conflict of Interest
All the authors declared that they have no competing interest.

Author's Contribution
proposal writing, coordination of data collection activity, data entry and processing, the data analysis and drafted the paper were made by MF. MM, JS,KC,TK,ABZ,RE and GJ; revise the proposal and supervising the data collection, data clearance, analysis and manuscript writing. All authors reviewed the final manuscript.

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