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Knowledge and Application of Body Mechanics: Nurses of a Hospital in Ecuador

Conocimiento y Aplicación de la Mecánica Corporal: Enfermeras de un hospital de Ecuador

Conhecimento e Aplicação da Mecânica Corporal: Enfermeiras de um hospital no Equador

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Abstract

Nursing is a profession that within its role should have knowledge and applicability of body mechanics in patient care, Ecuador maintains high statistics of musculoskeletal symptomatology related to the limited knowledge and applicability of body mechanics. The objective of this article is to analyze the application of the principles of body mechanics during the work performed by the nursing staff of the Alfredo Noboa Montenegro Hospital in the province of Bolivar Guaranda-Ecuador, a non-experimental, descriptive and correlational study. Population of 124 people, census sample, with three instruments for data collection: survey, questionnaire and observation guide. (1) Survey: collects information on social characteristics (age, sex, level of academic training, number of working hours, work shifts, length of service and service in which they work); (2) Questionnaire: collects knowledge on PMC; and (3) Observation guide: evaluates the application of these principles during work. The mean age was 42.20 ± 9.33 years (24-64 years), the predominant sex was female (91.94%), 69.35% were nurses and 30.65% were auxiliary nurses. The 33.72% completed a master's degree or specialization; 71.77% work 40 hours per week and 89.52% work rotating shifts, the work seniority was 14.75 ± 7.66 (1-59 years) and moonlighting was 8.06%. The 78.23% showed deficient knowledge but higher in the assistants, with no significant difference. Ergonomic risk was high (77.42%), even significantly higher for nurses ($p<0.001$). There was a significant association between ergonomic knowledge and risk, the greater the lack of knowledge of the principles, the greater the ergonomic risk ($P <0.01$). Conclusion: it is necessary to intervene in this personnel, to raise awareness and use of the BMP and to reduce ergonomic risk during work.

Keywords: Body mechanics; knowledge; musculoskeletal disorder; nurses; Ecuador.

Resumen

La enfermería es una profesión que dentro de su rol debe tener conocimiento y aplicabilidad de la mecánica corporal en el cuidado del paciente, Ecuador mantiene estadísticas elevadas de sintomatología músculoesquelética relacionada al limitado conocimiento y aplicabilidad de la mecánica corporal. El objetivo de este artículo es analizar la aplicación de los principios de la mecánica corporal durante el trabajo realizado por el personal de enfermería del hospital Alfredo Noboa Montenegro de la provincia de Bolívar Guaranda-Ecuador, estudio no experimental,

descriptivo y correlacional. Población de 124 personas muestra censal, con tres instrumentos para la recolección de datos: encuesta, cuestionario y guía de observación. (1) Encuesta: recoge información sobre características sociales (edad, sexo, nivel de formación académica, número de horas de trabajo, turnos de trabajo, antigüedad laboral y servicio en el que se desempeña); (2) Cuestionario: recoge conocimientos sobre PMC y (3) Guía de observación: evalúa la aplicación de estos principios durante el trabajo. Obteniéndose que la edad media fue 42,20 ± 9,33 años (24-64 años), predominó el sexo femenino (91,94%), el 69,35% enfermeras y el 30,65% auxiliares de enfermería. El 33,72% completó una maestría o especialización; El 71,77% trabaja 40 horas semanales y el 89,52% trabaja en turnos rotativos, la antigüedad laboral fue de 14,75 ± 7,66 (1-59 años) y el pluriempleo fue del 8,06%. El 78,23% mostró conocimientos deficientes pero superiores en los asistentes, sin diferencia significativa. El riesgo ergonómico fue alto (77,42%), incluso significativamente mayor para las enfermeras (p <0,001). Hubo una asociación significativa entre conocimiento ergonómico y riesgo, a mayor desconocimiento de los principios, mayor riesgo ergonómico (P <0,01). Conclusión: es necesario intervenir en este personal, dar a conocer y utilizar el PMC y reducir el riesgo ergonómico durante el trabajo.

Palabras clave: Mecánica corporal; conocimiento; trastorno músculoesquelético enfermeras; Ecuador.

Resumo

A enfermagem é uma profissão que no seu papel deve ter conhecimentos e aplicabilidade da mecânica corporal no cuidado ao paciente. O Equador mantém estatísticas elevadas de sintomatologia músculo-esquelética relacionadas com o conhecimento limitado e aplicabilidade da mecânica corporal. O objectivo deste artigo é analisar a aplicação dos princípios da mecânica corporal durante o trabalho realizado pelo pessoal de enfermagem do Hospital Alfredo Noboa Montenegro na província de Bolivar Guaranda-Equador, um estudo não experimental, descritivo e correlacional. População de 124 pessoas, com três instrumentos para a recolha de dados: inquérito, questionário e guia de observação. (1) Inquérito: recolhe informações sobre características sociais (idade, sexo, nível de formação académica, número de horas de trabalho, turnos de trabalho, antiguidade e serviço em que trabalham); (2) Questionário: recolhe conhecimentos sobre PMC e (3) Guia de observação: avalia a aplicação destes princípios durante o trabalho. A idade média foi de 42,20 ± 9,33 anos (24-64 anos), o sexo predominante foi feminino

(91,94%), 69,35% eram enfermeiros e 30,65% eram enfermeiros auxiliares. 33,72% completaram uma PMC. Um total de 33,72% tinha concluído um mestrado ou especialização; 71,77% trabalhavam 40 horas por semana e 89,52% trabalhavam em turnos rotativos, o tempo de serviço era de 14,75 ± 7,66 (1-59 anos) e o trabalho à lua era de 8,06%. Os 78,23% mostraram um conhecimento deficiente mas superior nos assistentes, sem diferença significativa. O risco ergonómico era elevado (77,42%), ainda mais elevado para os enfermeiros (p<0,001). Havia uma associação significativa entre conhecimento ergonómico e risco, quanto maior a falta de conhecimento dos princípios, maior o risco ergonómico (P <0,01). Conclusão: é necessário intervir neste pessoal, dar a conhecer e utilizar o PMC e reduzir o risco ergonómico durante o trabalho.

Palavras-chave: Mecânica corporal; conhecimento; doença músculo-esquelética; enfermeiras; Equador.

Introducction

Various international organizations such as the International Labor Office (OIT, 2013), the Occupational Safety and Health Administration (OSHA), the European Agency for Safety and Health at Work (AESST) and the World Health Organization (WHO), coincide in stating that musculoskeletal disorders (MSD) are the most frequent occupational pathologies in the world, affecting not only the worker but also the family and the company to which they belong, recognizing as the main cause of absenteeism. The symptoms of this disease are located in the muscles, tendons, ligaments, joints, nerves and blood vessels, causing considerable costs for the public health system (OSHA, 2018; OSHA, 2019; WHO, 2004).

In this sense, it is pointed out that at present, regardless of the work carried out by a worker, they have a greater exposure to multiple occupational hazards, including MSDs, which significantly affect health and develop over time, Thus, it is reported that those that are located in the back present between 15% and 42% in an acute form, while 60% to 90% are chronic (OSHA, 2011). This could be explained by the demands made on workers to obtain greater production and provision of services in the institutions or companies where they work, regardless of the type of work, requiring an intense or accelerated rhythm and a decrease in rest time; consequently, they will have a higher occupational risk (Dal Rosso., 2012; Dali et al., 2014; Olalla et al., 2020). It is

also reported that men suffer more MSDs in the back, while in women they appear in the neck, shoulders, arms or hands they are more reported (AESST, 2019).

In this regard, it is revealed that the work characteristics of health personnel are very particular, even more so if they refer to the nursing sector, because in addition to the intense psychological effect they suffer from the direct care and attention they provide to the patient (some of them between life and death), they are exposed to chemical substances, sharp objects, infectious-contagious agents, temperature changes and the performance of various physical activities, including lifting and transporting patients (bed bath, change of clothes, lift and transfer the patient). For the latter, physical postures must be adopted that when performed improperly can cause musculoskeletal pain or discomfort (De Lima et al., 2014; Arenas-Ortiz and Cantú-Gómez, 2013). Hence, the need to know and apply the principles of body mechanics that establish the efficient, coordinated and safe use of the body to produce movement and maintain balance during activity.

The application of Body Mechanics by the nursing staff when caring for the patient, facilitates safe body movement by using the muscular system correctly and injuries are avoided (Garg et al., 1992). Various studies reveal ergonomic damage as a result of the inadequate performance of work activity in these personnel, observing damage to extremities, neck, back, waist and hips in more than 50% (Cachay et al., 2017; Fernández González et al., 2014; Antithesis-de-Oliveira et al., 2017). All conclude that there is a direct relationship between physical effort and the application of body mechanics when performing work.

In Ecuador, an increase in the rate of occupational accidents is reported between 2010 and 2015, especially for Occupational Diseases, including Musculoskeletal Disorders, with a value that ranges from 6% in 2010 to 28.4% in 2015. One of the Provinces with the lowest incidence is Bolívar, with 0.3% for 2015 (INEC, 2015). The objective of this study is to analyze the application of the principles of body mechanics during the work carried out by the nursing staff of the Alfredo Noboa Montenegro General Hospital (ANMH), of the Province of Bolívar in the Guaranda canton of Ecuador.

Materials and methods

The present investigation is non-experimental, field, descriptive, prospective and cross-sectional, in which the members of the nursing staff who work at the Alfredo Noboa Montenegro Hospital (HANM), located in the Bolívar Province in Ecuador, were studied. The population consisted of

141 subjects: 97 with a university degree in nursing and 44 Nursing Assistants. The following selection criteria were considered: being a member of the HANM nursing staff, regardless of the contracting modality and the hospital service where they are assigned, without previously diagnosed musculoskeletal pathology, not being pregnant, working seniority in the service of a year or more, consent to their inclusion in this research and complete the instruments for collecting the information necessary to achieve the objective of this work. Once all the required data had been collected, the final sample was 124 people, 86 nurses and 38 assistants, which represents 87.94 of the population.

Each member of the nursing staff was explained the objective, benefits and risks of this research, in order to request their consent to be included in the present study, and they were required in writing; Likewise, it had the authorization of the Bioethics and Teaching and Research Committee of the Alfredo Noboa Montenegro Hospital, thus complying with the standards required for study in human beings (WMA, 2013). The data were collected in the last six months of 2018, using various instruments that made it possible to collect information on:

- The social characteristics of the nursing staff, referring to age, sex, level of academic training, number of working hours, work shifts, seniority and service in which they work, through the survey of the National Institute of Statistics and Censuses of Ecuador (INEC, 2010).
- The degree of knowledge about the application of the principles of body mechanics, possessed by these personnel, for this, two instruments were used: a. A questionnaire that measures this knowledge and whose result reflects a High, Medium or Low degree (Arone Hernández et al., 2017). ban observation guide that evaluates whether these principles are applied during the nursing work (Frontado Quiroz et al.,2017). Before using these last two instruments, a pilot test was applied to members of the nursing staff of the hospital under study, obtaining a reliability of 0.8.

The information obtained was organized in a matrix, using the Microsoft Excel 2010 program. Data on the characteristics of the nursing staff, knowledge and applicability of the principles of body mechanics, through absolute values, percentages, mean ± 1 standard deviation, presented in tables. For the interpretation of the data, frequency and inferential analyzes were performed, for the latter Chi square was used and $p < 0.05$ was considered as the lowest probability.

Results

Table number 1 shows the characteristics of the nursing staff at Hospital Alfredo Noboa Montenegro. 124 subjects were studied whose average age was 42.20 ± 9.33 years (24-64 years), with a predominance of females (91.94%). 69.35% (86/124) had a university degree in Nursing and of these 33.72% (29/86 cases) had completed master's or specialization studies in nursing subareas, but none were or had completed studies doctorate; while 30.65% (38/124) were nursing assistants. On the other hand, when analyzing the labor characteristics, it was found that 71.77% work 40 hours a week, 89.52% work rotating shifts, the average value of work seniority was 14.75 ± 7.66 (1-59 years), with the highest frequency between 11 and 30 years (53.22%) and 91.94% only carried out a job.

Table 2 analyzes the degree of knowledge about the principles of body mechanics shown by the nursing staff studied. The low and very low grade obtained in all the personnel results in 78.23% (97/124) indicating poor knowledge, with the highest percentage for the assistants (62.63% low grade and 34.21% very low) but no significant differences when compared to nurses.

The ergonomic risk observed in the nursing staff of the Alfredo Noboa Montenegro Hospital is shown in table number 3, which was high in all the subjects studied with 77.42% (96/124), with a higher degree in the graduates in nursing (81.25%) than in assistants, which was statistically significant ($p < 0.001$).

When establishing the relationship between the degree of knowledge about the application of the principles of Body Mechanics and the ergonomic risk observed in the Nursing Personnel studied, it was obtained that a greater ignorance of these principles produced a greater ergonomic risk with a statistically significant association ($p < 0.01$) as evidenced in table number 4.

Table 5 The results of the present investigation reveal a low and very low grade obtained in all the personnel in 78.2% (97/124) indicative of poor knowledge, being the highest percentage for the assistants and inadequate use of the principles of the body mechanics, with 78.23% (54.84% low grade and 23.39% very low) being higher in nurses than in assistants (with statistically significant difference ($p < 0.001$), in addition a significant association was found ($p < 0 , 01$) between degree of knowledge and inappropriate use of body mechanics.

Table 1: Personal characteristics of the 124 members of the Nursing Staff of the Alfredo Noboa Montenegro Hospital.

Parameter	Number of Cases	Average ± SD (Age years)
Nursing staff	124 (100%)	42,20 ± 9,33 (range: 24-64)
Sex		
Malé	10 (8,06%)	40,3 ± 12,86
Fémale	114 (91,94%)	42,36± 9,02
Nursing academic training		
Undergraduate	58 (46,77%)	37,24 ± 7,62
Postgraduate	28 (33,58%)	46,71 ± 8,13
Auxiliaries	38 (30,65%)	46,45 ± 8,91
Working hours		
160 (40 Welsy)	89 (71,77%)	40,69 ± 9,31
120 (30 Welsy)	35 (28,23%)	45,06 ± 8,35
Work shift		
Rotary	111 (89,52%)	41,29 ± 8,99
Fixed work shift	13 (10,48%)	50 ± 8,91
Work seniority (years)		
≤ 5	18 (14,52%)	32,59 ± 4,66
6-10	35 (28,23%)	37,31 ± 6,59
11-15	26 (20,97%)	40,31 ± 5,74
16-20	10 (8,06%)	46,1 ± 6,12
21-25	15 (12,09%)	50 ± 5,71
26-30	17 (13,71%)	53,65 ± 4,34
> 30	3 (2,42%)	59,33 ± 0,58
Average ± working seniority: 14,75 ± 7,66 (range: 1-59years)		
Moonlighting		
Yes	10 (8,06%)	46,12 ± 11,85
NO	114 (91,94%)	41.85 ± 8,06

SD = Standard Deviate

Source: Authors

Table 2: Degree of knowledge about the application of the principles of body mechanics among the Nursing Assistants and Graduates of the Alfredo Noboa Montenegro Hospital

Degree of Knowledge	Number of cases	Nursing staff		P
		Graduates	Auxiliaries	
High or tall	2 (1,61%)	2 (2,33%)	0	
medium	25 (20,16%)	20 (23,26%)	5 (13,16%)	
Low	68 (54,84%)	48 (55,81%)	20 (62,63%)	NS
Very low	29 (23,39%)	16 (18,60%)	13 (34,21%)	
Total	124 (100%)	86 (69,15%)	38 (30,65%)	

The number before the parentheses represents number of cases NS = Not significant

Source: Authors

Table 3: Ergonomic Risk observed during the work carried out by the Nursing Staff of the Alfredo Noboa Montenegro Hospital

Degree of Knowledge	Number of cases	Nursing staff		P
		Graduates	Auxiliaries	
Low	0	0	0	< 0,001
Medium	28 (22,58%)	8 (28,57%)	20 (71,43%)	
High	96 (77,42%)	78 (81,25%)	18 (18,75%)	
Total	124 (100%)	86 (69,15%)	38 (30,65%)	

Source: Authors

Table 4: Relationship between the Degree of Knowledge (CG) about body mechanics and the Ergonomic Risk (ER) observed during the work carried out by the Nursing Staff of the Alfredo Noboa Montenegro Hospital

Parameter	Number of cases	Nursing staff		P
		Graduates	Auxiliaries	
RE High	96	78 (81,25%)	18 (18,75%)	< 0,001
Lower GC	97	64 (65,98%)	33 (34,02%)	

Source: Authors

Table 5: Aspects of body mechanics known to graduates and nursing assistants. Hospital Alfredo Noboa Montenegro-Ecuador

Aspects of the Body Mechanics Corporal	**Degree of knowledge Number of cases**								**Total**
	High		**Half**		**Low**		**Ver y low**		
	L	**A**	**L**	**A**	**L**	**A**	**L**	**A**	
Definition	2 3,51%	0	15 26,32%	1 1,75%	6 10,53%	25 43,86%	0	8 14,04%	57 45,97%
Principles	0	0	5 14,71%	1 2,94%	3 8,82%	18 52,94%	3 8,82%	4 11.76%	34 27,42%
Elements	0	0	3 9,09%	0	2 6,06%	14 42,42%	4 12,12%	10 30,30%	33 26,61%
Total	**2 1,61%**		**25 20,16%**		**68 54,84%**		**29 23,39%**		**124 100%**

Principles: stability, patient transfer, decreased physical work

Elements: Alignment, Balance, Movement

L = Graduate; A = Auxiliary

Source: Authors

Discussion

The General Labor Risk Insurance of Ecuador reports for the period 2013 to 2015, a total of 674 occupational diseases of which 93.92% correspond to musculoskeletal disorders, including herniated disc, low back pain and carpal tunnel syndrome, and the most affected staff is "nursing" and in whom low back pain occurred in more than 50% (IESS, 2017) and induced absenteeism from work between 1 and 5 days in a year (Harari, 2010). In the present study, the nursing staff working at the Alfredo Noboa Montenegro Hospital, located in the province of Bolívar, was analyzed. The first report of occupational disease from 2012 is shown, whose frequency is 0.5%, then for the 2014 and 2015 were between 0.4% and 0.3% respectively (IESS, 2016). It is evident that there is an under-registration of occupational diseases in Ecuador, and those that exist officially cover a relatively short period (Gómez et al., 2016).

The nursing staff studied showed an average age of 42.20 ± 9.33 years (range: 24 to 64), a value above the average for an Ecuadorian (29 years) (INEC, 2010), but within the reported values for these professionals in developed countries (between 35 and 50 years old) (Graham and Duffield, 2008; AIHW, 2008). These results are similar to those reported by some authors, who reveal a slightly higher average (48.06 years) (Bernal et al., 2015) and higher than that evidenced by others (Duque et al., 2011). For nursing work, it is described that between 81.2% and 89.4% the female sex predominates (Duque et al., 2011; Bernal et al., 2015), but in the present investigation this figure was higher (91, 94%); Although men have had an important place in this profession, their contribution is perceived as low due to the fact that this work is carried out mainly by women, especially because of the dominant influence of the female nursing movement of the 19th century (Keogh et al., 2007).

Regarding academic training, it is highlighted that the degree of job satisfaction is related to the higher degree of education carried out, since it affects the efficiency of the tasks performed (Córdova Delgado et al., 2014). In health professionals, such as nurses, greater academic training improves the quality of patient care and reduces the presence of adverse effects (Bowie et al., 2013; Pooh et al., 2013), and given their greater preparation, you have a better knowledge about the employment repercussions on your health. In this research, 69.36% had a university degree in nursing, 33.72% had 4th level studies and none with a doctorate. Barbera et al. (2015) found that 3.2% had a nursing degree without other studies, 89.8% had graduate, specialty and / or master's

degrees, and 2.99% with a PhD. The auxiliary nursing staff in the present study had only completed the intermediate level vocational training cycle.

Now, every organization pursues the highest production, but there is the misconception of associating productivity with the greatest number of hours worked and, although productivity is associated with time, it refers to the amount of useful work performed in a period of time determined. Working time is the period that a worker performs her functions, at the disposal of an employer and adjusted to the law (ILO, 2008). This is highlighted when dealing with night work, due to the repercussions on the individual's health (Lawson et al., 2011; Sadeghniiat-Haghighi et al., 2011), even more so in those of older chronological age because they have accumulated organic effects and a less flexible circadian rhythm, which induces less adaptation and tolerance to the schedule (Griffiths et al., 2009). For this reason, it is recommended that these older and older workers be assigned to positions or daytime hours (ILO, 1990).

In this sense, 71.77% and 28.23% of the HANM nursing staff work 40 hours (160 hours per month) and 30 per week (120 hours per month), respectively, in accordance with the provisions of the Labor Code of Ecuador that indicates a working day of eight hours a day, not exceeding 40 hours a week (Ecuador Labor Code, 2016). Similarly, the Organization for Economic Cooperation and Development (its acronym in English, OECD) clarifies, among other aspects, that working hours are held for forty hours a week and less than 160 hours a month (OECD, 2019). It was also found that 89.52% of workers work rotating shifts, which cause physical-mental exhaustion and drowsiness at the end of the day, increasing occupational risks (Bernandino et al., 2007; Fido and Ghali, 2008).

When analyzing the work seniority of the studied personnel, an average value of 14.75 ± 7.66 years was evidenced, with a range between 1 to 59; the highest frequency was between 11 and 30 years with 53.22%, values similar to those described by Urbaneto et al. (2011) and Moreno Arrollo et al. (2013). Despite the vital importance of nursing personnel in health care, it is estimated that there is a deficit of it, with an inadequate territorial distribution, concentrated in urban areas with the greatest economic resources and an unequal proportion per inhabitants, thus, in the United States it is 111.4 per 10,000 inhabitants, in Haiti 3.5 and in half of the Latin American countries it is less than or equal to 10.4 (PAHO, 2013). This lack of personnel and the intense work, physical-emotional burden and low salaries, drive moonlighting (Aspiazu, 2017; Novick and Galin, 2003).

The present results show that only 91.94% of the nursing staff report having only one job, a figure higher than that reported by Urbaneto et al. (2011) who found it in 82.9% of workers.

Among all health personnel, the nursing staff, is probably the one who maintains the most forced body postures and for long periods, coupled with this is added the manual handling of loads and repetitive movements, which carries the risk of causing muscle or joint injuries, acutely or chronically (Arenas-Ortiz and Cantú-Gómez, 2013). To avoid these injuries, it is necessary to know and apply the principles of Body Mechanics that describe the correct way to use the muscular system (Garg, 1992). In this sense, ergonomic damages are reported as a result of the inadequate performance of the work activity (Cachay et al., 2017; Antochevis-de-Oliveira et al., 2017).

The results of the present investigation reveal a poor degree of knowledge and inappropriate use of the principles of body mechanics, with 78.23% (54.84% low grade and 23.39% very low) and 77.42% respectively, being greater in nurses (81.25%) than in assistants (18.75%), with a statistically significant difference ($p < 0.001$), in addition a significant association ($p < 0.01$) was found between grade knowledge and improper use of body mechanics. These values are similar to those described in Peru by Frontado et al. (27) with 86% and 85% and Polo & Villena with 70.9% (2012), but different from those described in Mexico by Canizales et al. with 70% with correct knowledge and application. It is therefore necessary to apply body mechanics correctly, following the principles and guidelines to safely and effectively facilitate the movement of the musculoskeletal system and lower ergonomic risk in the tasks that are performed (Berman et al., 2003).

In addition to the aforementioned, to reduce ergonomic risk and increase knowledge about body mechanics in health personnel such as nursing, it is necessary to apply various actions, including educational interventions, which include the first level of health care (WHO, 2008); moreover, when observing that health centers are updated in their buildings, medical, therapeutic, pharmacological and computer techniques, however, not so in relation to ergonomics. Hence, good results are shown in terms of educational strategies that have been applied in nursing professionals to reduce MSDs (Long et al., 2013; Anderson et al., 2016); this being recommended for the HANM nursing staff.

In summary, the present results show a deficit in the knowledge and use of the principles of body mechanics during the work carried out by the nursing staff of the Alfredo Noboa Montenegro

Hospital, therefore it is recommended that the health authorities consider the implementation of actions, among They educational programs on these principles, in order to reduce the risks of the factors that affect the appearance of musculoskeletal disorders in these personnel.

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