Critical Care Nursing

Iran J Crit Care Nurs 2013,5(4):196-203

Journal home page: www.inhc.ir

Related factors of Body posture Ergonomic in intensive care units nurses during Work.

Maryam Khoshbakht[1], Mojgan Baghaei Lakeh [*1], Farideh Hasavari[1], Ehsan Kazemnejad leili[1], Mahdi Jahangir Bolourchian[1]

1. Medical Sciences University and educational-therapeutic services of Guilan .Research Center of Health related Social Factors.Guilan.Iran.*

ARTICLE INFO

Article type:
Original article

Article history:
Received: 5 Nov 2011
Revised: 9 Apr 2012
Accepted: 23 Apr 2012

Key words:
Ergonomic of human work
Environment
Posture
Nurse
Intensive Care Unit

ABSTRACT

Aim: Observing ergonomic principles during taking care of the patients by the nurses of ICU units can prevent many musculoskeletal damages. Regarding this, diagnosis of special related factors of every area can make it possible to have preventive effective program. The aim of this study was determining related factors of nurses' Body posture Ergonomic during position changing of patients in intensive care units.

Methods: In this analytic cross-sectional study all the nurses with determined characteristics of the study (n=91) had been assessed in intensive units of educational -therapeutic centers of Rasht in 2010 by census method and a 3-part tool including questionnaire of demographic factors, Knowledge and environmental factors that effect on Ergonomics during position changing. Data were collected by self-report method and observation and have been analyzed by inferential tests under **SPSS** software.

Results: The findings showed that almost half of nurses had moderate knowledge about ergonomics science (49/4%) and did position changing under desirable environmental condition (45/1%). According to GEE model, single samples with normal BMI and less work experience in ICU (p<0, 0001) among demographic factors, lack of adjustability of beds "parts "and "height" in work environment and poor knowledge were related to undesirable ergonomic condition.

Conclusion: The findings highlight necessitation of considering proper planning for controlling preventive related factors of ergonomic in ICU units during patients' position changing such as knowledge deficit, using present technologies and maintaining appropriate BMI.

Please cite this paper as:
Baghaei Lakeh M, Khoshbagkt M, Hasavari F, Kazemnejad leili E, Jahangir Bolourchian M. Related Factors of Body posture Ergonomic during work in Intensive Care Unit nurses. Iran J Crit Care Nurs 2013,5(4):196-203.

* Correspondence Author: Mojgan Baghaei Lakeh
Medical Sciences University and educational-therapeutic services of Guilan .Research Center of Health related Social Factors.Guilan.Iran. Tel:+98+9113311029
Email: baghaie@gums.ac.ir

1. Introduction

Nowadays, Work-Related Musculoskeletal disorders(WMSDs) is as one of the major

[Downloaded from mail.jccnursing.com on 2026-11-15]

problems of occupational health in industrial and developing countries that lack of observing ergonomics during using high force (picking up or pulling objects), repetitive or stretching modes or movements in inappropriate and steady state in some occupations are known as the main reasons of it [1]. Health care workers are among high risk cases for these disorders. For example 12.6 % of full time workers of nursing homes in USA in 2002 suffered from occupational damages that are significantly higher than industrial workers [2]. Nakhaie et.al in their study on ergonomic evaluation of working postures of nurses and musculoskeletal disorders in Medical- Surgical wards of Birjand University hospitals showed that majority of samples reported musculoskeletal disorders in their legs (62.8 %) and lower in their backs (53.5%) [1]. There are two main risk factors for back injury among nurses including lifting and transferring patients, and bed-making. Among these, activity of moving the patients is especially important based on research findings that indicate more than 40.1% of the reported damages in nurses are related to manual handling activity [3]. The remarkable point is that WMDs are about 52.5% in intensive care units (ICUs) nurses that is more prevalent than other area in hospital. Special work conditions in these units and necessity of doing many duties of taking care of the patients by nurses can be the causes of achieving this finding [4].

In this regard, using ergonomics and studying compliance among people and work type and paying attention to human's abilities and limitations [5] can be used as a main guideline for reducing occupational damages and costs [6].Although, Nakhaie et.al in their study on nurses showed that patient's moving technique was in high and very high risk level according to rapid body assessment (REBA) and needs immediate and fast implementations to improve it. These researchers concluded that paying attention to ergonomic based-mechanic teaching is needed in administrative and teaching plan to prevent WMDs [1]. Of course every interference should be done in a specific way and for particular work units [2] and it should be planned with paying attention to the effective factors on ergonomics such as human factors and physical characteristics including size of body and fitness, different senses like sense of sight and hearing and also individual psychological factors such as mental abilities, personality and people's knowledge. Also the type of technology, physical environment, temperature, humidity, light, noise and vibration are other related factors that can affect work ergonomic [7].

In addition, nurse's fruition of ergonomic knowledge in ICUs has special sensitivities [6], because of high dependence of patients to nursing care to move [7].

Considering the available researches that mainly were conducted on nursing in general wards [2] and limited access to data about ergonomic related factors during work in ICU, this study has conducted with the aim of determining the ergonomic related factors during work in ICUs in therapeutic-educational centers of Medical Science University of Rasht. It has been known that identifying the current situation is an important step to strategic planning and determining appropriate educational and administrative guidelines for preventing and reducing WMDs.

2. Methods

This analytic cross-sectional study has been done to evaluate prognostic factors of ergonomic posturing during changing patient's position in bed. Samples of the research were chosen by census method from all the nurses (145 people) who worked in ICUs and participated in changing the patient's position in therapeutic-educational centers of Rasht. Having associate degree in nursing, full time employment, lack of suffering from musculoskeletal disorders according to the person's words, lack of history of surgery in musculoskeletal system, lack of vision or hearing problems that affects on doing the work according to one's words and announcing oral consent for participating in the study were

[Downloaded from mail.jccnursing.com on 2026-11-15]

determined characteristics for the research samples. Finally, 91 nurses participated in the study. Data collection started after classification of nurses in two groups of low risk or desirable (score 1-3) and moderate/high risk or undesirable (4-15) body posturing ergonomics according to REBA tool. Data collection tool in this study was a 3- parted researcher-made questionnaire including demographic factors (age, gender, work experience, education and height and weight), Knowledge assessment (15 phrases) and work environment conditions (8 phrases). The scores of samples in Knowledge (with range of 0-30) with correct (2 points), I don't know (1 point) and wrong (0point) answers classified in 4 levels of weak (15 or less), moderate (15-20), well (20-25) and very good (more than 25) knowledge level. In order to bias control in answering phrases in 3, 4, 5,10,11,13 and 15 items were designed in a way that wrong choice was considered as the correct answer with reverse score.

The third part of the tools was a researcher made checklist (8 phrases) about features of work environment with answers of yes (1 point) no (0point) and no use (without point). Scores of this unit are (with range of 0-8) also classified in 2 levels of undesirable (less than 4) and desirable (4 and more).

Validity of all 3 questionnaires was determined by using content validity. Reliability and internal consistency of the knowledge questionnaire were confirmed according to the result of Kowder-Richardson 20 formula (α>0.75). Reliability of work environment checklist has been confirmed with kappa agreement coefficient 0.99 (p<o.ooo1), after simultaneous observation of two people.

Table 1: Distribution of subjects according to demographic variables

Individual variables of the subjects of the study / Distribution of the samples		number	percent	Mean ±SD (year)
gender	Female	88	96.7	
	Male	3	3.3	
age	20-30	36	39.5	32/03 ± 5/62
	30-40	42	46.1	
	40<	13	14.2	
Marital status	married	61	67.03	
	single	30	32.96	
Experience (year)	1-10	58	63.7	7/87±5/45
	10-20	30	32.9	
	20<	3	3.3	
Experience of working in intensive unit (year)	1-5	53	58.2	4/9±3/85
	5-10	23	25.2	

[Downloaded from mail.jccnursing.com on 2026-11-15]

Table 2: Distribution of the environmental characteristics items related to ergonomic posture in ICU Nurses.

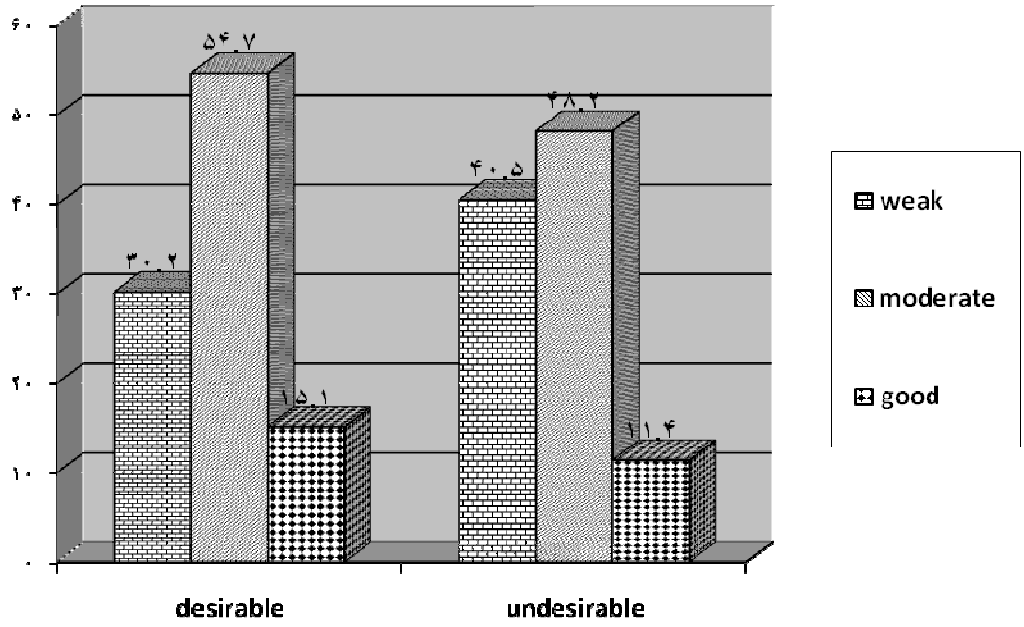
Environmental items \ Ergonomic status		Desirable (%)	Undesirable (%)	significance
Adjustability of bed height	Yes	41.7	14.7	Fisher test
	no	58.3	85.3	p<0,0001
	no	80.6	80.6	
Adjustability of different be parts	Yes	27.8	72.2	Fisher test
	no	16.4	83.6	p<0.03

Table 3: Estimation of body ergonomic regression coefficients by logistic model with GEE method

Individual factors \ Estimate related to ergonomic			coefficientβ	Wald chi – square	df	Odds ratio	P -value
Individual factors	Marital	Single	-0.508	169.700	1	0.44	0.0001
		Married	reference				
	BMI	Less than 20	-0.172	0.121	1	0.84	0.728
		20-25	-0.302	31.102	1	0.73	0.0001
		25-30	-1.107	18.227	1	0.33	0.0001
		>30	Reference				
	Experience of intensive unit		0.098	43.357	1	1.10	0.0001
Knowledge level	Weak		0.829	309.590	1	2.29	0.0001
	Moderate		0.002	0.0001	1	1.002	0.997
	Good		reference				
Work environment factors	3. patient's bed height is adjustable		1.425	32.711	1	4.156	0.0001
	7. Different parts of the bed is adjustable		0.672	7.859	1	1.958	0.005

Research tools were used after taking the related letters of introduction and giving them to nursing officials in all work shifts in determined ICUs. Data were collected by self-report method (except measuring height and weight and calculating BMI) for demographic and knowledge assessment tools; and observation method for environmental checklist. In order to control confounding factors, the questionnaires were given to the samples that were satisfied to participate in the research (with census method) at the first hours of every work shift and asked to complete them in maximum two hours.

[Downloaded from mail.jccnursing.com on 2026-11-15]



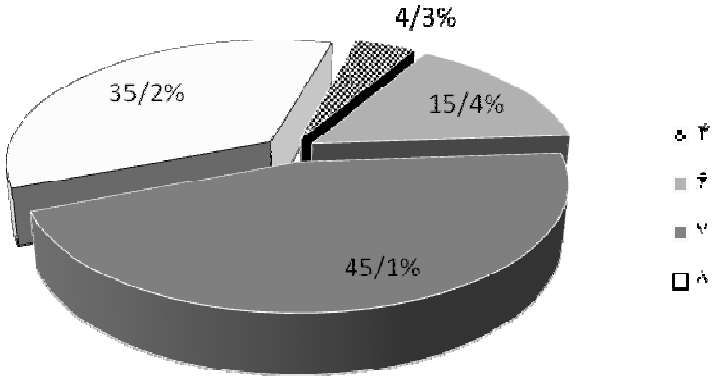
Graph 1: Distribution of ergonomic according knowledge level of nurses

Analysis of the results was done by using descriptive statistic (the mean and standard deviation) and inferential statistic (X2, Fisher and GEE model in logistic regression) under spss16 with regards of all ethical issues.

3. Results

Findings related to demographic data are shown in table 1. In primary evaluation of ergonomics status it has been seen that most of the samples (80.6%) had undesirable ergonomics in changing patient's position. The findings also showed direct significant relationship between higher position in nursing ($p<0.017$) and lower work experience in ICUs ($p<0.0001$).

Also findings show that 49.4% of the samples



Graph 2: Distribution of the subjects of the study according to the given point to work environment

[Downloaded from mail.jccnursing.com on 2026-11-15]

in this study had moderate knowledge about patients' status changing ergonomic. Graph 1 shows that 69.8% of the samples with desirable ergonomics compared to 59.6% in undesirable ergonomic group had moderate to good knowledge about ergonomics fundamentals in patient's position changing. This difference was not significant by X2 statistical test analysis.

Findings revealed that 45.1% of the samples acted in work environment conditions with point of 7 from total score 8 (graph 2). Thus all the cases of changing patients' status had been in desirable environmental conditions in overall. But statistical tests showed that there is a direct significant relationship between desirable ergonomic with adjustability of "bed height" ($p<0.0001$) and "bed sections" ($p<0.3$) in environmental factors (table 2).

Finally, logistic regression model with GEE method showed that work experience in ICU ($p<0.0001$), normal BMI at 20-25 ($p<0.0001$) and bachelorhood ($p<0.0001$) among demographic factors; weak knowledge (OR= 2.29) and lack of adjustability of "bed height" (OR= 4.156) and "different parts of the bed" (OR=1.958) were related to undesirable ergonomic status (table 3).

4. Discussion

This study showed that almost half of the subjects of the study (49.4%) had moderate knowledge about ergonomics related to changing patient's status. The data that make us worried was that only 12.1 % of samples had good knowledge and no one had very good level of knowledge. So knowledge deficit can result in inappropriate body posture and movements that can lead to localized mechanical stresses on the muscles, ligaments and joints resulting complain of neck, back, shoulders, wrist or other parts of musculoskeletal system [8]. This finding is in better level than finding of MossadeghRad's study that had shown weak knowledge level in nurses about Ergonomics with average of 2.68± 0.76 from 5 points [5]. Of course this higher level of the knowledge level in the present study in compare with Mossadegh Rad's study perhaps is because of the difference in study environment and relative stability of the nurses in ICU and thereupon possibility of achieving necessary information about taking care of the patients who need position changing and also difference in tools and method of scoring in two studies.

Finally, 40.5% of the samples with weak knowledge level in compare with 30.2% of the samples with good knowledge level had undesirable ergonomic posture. Statistical tests didn't show any significance in this difference. This finding can be because of more effect of other factors such as environmental conditions on ergonomic during work.

Findings in work environment conditions showed that 45.1% of the subjects in the study had done changing patients' position in environmental conditions with point of 7 from total score 8 (with the mean and standard deviation of 0.5±7.06). So 100% of the samples had appropriate work environment during changing patients' position. According to special conditions of the research environment that included intensive units this finding is expectable. Because all the centers of the study with special attention to intensive units and standardization of them in the recent years had necessary instruments and equipment to reposition the patients. But the study of relationship between postures ergonomic and every factor or item in work environment showed that there is significant direct relationship between body ergonomic posture during work with phrase of "adjustability of the bed height" and "Adjustability of bed parts". Observing this finding highlights the importance of intact technology of "adjustability of beds" during changing patients' position especially in ICUs.

Studying of related factors to body ergonomic posture of the subjects according to regression logistic model with GEE method according to OR odds ratio in this study showed that higher work experience in ICUs (OR=1.10), BMI in the range of 20-25 (OR=0.73) and 25-30

[Downloaded from mail.jccnursing.com on 2026-11-15]

(OR=.33) and also bachelorhood (OR=0.44) among demographic factors had had reverse significant relationship with body ergonomic posture during work of subjects of the study (table 3). Reverse relationship between years ofwork experience and observing ergonomic can be because of longer interval with acquired university education. This result is along with study of Nasleseroji in dentists that showed higher incidence of discomfort in thigh and leg areas of people with more work experience [9]. Regression coefficient estimate of knowledge factor related to body ergonomic posture of subjects of the study.

According to regression logistic model with GEE method it also revealed that subject with weak knowledge had 2.29 times (OR=2.29) more chance to undesirable ergonomic in compare with reference group (good knowledge). Also estimation of these coefficients in work environment factors related to body ergonomic posture in subjects shows that factors of "adjustability of the bed height" (OR=4.56) and "adjustability of different parts of the bed" (OR=1.958) among 8 environmental factors can increase desirable ergonomic posture significantly (table 3). This finding according to the basic knowledge that is adjusting height and different parts of the bed during changing patients' status (in order to reduce tension against nurse) is an important factor in maintaining appropriate ergonomic posture during work in nurses can be expectable.

According to the above results and this fact that work pressure can be effective on care quality and immunity and nurses' working life [10], necessity of this issue has been felt that health care workers should have basic knowledge about nature of work, work related risks and risk control methods. As WMDs management will have direct and indirect costs in nurses and result in high level of emotional problems, burnout, and absence from work, losing work time, leaving or decision for changing the job. health managers by using findings of the study can plan some measures such as holding short-term courses of teaching in service for training correct methods and principles of doing the work, adequate funding for reducing and controlling risk factors, promoting ergonomic, reducing damages and increasing satisfaction that all can increase the efficiency and effectiveness of nurses. Such planning is important so that presence of healthy nurses for vigilant monitoring and empathic care of the patient will be vital [11].

It has to be mentioned that despite attentions and coordination for determining appropriate time for collecting data, some factors such as nature of the data, collection method, research environment conditions and necessity of researcher's presence for observing nurse's work could effect on care approach by nurses that are among uncontrollable limitations in this study.

5. Conclusion

This study showed that most of related factors of nurses' ergonomic during changing patients' position in ICUs were preventable. Thus it is possible to reduce WMDs and increase nurse's efficacy with approaching special teaching plans on ergonomic and using intact technology.

6. Acknowledgment

The authors thank and appreciate honorable deputy of research of Gilan Medical University, honorable nursing officials of Rasht University and its health centers, faculty members of nursing and midwifery college of Shahid Beheshti in Rasht, all the colleagues and also participants in this study.

Reference

1. Nakhaei M, Faragzadeh Z, Tabiei Sh, Saadatjoo SA, Mahmoodi Rad Gh, Hoseini MH. Evaluation of ergonomic position during work in nurses of medical and surgical wards in Birjand University of Medical Sciences hospitals. JBUMS. 2006;13(2):71-76**.** Text in persian
2. Fujishiro K, Weaver JL, Heaney CA, Hamrik CA, Marras CA. The effect of ergonomic interventions in healthcare facilities on musculoskeletal disorders. Am J Industrial Med. 2005;48(5):338-47.

[Downloaded from mail.jccnursing.com on 2026-11-15]

3. Hedge A. Back care for nurses. 2009 available in www.Ergostoreonline.com.
4. Ranjbar S, et al., Survey of effective personal and familial factors on absenteeism in nursing professionals at educational-therapeutic centers in Rasht in 2007-2008. J Nurs Midwifery Facaul Guilan Med Univ. 2008;18(60):17-22.
5. Mossadeghrad MA. The relationship between awareness of the science of ergonomics and occupational injury rates in nursing personnel. J Med Sci Branch. 2004;6(3):23-31.
6. Bashardoust D. The study of human factors in equipment design. The world of science and technology. [Available from: WWW.scitech.blogsky.co]. 2008.
7. Porghasemi A. Bitten and quantitative methods to evaluate the characteristics of workplace ergonomics. Hamedan Fanavaran. 2007:1-6.
8. Kurowski A, Punnett L, Boyer J,Nobrega S, Fulmer S. Factors associated with changes in ergonomic exposures among nursing assistants after the introduction of a no-lift program in nursing homes.APHA 137th Annual meeting and expo. Philadelphia, pennsylvania Am public Heath Asso 2009 available from: http://apha.confex.com/
9. Nasleseroji H. Ergonomic Evaluation of Dental professions practitioners by REBA method in Birjand. J Dent Med Tehran Uni Med Sci. 2005;18(1):7-61
10. Gurses A.P, Carayon P,Wall M. *Impact of performance obstacles on intensive care nurses' workload, perceived quality and safety of care, and quality of working life.* Health Services Research. 2009; 44(2p1): 422-443
11. Trinkoff AM, Geiger-Brown JM, Caruso CC, Lipscomb JA, Johantgen M, Nelson AL, Sattler BA, and Selby VL. *Personal Safety for Nurse, chap 39*:Hudge A. Patient safety and Quality: An Evidence Based Handbook for Nurses(US). 2008, available from:http://www.ncbi.nlm.nih.gov/books/NBK2661

[Downloaded from mail.jccnursing.com on 2026-11-15]