

# The Influence of Individual Characteristics and Work Posture toward Musculoskeletal Disorders (MSDs) to the Inpatient Nurse in X Hospital Area of Surabaya

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**Abstract:** Nurse becomes one of the high-risk jobs for Musculoskeletal Disorders (MSDs) than other jobs. The transfer of patients has been identified as a contributing factor to the Musculoskeletal Disorders (MSDs) on nurses, especially pain in the lower back, neck, and shoulders. The purpose of this study was to analyze the influence of individual characteristics and work posture toward Musculoskeletal Disorders (MSDs) in the nurse in the X hospital, especially in inpatient. This study was an observational analytic study. Data collected by using Rapid Entire Body Assessment (REBA) and the Nordic Body Map questionnaires were administered before and after working for 3 days in a row. Descriptive statistics and statistical analysis of categorical regression was used to analyze the data of this study. Statistical analysis showed the influence of individual characteristics and work posture together to MSDs of 47.4% (R square = 0.474). The factors that most influence on MSDs: gender and work posture, then work period and age. MSDs complaints ranging from the highest in a row that the lower back (72.2%), upper back (66.67%), upper neck (58.33%), and hip (38.89%). Individual characteristics and work posture influence on MSDs and most influential variables: gender and work posture. Efforts to provide mechanical aids and periodic training to nurses on patient transfer techniques can be performed by the hospital to prevent MSDs in nurses.

**Keywords:** work posture, nurses, musculoskeletal disorders (MSDs)

## 1. Introduction

A plenty of data from various studies from different countries show Musculoskeletal Disorders (MSDs) is one of the largest cases of occupational health. Musculoskeletal complaints in the work will cause pain and discomfort in the works. This can lead to stress or dissatisfaction at work, reduced productivity, inability to complete obligation of work, even difficulty in activities at home (Occupational Health and Safety Agency for Healthcare in BC, 2003).

One of the workers who are vulnerable to Musculoskeletal Disorders (MSDs) is a nurse at the hospital. Menzel, et al. (2004) explains that the risk factors for Work Related Musculoskeletal Disorders (WRMSDs) on nurses include turning, lifting, bathing, dressing, and transfers. Other risk factors include weight patients who were transferred, the frequency of lifting, and the level of awkward posture during work can cause MSDs in nurses.

Based on preliminary observations known that the work of nurses in the inpatient unit at risk for musculoskeletal disorders occur due to factors that work is still manual handling of patients with weight lifting patients so vary that require over-exertion to lift the patient. Room conditions were not sufficiently spacious limit the movements (mobilization) of nurse so that it can cause awkward posture. Statistical Agency in Sweden 2006 reported that musculoskeletal problems that often arise in the nurse include: pain in the lower back (50%), shoulders, arms, and fingers (24%), neck (6%) and legs (14%).

This study aims to determine the factors that influence Musculoskeletal Disorders (MSDs) in the nurse at hospital X, especially in inpatient installation.

## 2. Materials and Methods

This research is an observational study with cross sectional design, namely the collection of independent variables and the dependent variable is done jointly or simultaneously. The research was conducted in November-December 2014 Inpatient installation of Hospital X in Surabaya. The population in this research that nurses inpatient hospital X (Y units), amounting to 15 nurses on the unit because most numerous manual handling activities (moving the patient). The sampling technique is the total population.

In this study, there are two variables: the independent variable and the dependent variable. The independent variables include: age, work period, gender, and work posture, while the dependent variable : musculoskeletal disorders (MSDs). Data collection through observation using techniques Rapid Entire Body Assessment (REBA) to measure the work posture, a questionnaire Nordic Body Map (NBM) to determine the complaints of musculoskeletal disorders (MSDs) are given before and after working for 3 consecutive days. Data were processed and analyzed using descriptive statistics and multivariate regression analysis categorical.

### 3. Results

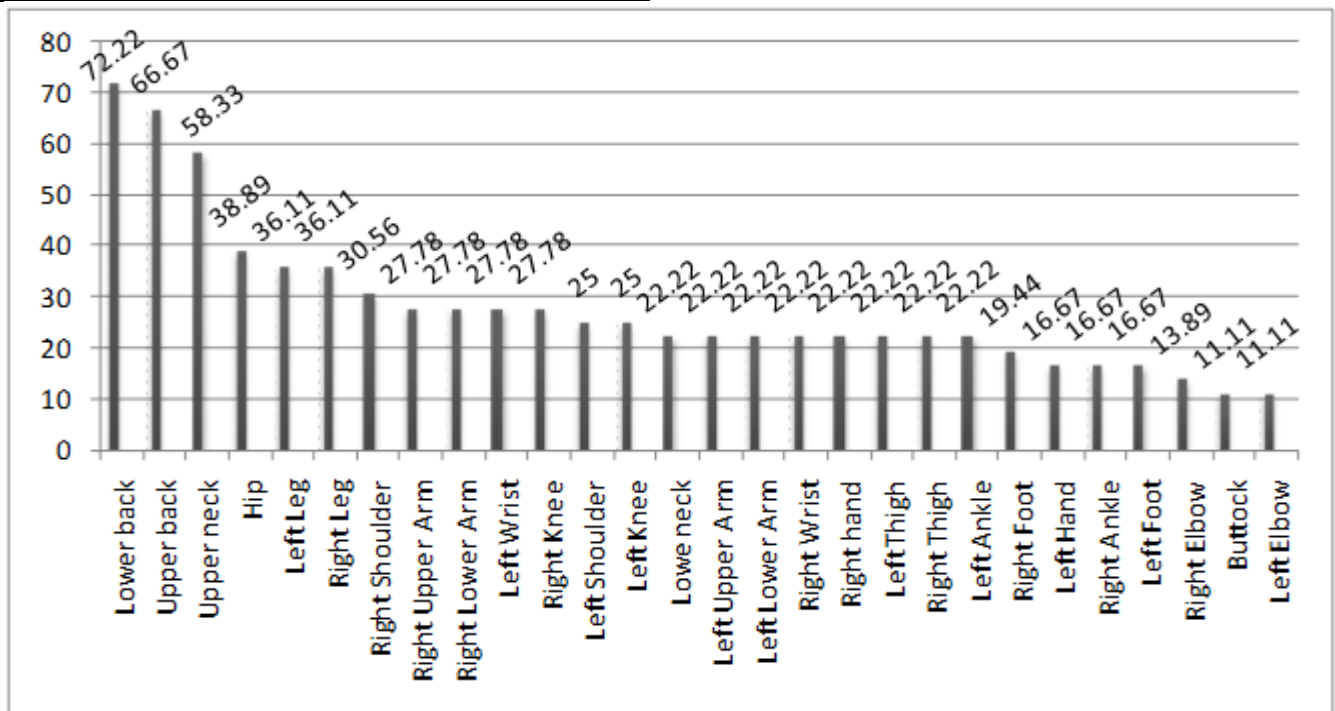
Posture	Not Ergonomic	86,67	
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Based on the results of questionnaires and observation work posture, the distribution of respondents was obtained as follows.

**Table 1:** Distribution of respondents (December 2014)

Variables	Category	Percentage (%)	Mean
Age	20 – 30 yrs old	33,33	36 years old
	31 – 40 years old	46,67	
	> 40 years old	20,00	
Work Period	≤ 5 Years	26,67	11 Years
	> 5 Years	73,33	
Gender	Male	46,70	-
	Female	53,30	
Work	Ergonomic	13,33	-

Table 1 show that the majority of respondents aged 31-40 years with a service life of > 5 years, the number of men and women respondent almost equally, and most of the work posture are including not ergonomic work posture. The musculoskeletal disorders (MSDs) in the respondent are calculated based on the average score of the questionnaire Nordic Body Map (NBM) NBM after working for 3 days. Results show MSDs complaints all respondents included in the category of low and medium. Most respondents including low MSDs category (86.67%), while respondents who are categorized MSDs are only a small proportion (13.33%). Here is a sequence of MSDs complaint on the part of the body.



**Figure 1:** Sequence Complaints Musculoskeletal Disorders (MSDs) on Respondents in Inpatient Installation X Hospital Surabaya region (December 2014)

Based on figure 1 it can be seen that the highest complaint at the lower back with the percentage of respondents who complain as much as 72.2%. In addition, the upper back of the percentage of 66.67%, 58.33% upper neck, and hip 38.89% are also included in the order of highest percentage. Here's a cross table showing the correlation between independent variables and the dependent variable.

**Table 2:** Correlation Independent Variable to Dependent Variable Crosstabs (December 2014)

Variables	Category	MSDs (%)		Total
		Low	Medium	
Age	20 – 30 years old	80,00	20,00	100%
	31 – 40 years old	85,71	14,29	100%
	> 40 years old	100,00	0	100%
Work Period	≤ 5 years	100,00	0	100%
	> 5 years	81,81	18,19	100%
Gender	Male	85,71	14,29	100%
	Female	87,50	12,50	100%
Work Posture	Ergonomic	50,00	50,00	100%
	Not Ergonomic	92,31	7,69	100%

Based on Table 2 it can be seen that all respondents aged > 40 years experienced a low level of complaints MSDs. When viewed from the work period, results show that the longer work period then complaint MSDs increasing. Based of sex showed almost the same results on the percentage of MSDs. In the ergonomic work posture, as much as 92.31% including MSDs low level, while the MSDs medium level as much as 7.69%. The final result of statistical test, the influence of independent variables and the dependent variable is shown in the table below.

**Table 3:** Results of statistical tests (December 2014)

Variables	Cofisien Beta	R Square
Age	-0,320	0,474
Work Period	0,542	
Gender	0,759	
Work Posture	0,609	

The statistical calculations show the results of the R square of 0.474. That is, the effect of independent variables on the

dependent variable together amounting to 47.4%. Based on the test results of the above statistics, it can be seen that the most influential variable on Musculoskeletal Disorders: gender and work posture.

## 4. Discussion

### 4.1 Age

Armstrong and D.B. Chaffin (1979) and Guo et al. (1995) stated that in general skeletal muscle complaints began to be felt in the working age is 25-65 years. The first complaint is usually felt at the age of 35 years and will continue to increase the level of complaints in line with age. In contrast, in this study indicate the age > 40 years of all respondents including MSDs low level and is based on a statistical test, the beta coefficient age variable has a negative correlation direction, meaning that increasing age, the complaint MSDs decrease.

The difference can be explained by the conditions on the research location shows the manual handling activities more performed by young nurses, whereas older nurses more perform administrative tasks so that the risk of MSDs at younger nurses greater than older nurses. Acclimatization factor can also to be the cause of lower complaint MSDs at older nurses. As the nurses are accustomed to do the work so that they assume the complaints are common and no longer felt.

Other factor according to Tinubu, et al. (2010) is a factor of knowledge. Older nurses are very probably understand more about the prevention of the risk of injury due to moving patients than younger nurses so that nurses will avoid dangerous physical burden and develop better prevention strategies MSDs than younger nurses.

### 4.2 Work Period

Various studies have explained that the factors working period is one of the factors causing MSDs, among which research Cohen, et al. (1997) which describes the work has a strong correlation with the complaint of muscle and increase the risk of MSDs. Research Kulkarni, et al. (2013) obtained results that nurses with work experience > 5 years reported experiencing Work Related Musculoskeletal Disorders (WRMSDs).

This study appropriate to the theory because MSDs medium levels were found in the working period > 5 years, while the working period ≤ 5 years all respondents including MSDs low level. That is, the longer work period, complaints MSDs increasing. In addition, the results of this study are consistent with research Munabi IG, et al. (2014) that work period associated to MSDs significantly.

According to research Humantech (1995), disorders of the musculoskeletal system never occur directly, but a clash of clusters of small and large accumulated continuously in a relatively long time, it can occur in few days, months and

years, depend on the severity of trauma so that causing injure, pain, numbness, or stiffness in musculoskeletal.

### 4.3. Gender

The results of this study indicate that sex is one of the factors that affect the MSDs. This is in line with several studies significantly showed that gender strongly influence the level of risk of muscle complaints. It because physiologically, the women muscle ability is inferior to men. Astrand and Rodahl (1986) explain that the women muscle strength is only 2/3 of men so endurance muscle of men were higher than women.

Research Chiang et al. (1993) and Hales et al. (1994) show a comparison of muscle complaints between men and women are 1: 3. Based on the research Mehrdad R, et al. in 2010 explained that women workers are more susceptible to Work Related Musculoskeletal Disorders (WRMSDs) compared to male workers.

### 4.4 Work Posture

Based on the results of observations showed some work posture that seem awkward performed by nurses during patient transfer process are bending position which this position away from the natural position of the spine in a straight position thus causing spinal complaint if continuously performed. The position of the arm away from the body so causing over reaching position when reach out patient to move from bed to another bed. This condition can lead to puts pressure on the nurse's arm; causing complaints in the arm, in addition the lower arm flexed position resulted in no straight arm position. Elevated head position is also visible when the nurses do patient transfer. The position causes the position of the head is not aligned with the neck causing complaints on the neck.

According to the theory explained that the more away of the body position from the center of body gravity, higher the risk of musculoskeletal system complaints. Improper posture causes spinal curves are not in a straight line so easy to injury and disorders in premature discs (Depkes RI, 2006).

The presence of awkward posture by nurses caused by the demands of work and work tools to reach out patients on stretcher to be transferred to the patient's bed. Both handle located on the side of the sliding sheet curved form of a small slit in the side of the sliding sheet forcing nurses to over bending to reach the handle and pull it so that the patient move to the bed. Therefore, it needs to be redesigned to handle the sliding sheet which is easily accessible by nurses. In addition, administrative controls are also needed, such as improved ergonomics socialization to nurses and procurement stretching program.

## 5. Conclusion and Acknowledgements

Based on the results and discussion can be concluded that most of the nurses showed not ergonomic work posture. Complaints Musculoskeletal Disorders (MSDs) in the inpatient nurses are lower back, upper back, upper neck, hip,

left and right calf. Individual characteristics and work posture influence to the MSDs and most influential variables: gender and work posture.

## 6. Suggestion

Efforts to control the risk of Musculoskeletal Disorders (MSDs) can be done through engineering controls, such as the provision of mechanical aids for patient transport when it is possible. The administrative controls, such as the socialization of ergonomics and the risk of musculoskeletal disorders due to the work of nurses, procurement stretching program, and periodic training to nurses about lifting or moving patients techniques.

## References

- [1] Armstrong, T.J., D.B. Chaffin, (1979). Some biomechanical aspects of the carpal tunnel. *Journal of Biomechanics* Vol 12, p 567-570.
- [2] Astrand, P.O and Rodahl, K. (1986). *Textbook of Work Physiology*. McGraw-Hill Book Company. New York.
- [3] Chiang H-C, Yin-Ching K, Chen S-S, Hsin-Su Y, Trong-Neng W, Chang P-Y., (1993) Prevalence of shoulder and upper-limb disorders among workers in the fishprocessing industry. *Scandinavian Journal of Work Environment and Health*. Vol. 19, pp. 126-131.
- [4] Cohen, Alexander L, Bernard, Bruce P, Fine, Lawrence J., Gjessing, Christopher C., and McGlothlin, James D. (1997). *Elements of Ergonomics Programs. A primer Based on Workplace Evaluations of Musculoskeletal Disorders*. US Department of Health and Human Services. NIOSH. Amerika.
- [5] Depkes RI. (2006). Mengatasi Gangguan Punggung. <http://www.depkes.go.id/> (sitasi 1 Oktober 2014).
- [6] Guo, H., S. Tanaka, Cameron LL, Seligman PJ, Behrens VJ, Ger J, Wild DK, Putz Anderson V, (1995). Back pain among workers in the United States: National estimates and workers at risk. *Am. J. Indus. Med*, Vol 28, p 591-602.
- [7] Hales, T.R., Sauter, S.L., Peterson, M.R., Fine, L.J., Putz-Anderson, V., Schleifer, L.R., et al., (1994) Musculoskeletal Disorders Among Visual Display Terminal Users In A Telecom-Munications Company. *Ergonomics*. Vol. 37, No. 10, pp. 1603–1621.
- [8] Humantech. (1995). *Applied Ergonomic Training Manual Second Edition*. Barkeley Vale. Australia.
- [9] Kulkarni S, N G Darsana, (2013) Musculoskeletal Risk Assessment among Nurses in Patient Manual Handling in Hospital Wards – A Cross Sectional Study. *Cureus*. Vol. 5, No. 8, p 137.
- [10] Mehrdad R, Dennerlein AJT, Haghigat M, Aminian O, (2010) Association between Psychosocial Factors and Musculoskeletal Symptoms Among Iranian Nurses. *Am J Ind Med*. Vol. 53, p 1032–1039.
- [11] Menzel, N. (2004). Back pain prevalence in nursing personnel. *AAOHN Journal*. Vol. 52:54–65.
- [12] Munabi I.G, William Buwembo, David L Kitara, Joseph Ochieng and Erisa S Mwaka, (2014) Musculoskeletal Disorder Risk Factors Among Nursing Professionals in Low Resource Settings: A Cross-Sectional Study in Uganda. *BMC Nursing*. Vol. 13, No. 7.
- [13] Occupational Health and Safety Agency for Healthcare in BC. (2003). *Guide Ergonomic for Hospital Laundries*. British Columbia.
- [14] Swedish Statistic. (2006). *Musculoskeletal Ergonomic Statistic*. Swedish.
- [15] Tinubu Bolanle MS, Chidozie E Mbada, Adewale L Oyeyemi, Ayodele A Fabunmi, (2010) Work-Related Musculoskeletal Disorders among Nurses in Ibadan, South-West Nigeria: A Cross-Sectional Survey. *BMC Musculoskeletal Disorders*. Vol. 11, No. 12.