Ergonomics as Perceived by Staff Nurses and Its Relation to Their Job Satisfaction

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ABSTRACT

Context: Ergonomics is a systems-oriented discipline that extends across all aspects of the work environment and human activity to enhance safety, efficiency, quality of work-life, operators' comfort and productivity that increase job satisfaction of the health care team members as well as staff nurses.

Aim: This research aimed to assess ergonomics as perceived by staff nurses and its relation to their job satisfaction.

Methods: A descriptive-analytical cross-sectional design utilized for carrying out this study. The current study was conducted in surgical building at Benha University Hospitals, Qaliobia Governorate, Egypt. Study subjects were all available (200) staff nurses. Two tools used to collect data, namely, ergonomics assessment questionnaire and job satisfaction assessment questionnaire.

Results: The results of the study revealed that ergonomics was inadequate as perceived by more than two-thirds (71%) of the studied staff nurses. Also, more than two thirds (72.5%) of them had a low level of job satisfaction. Moreover, there was a highly statistically significant positive correlation at (P-value<0.001) between total ergonomics and total job satisfaction.

Conclusions: The study concluded that there was a highly statistically significant positive correlation between total ergonomics and total job satisfaction. The study recommended that hospital administration should deploy more efforts in improving the workplace ergonomics; this includes the work setting, and equipment. Nursing administrators should develop strategies for improving the ways of work to perform tasks that distributed throughout the shift to enhance staff nurses' job satisfaction. Also, Future studies should be conducted to investigate the relationship between ergonomics and other variables, like job performance, turnover, and productivity.

Keywords: Ergonomics, Staff nurses' perception, Job satisfaction.

1. Introduction

In the 21st century, globalization and quality had obliged the economy to advance the health care services, thus making efficient and resourceful nursing staff as the organization's most valuable asset for its success. However, hospitals have traditionally placed more focus on the safety needs of the patient than the safety needs of their nurses. *(Hsiao & Lin, 2018).* The complexity of providing patient care in a modern hospital environment requires rethinking this approach to safety as the interplay between factors related to the patient, nurse, and physical environment poses a dangerous ergonomics hazard to all *(Abd El-Rasol & Abd El Rahman 2018).*

The word "ergonomic" formed of two Greek words "ergon" which means work, and "nomos" which means natural law. The environment may be a work tool or piece of equipment or the spatial surroundings in which work is conducted *(Eslami Akbar, Elahi, Mohammadi, & FallahiKhoshknab, 2017; Olabode, Adesanya, & Bakare, 2017)*. The word ergonomic is loosely translated means, "the customs, habits, and laws of work" *(Chanchai et al., 2016).*

Ergonomics is the science of studying how efficient people are in their work environment, as well as detailing what could be done to make them more productive throughout the day. Ergonomics defined as the study of the interface between individuals and their work environment *(Eslami et al., 2017; Olabode, et al., 2017)*.

The National Institute for Occupational Safety and Health (NIOSH) develop ergonomic guidelines for operating room nurses to maintain healthy and safe working conditions for men and women in working place and recommend providing education, training, and information regarding ergonomics principles, safe patient lifting and handling *(Hsiao & Lin, 2018).*

Organizations should incorporate the elements of ergonomics and follow the Occupational Safety and Health Administration (OSHA) complaint. In applying a healthful working environment, the 12 ergonomics principles, as suggested by OSHA, should be followed. They are keeping everything easy to reach, work at proper heights, reduce an excessive force, work in good postures, reduce excessive repetition, minimize fatigue, minimize direct pressure, provide adjustability and change posture, and provide clearance. Moreover, access to material resources to maintain a comfortable environment, enhance clarity and understanding and improve organizational work *(Saxena, 2017; Khandan, Maghsoudipour, Vosoughi, & Kavousi (2013).*

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Ergonomics in the organization promotes a healthful workplace. ergonomics considered the workplace key elements such as workstations, computers, chairs, lighting, noise level, room temperature that could be tailored to fit and enhance staff health, safety, and performance. The goal of hospital ergonomics is to set up a workspace that fits and adequately supports the needs of the patients, nurses, and all health care team members in his quest to execute a task *(Sarode & Shirsath 2014; Ganesh, 2015)*. Healthful workplace environment such as a proper unit design and appropriate arrangement of furniture may cause higher productivity, higher morale among nurses, and fewer stress outcomes. This healthful work environment has a connection with ergonomics. The limitation and interaction ensure reducing work stress, absenteeism, low productivity, and job strain as long as it correctly provided and used in the workplace *(Zaidi, Hammad, Awad, Elkholi, & Qasem, 2018).*

The quality of the work environment plays an essential role in explaining turnover and dissatisfaction in nurses through adequate staffing, positive working relationships, higher job autonomy, and adequate organizational support services. Crucial in creating a work environment for nurses is a strong nursing, and hospital leadership that are critical elements in creating a healthy work environment to support daily professional practice, well-being and satisfaction of nurses *(Leodoro, Labrague, Michael, Leocadio, & Konstantinos, 2018; Bander, 2019).*

Job satisfaction is the key to establish a healthy organizational environment; thus, the most crucial evidence that indicates the worsening conditions of an organization is the low rate of job satisfaction *(Ojulu, 2015)*. Factors related to job satisfaction are relevant in the prevention of employee frustration and low job satisfaction because employees will work harder and perform better if they are satisfied with their jobs *(Riklikiene, Krusinskaite, Gatautis & Bagdonaite, 2015; Hsiao & Lin, 2018).*

Job satisfaction is the level of contentment that a person feels regarding his or her job. This feeling is largely based on the individual's perception of satisfaction *(Hamouda, Eid & Saleh, 2018)*. Job satisfaction can be influenced by a person's ability to complete the required tasks, the level of communication in an organization, and the way management treats employees. Job satisfaction falls into two levels: affective job satisfaction and cognitive job satisfaction. Affective job satisfaction refers to a person's emotional feelings about the job as a whole. Cognitive job satisfaction considers how satisfied nurses feel concerning some aspect of their job, such as their wages, work hours or benefits, and work environment *(Styron & Styron, 2017; Brayer, Foley, Doroszkiewicz, Jamiołkowski, & Marcinowicz, 2017).*

Hospital staffs, nurses are considered a high-risk group. Nurses exposed to a variety of risks performing their duties daily. The nurse's workplace is stressful, complicated settings in which there are ergonomic risk factors, such as lifting/moving heavy equipment. Good ergonomic conditions increase nurses' occupational health and safety, job satisfaction, and performance. These factors contribute positively to patient care outcomes *(Vural & Sutsunbuloglu 2016; Nzewi, Augustine, & Mohammed, 2018).*

In recent years, conditions in the hospital setting have not been reorganized to take account of ergonomic factors that have been introduced with new technology. New equipment is often employed without proper consideration of design issues. Open surgical procedures take a long time to prepare, and to conclude complications and delays lead to more stress and time pressure on surgical staff. For this reason, the hospital environment contains physical, cognitive, and organizational ergonomic risk factors, and staff nurses can be exposed to these risk factors *(Ali & Abdel-Hakeim, 2018; Kozak, Freitag, & Nienhaus, 2017).*

The physical work environment of staff nurses has various effects on their satisfaction and the ability to get the work done. To better understand the factors of the environment that affect the satisfaction of staff nurses, a study conducted to explore different work environments at the hospital *(Pickson, Bnnerman, & Ahwireng, 2016).* There are extrinsic and intrinsic factors that can affect a worker's job satisfaction and acceptance. Here the extrinsic factor means working conditions, which are personal resources that the working environment gives, such as salary, benefits, work autonomy, organizational culture. Also, poor environmental conditions can cause inefficient worker productivity as well as reduce their job satisfaction (*Yoshifumi, Premkumar, & Manzuma-Ndaaba (2017)*. The intrinsic factor that affects worker's job satisfaction is employee competencies which are personal capabilities such as expertise, interpersonal communication, self-regulation, learning, and creativity). Both factors might affect the job's expertise, even one's salary, and the level of job satisfaction *(Mahmoudifar & Seyedamini 2017).*

2. Significance of the study

Using ergonomics science and evaluating people, job, equipment features, and their workplace, and the interaction between these factors can help to design working systems with adequate safety and high efficiency and productivity and thereby reduce the causes of accidents and muscular-skeletal injuries in staff and lead to health promotion and enhance their job satisfaction *(Das Malhi et al., 2016).* Nursing is ranked as one of the occupations with the most incidences of workplace-related injury and illness *(King 2011).* Many factors in the work environment could contribute to nurses' exposure to physical hazards and musculoskeletal disorders. These include physical demands of the nursing work as bending and twisting; and physical demands of nurse-patient interaction as turning, bathing, dressing, seating the patient in the bed or chair and transferring the patient *(Yang, Spector, Chang, Gallant-Roman, & Powell, 2012; Thinkhamrop, Sawaengdee & Tangcharoensathien 2017).*

Workplace environment and material resources are central of the achievement of the goals of any health care organization, so needed equipment is purchased and installed and do not stop at that but also train who use them on how to operate such equipment for optimum performance.

However, it was observed that more attention seems to be paid to the production equipment than to the operating personnel. The nurses who daily operate and use the needed equipment, however, seem to be left out of consideration for proper design to ensure that the equipment suits the person; instead, they seem to be driven by the principle of the persons suiting the equipment *(Chernoff, Adedokun, O'Sullivan, McManus, & Payne 2018; Nzewi et al., 2018).*

Additionally, based on the researchers' observation of staff nurses in surgical units at Benha University Hospital complains of poor ergonomics that increases the risk of accident in their workplace. No auditing system for the hospital environment available or applied in the hospital. This may threaten staff safety in the hospital, which affects their job satisfaction. Staff nurses are the vast majority of healthcare providers and it is essential to assess ergonomics from their points of view also to measure their job satisfaction. Although job satisfaction has been widely explored, the relationship between job satisfaction and ergonomics as perceived by staff nurses has not been previously studied in Benha University Hospital, Egypt. So, this study conducted to assess ergonomics as perceived by staff nurses and its relation to their job satisfaction

3. Aim of the study

The current study aimed to assess ergonomics as perceived by staff nurses and its relation to their job satisfaction.

3.1. Research questions

- What is the ergonomics level as perceived by staff nurses?
- What is the level of staff nurses' job satisfaction?
- Is there a relation between ergonomics as perceived by staff nurses and their job satisfaction?

4. Subjects & Methods

4.1. Research design

A descriptive-analytical cross-sectional design was utilized to achieve the aim of this study. Selecting this design guided by (*Fain James, 2013)* who define it as a type of study in which information is collected without making any changes to the study subjects, analytical to measure the relations between two or more variables performing a statistical analysis. A cross-sectional through the researchers meets a group of people one time and collects the data.

4.2. Research Setting

This study conducted in surgical building in the following (Operating Rooms, Emergency ICU, ENT, Obstetric department, Orthopedic department, Surgical department, and Uro-Surgery department) at Benha University Hospital that located in Qaliobia governorate, Egypt.

4.3. Subjects

The current study consisted of all the available (200) staff nurses who were working in the setting mentioned above during the time of data collection. The studied staff nurses were distributed in their workplace as the following; operating rooms (70), Emergency ICU (60), ENT department (29), Obstetrics (8), Orthopedic (8), Surgical department (10), Uro-Surgery (15). The data was collected daily from approximately 2-3 staff nurses from each unit during the time of data collection.

4.4. Tools of the study

Data for this study collected using the following two tools:

4.4.1. Ergonomic Assessment Questionnaire

It consisted of two main parts: Part I concerned with socio demographic characteristics of the staff nurses such as age, gender, marital status, educational qualifications, workplace setting, and years of experience.

Part II concerned with assessment of ergonomics as percieved by the staff nurses**.** This questionnaire developed by *(Nag, Goswami, Ashtekar, & Pradhan, 1988)* and modified by *(Eldomiaty, Shazly, & El-Sayed, 2019).* The tool consists of (36 statements) categorized into five main domains, which are manual materials handling (6 statements), workplace design (13 statements), work posture (4 statements), work environment (9 statements), work schedule (4 statements).

Ergonomics assessment questionnaire reliability measured by using Cronbach's alpha test-retest, it was reported as the following (0.859) for manual materials handling, (0.897) for workplace design, (0.975) for work posture, (0.894) for work environment, and (0.879) work schedule. The total tool reliability was 0.935.

Scoring system:

The responses of staff nurses ranged from "strongly agree" to "strongly disagree" were scored from 5 to 1, respectively. Reverse scoring was used for negatively stated items so that a higher score indicates adequate ergonomics. Totals of each domain and the total of all were calculated and converted into percentages. <75% considered as inadequate, ≥75% considered adequate especially in setting that the ergonomics is very important as operating room. For the presentation of each item, means and standard deviations, and interquartile ranges computed with a maximum score of 5 for quantitative presentation, and the Likert scale compressed into three categories: "strongly agree/agree," "uncertain," and "strongly disagree/disagree" for categorical presentation.

4.4.2. Job Satisfaction Assessment Questionnaire

This tool adopted from *(Ahmed, 2006)*. It is a 3-point Likert scale used to assess job satisfaction among staff nurses at Benha University Hospital. It consisted of (73 statements) that measures nine domains of job satisfaction which are: salaries and incentives (10 statements), management and work system (13 statements), work environment (9 statements), relation with colleagues (7 statements), appropriate appreciation from others (8 statements), progress and career advancement (7 statements), the way of work (5

statements), Achievement (7 statements), responsibility at work (7 statements).

Job satisfaction questionnaire reliability was measured by using Cronbach's Alpha test-retest, and the value was (0.869) for salaries and incentives, (0.945) for management system at work, (0.978) for work environment, (0.836) for relation with colleagues, (0.798) for appropriate appreciation from others, (0.769) for progress and career advancement, (0.795) for the way of work, (0.984) for Achievement, and (0.861) for responsibility at work. The total tool reliability was 0.879.

Scoring system:

Scoring system of job satisfaction questionnaire; each item was scored as (0) for no, (1) for sometimes, and (2) for yes. The total satisfaction score of each dimension determined as satisfied when (≥ 60%) and unsatisfied when (<60%).

4.5. Procedures

Content validity of the tools of data collection was ascertained by jury of five professors specialized in nursing administration, two professors from Cairo university, two professors from Ain shams University, and one professor from Menoufia University. Contents of the tool tested for accuracy, consistency, relevance, applicability and feasibility.

Official permission to conduct the study was secured. The researchers clarified to staff nurses that participation was voluntary, and anonymity was assured. Approval of the hospital director has taken first. Also, a suitable time for data collection determined with each head nurse of the participated units and informed oral consent obtained from each participant.

A pilot study conducted on 10% of the total number of the study subject. Twenty staff nurses included in the pilot study. It was done at the end of February 2019 to ensure clarity and applicability of the study questionnaires; also, to identify the feasibility of the research process. It has also served in estimating the time needed for filling the study questionnaires. It ranged from 10–15 minutes for each questionnaire. No modification was needed, and the pilot sample was included later in the mainstream sample.

The fieldwork for this study extended through six months. It is started at the beginning of January 2019 and completed by the end of June 2019. The data collection took one month (March 2019). The researchers introduced themselves to staff nurses and explained the purpose of the study to them wishing to participate in the study. The researchers met staff nurses and distributed the questionnaires to fill them during staff nurse's work hours in morning and afternoon shifts according to their suitable time which did not obstacles their work to ensure the continuity of patient care. The data collected through 3 days/week in the presence of the researchers. Filling the tools took about 20-30 minutes from every participant. The number of the collected questionnaires from participated staff nurses per day ranged from 15-20 questionnaires by the two researchers from different units.

Ethical considerations: Before conducting the study, the nature and purposes of the study have been explained during the initial interview with the participated subjects. All nurses informed that participation is voluntary, and the oral consent obtained from each participant in the study. Confidentiality through using a code for obtained data protection. Staff nurses informed that data collected for scientific research only. The participants' right to withdraw from the study at any time was ascertained.

4.6. Data analysis

The data collected, tabulated, and analyzed by SPSS (Statistical Package for the Social Science Software) version 20 on IBM compatible computer. Quantitative data expressed as mean and standard deviation and analyzed by applying student t-test for normally distributed variables. Qualitative data expressed as numbers and percentages analyzed by applying the chi-square test. For comparison between the quantitative data at the interval for the same group at two sessions, a paired-sample t-test applied. Analysis of variance, F (t-test) used to test the difference among means. P-value considered significance at level ($P < 0.05$) and Pearson correlation used in the current study to find the correlation between the studied variables.

5. Results

Table 1 reveals that the study sample consisted of (200) staff nurses whose mean age was (25.87±6.83), slightly more than two thirds (69.5) of them were females, more than half (62.5%) of them were had technical nursing education, approximately three quarters (76.5%) of them were married and slightly more than two-thirds of them (68.5%) had 5 to less than ten years of experience.

Figure 1 shows that slightly more than one third (35%) of the studied staff nurses were working in operating rooms, while the minority (4.0%) of them were working in obstetric department and orthopedic department.

Table 2 illustrates that the highest mean percentage regarding the ergonomics domain of workplace design was (60.31), while the lowest mean percentage was (47.77) regarding the work schedule domain as perceived by the studied staff nurses, and the total mean percentage of the studied staff nurses' ergonomics was (54.94).

Figure 2 describes total ergonomics, it was inadequate as perceived by more than two-thirds (71%) of the studied staff nurses, while slightly more than one quarter (29%) of them perceived that ergonomics was adequate.

Table 3 clarifies that there was a statistically significant relation between total ergonomics as perceived by the studied staff nurses and their years of experience.

Table 4 indicates that there was a statistically significant relation between ergonomics as reported by the studied staff nurses and their workplace setting. The highest mean (108.87) was among nurses working in the emergency ICU, and the lowest mean (86.00) was among staff nurses working in the ENT department.

Table 5 illustrates that the highest mean percentage (51.13%) was regarding the "work environment" of job

satisfaction. While the lowest mean percentage (38.92%) was regarding the "Achievements" of job satisfaction as reported by the studied staff nurses, and the total mean of the studied staff nurses' job satisfaction was (64.48±26.61).

Figure 3 clarifies that near to three quarters (72.5%) of the studied staff nurses had an unsatisfactory job, while more than one quarter (27.5%) of them had a satisfactory job.

Table 6 shows that there were no statistically significant differences between staff nurses' job satisfaction and all their socio demographic characteristics.

Table 7 shows that there was no significant statistical relationship between1 the studied staff nurses ' job satisfaction and their workplace setting.

Table 8 indicates that there was a highly statistically significant positive correlation between total ergonomics and total job satisfaction, as reported by the studied staff nurses.

Table (1): Frequency and percentage distribution of the studied staff nurses according to their socio-demographic characteristics (n=200).

Socio-demographic characteristics	Frequency	%
Age in years		
20- < 30	126	63.0
30- < 40	66	33.0
40 -50	8	4.0
Mean ±SD	25.87±6.83	
Gender		
Male	61	30.5
Female	139	69.5
Marital status		
Married	153	76.5
Single	47	23.5
Educational qualification		
Secondary nursing education	10	5.0
Technical nursing education	125	62.5
Bachelor of nursing	63	31.5
Postgraduate nursing studies	2	1.0
Years of experience		
Less than 5	4	2.0
5-<10	137	68.5
10-<15	51	25.5
≥15	8	4.0
Mean ±SD	7.56±4.98	

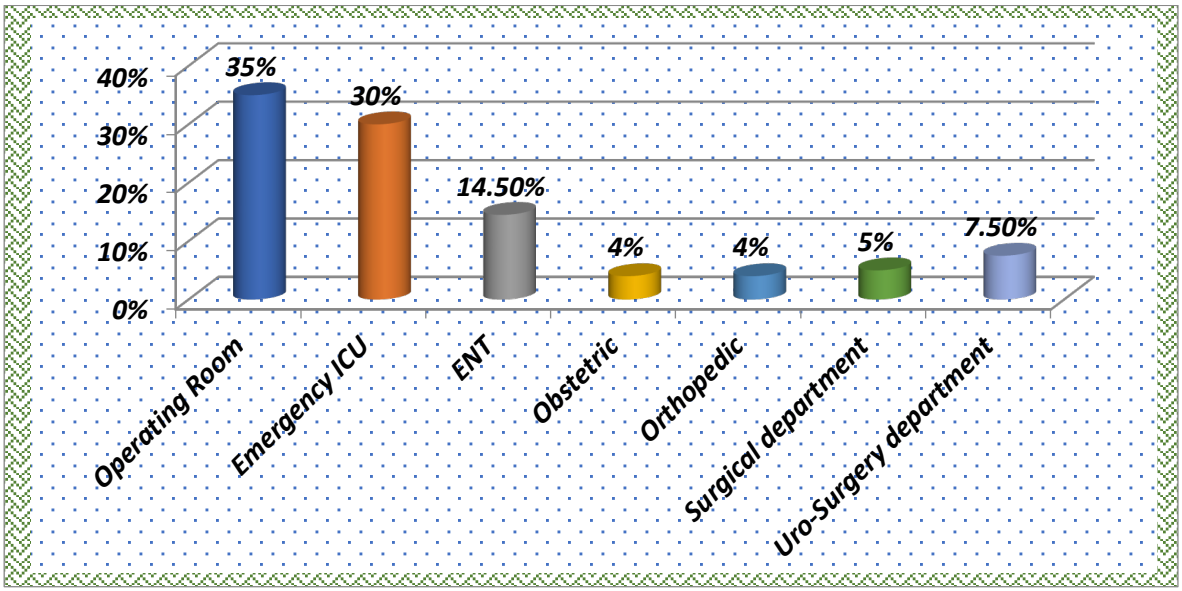

Figure (1): Percentage distribution of the studied staff nurses according to their workplace (n=200).

Table (2): Ergonomics domains as perceived by the studied staff nurses (n=200).

Ergonomics domains	No. of Items	Minimum	Maximum	Mean±SD	Mean percentage
Manual materials handling	6	7.00	24.00	16.33±4.15	54.43
Workplace design	13	19.00	56.00	39.20±8.34	60.31
Work posture	4	5.00	16.00	10.50±2.84	52.53
Work environment	9	9.00	40.00	23.35±6.63	51.9
Work schedule	4	4.00	18.00	9.55±2.87	47.77
Total	36	53.00	138.00	98.90±17.05	54.94

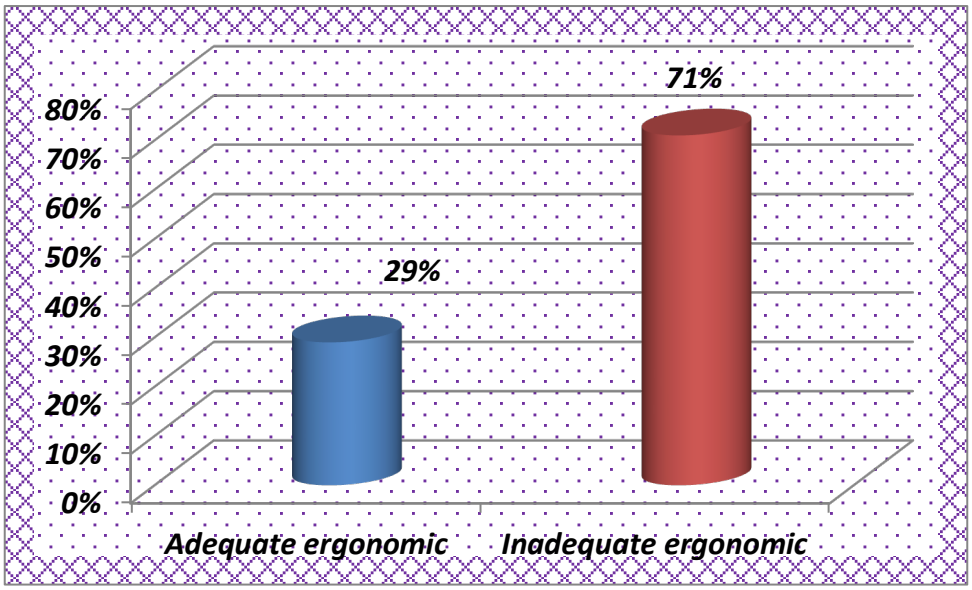

Figure (2): Total ergonomics level as perceived by the studied staff nurses (n=200).

Table (3): Relation between total ergonomics as perceived by the studied staff nurses and their socio-demographic characteristics (n=200).

Socio-demographic characteristics	Total ergonomic score Mean ±SD	Statistical tests	P value
Age in years			
20<30	99.40±16.67	1.33	>0.05
30<40	96.90±17.14	F test	
40-50	106.22±21.05		
Gender		0.039	
Male	98.55±18.11	Independent T	>0.05
Female	99.05±16.64	test	
Marital status		0.541	
Married	99.39±16.79	Independent	>0.05
Single	97.29±17.98	T test	
Educational qualification			
Secondary nursing education	b107.10±20.04	1.06	>0.05
Technical nursing education	99.23±16.31	F test	
Bachelor of nursing	96.95±18.11		
Postgraduate nursing studies	98.50±3.53		
Years of experience			
Less than 5	92.00±20.80	3.76	<0.05*
5<10	95.89±17.13	F test	
10<15	97.66±15.89		
≥15	112.37±21.42		

**A statistically significant difference P ≤ 0.05.*

Table (4): Relations between total ergonomics as reported by studied staff nurses and their work setting (n=200).

Workplace setting	Total ergonomics score Mean ±SD	F test	P-value
Operating Rooms	102.65±14.42		
Emergency ICU	108.87±25.43		
ENT department	86.00±18.90		
Obstetric department	100.25±28.68	2.90	<0.05*
Orthopedic department	92.10±17.65		
Surgical department	97.79±15.81		
Uro-Surgery department	97.90±15.18		

Table (5): Domains of job satisfaction, as reported by the studied staff nurses (n=200).

Job Satisfaction Domains	No. of Items	Minimum	Maximum	Mean ±SD	Mean percentage
Salaries and incentives	10	3.00	20.00	9.60±5.00	48.00
management and work system	13	2.00	25.00	10.29±7.10	39.57
Work environment	9	2.00	17.00	9.20±3.48	51.13
Relation with colleagues	7	1.00	13.00	6.81±2.85	48.67
Appropriate appreciation from others	8	.00	16.00	7.22±3.84	45.15
Progress and career advancement	7	1.00	14.00	5.47±3.31	39.07
The way of the work	5	.00	9.00	4.24±2.44	42.4
Achievements	7	.00	14.00	5.45±3.48	38.92
Responsibility at work	7	.00	14.00	6.18±4.82	44.17
Total	73	27.00	126.00	64.48±26.61	44.16

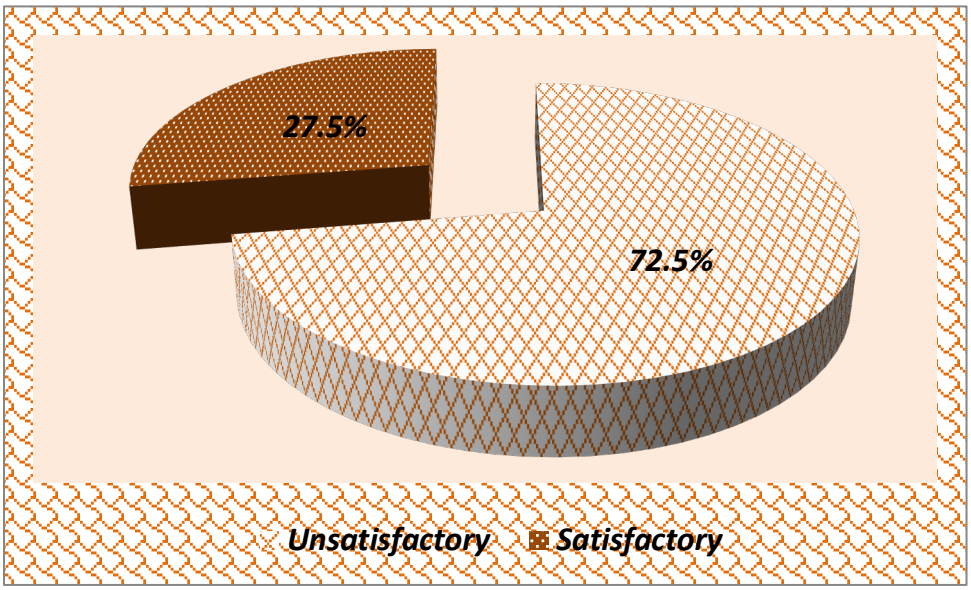

Figure (3): Total job satisfaction level of the studied staff nurses (n= 200).

Table (6): Relation between the studied staff nurses' job satisfaction and their socio-demographic characteristics (n=200).

Items	Total satisfaction score Mean ±SD	Statistical tests	P-value
Age in years			
20-29	65.42±26.23	3.17	>0.05
30-39	65.63±27.85	F test	
40-50	42.88±10.14		
Gender		0.000	
Male	64.44±24.36	Independent T	>0.05
Female	64.49±27.62	test	
Marital status		2.79	
Married	62.74±25.87	Independent T	>0.05
Single	70.12±28.42	test	
Educational qualification			
Secondary nursing education	49.60±23.27	1.67	>0.05
Technical nursing education	66.62±27.54	F test	
Bachelor's degree in nursing	62.14±24.62		
Postgraduate nursing studies	78.50±28.99		
Years of experience			
Less than 5	78.00±39.79	2.10	>0.05
5-10	65.35±25.24	F test	
10-15	64.39±29.76		
≥15	43.37±10.72		

**A statistically significant difference P ≤ 0.05*

Table (7): Relation between the studied staff nurses' job satisfaction and their workplace setting (n=200).

Workplace setting	Total satisfaction score Mean ±SD	F test	P-value
Operating Room	65.31±28.94		
Emergency ICU	65.87±17.11		
ENT department	70.40±21.89		
Obstetric department	56.50±22.05	0.392	>0.05
Orthopedic department	70.10±27.87		
Surgical department	63.58±27.86		
Uro-Surgery department	62.40±26.21		

**A statistically significant difference P ≤ 0.05*

Table (8): Correlation between total ergonomics and total job satisfaction as reported by the studied staff nurses (n=200).

Variable	Total job satisfaction	
	r	P value
Total workplace ergonomic	0.539	<0.001*

**A highly statistically significant difference P ≤ 0. 001*

6. Discussion

The physical aspects of a workplace environment can have a direct effect on job satisfaction, morale, health, safety, comfort, concentration, the productivity of the staff within it. Essential factors in the work environment (ergonomics) that should be considered include building design, workplace layout, workstation set-up, furniture, equipment design and quality, space, temperature, ventilation, lighting, noise, vibration, radiation, and air quality *(Pickson et al., 2016).* The present study aimed to assess workplace ergonomics as perceived by staff nurses and its relation to their job satisfaction.

Regarding workplace ergonomics as perceived by the studied staff nurses, the study results illustrated that the highest mean regarding the ergonomics domain of workplace design, while the lowest mean regarding the work schedule domain. This is may be due to workplace is compatible with number of staff nurses in the department, seating arrangement is adequate as comfortable chair, good postural support, design match of handles, ladders, staircases, handrails.

According to the present study findings, the area of least ergonomic adequacy was that of work schedule. This finding was mostly related to working night shifts, overtime/extra work time, in addition to the uneven distribution of the work throughout the shift and working at a predetermined pace/time limit. The inefficient use of time might lead to the low job satisfaction that expressed by the three-fourths of the studied nurses. These findings were similar to *(Plessas & Bernardes Delgado, 2018)*.

These results were also, similar to *Eldomiaty et al. (2019),* who revealed in their study on staff nurses in Menouf Fevers Hospital that the area of work time schedule was the

least adequate ergonomic. While dissimilar at the highest ergonomic adequacy as reported by the staff nurses were those of manual material handling and work environment.

The study results illustrated that total ergonomics was inadequate as perceived by more than two-thirds of the studied staff nurses, while slightly more than one quarter of them perceived that ergonomics was adequate.

This finding had major concern since, it might have a negative effect on the hospital work that affect safety and threaten life of the nurses and patients in this setting, this reflect on their nurses wellbeing, satisfaction, performance and consequently on the quality of patient care. This finding was due to attributed to noise, lack of good lighting, and inadequate ventilation with unsafe environment and radiation risks. These factors provide uncomfortable environment for the nurses and feel unsafe when performing their job

These results were in the same line with *Eldomiaty et al. (2019),* who indicated that the majority of the nurses view their workplace as ergonomically inadequate. Also *Mahmoudifar and Seyedamini (2017),* who revealed in their study on nurses working at ICU and operating room, ward of the hospitals at health-care service university in southern regions of west Azerbaijan province of Iran that nurses working at operating room and ICU ward are subjected to high-risk levels and occupational injuries which is dramatically resulted from inappropriate body posture or particular conditions of their works due to inadequate ergonomics.

The importance of adequate ergonomics is emphasized in a study conducted in the United States which demonstrated that the ergonomic improvement of the work environment with proper temperature, lighting, and ventilation led to better productivity and less musculoskeletal disorders among radiologists *(Sze, Bluth, Bender, & Parikh, 2017).* This respect is one of the most crucial areas in workplace, which is mainly aimed at fitting the work to the worker that make the performance of the job easier for the nurse, with more efficient use of the time and effort.

In incongruence with this finding, a study in the United States demonstrated an improvement in work efficiency and a decrease in musculoskeletal disorders following an intervention aimed at re-designing the workplace to be more ergonomically adequate *(Robertson, Huang & Lee 2017).*

The study results clarified that there was a statistically significant relation between total ergonomics as perceived by the studied staff nurses and their years of experience. This might be due to years of experience inducing self-confidence and the nurses become aware regarding their rights and their work environment characteristics. This result was in disagreement with*, Ali and Abdel-Hakeim (2018),* who revealed in their study on nurses working at Ain Shams University Hospitals, Cairo, Egypt that there was no statistically significant correlation between studied nurses' knowledge about ergonomics and their years of experience. Also, *Eldomiaty et al. (2019),* indicated that no statistically significant relation between staff nurses' reported adequacy of workplace ergonomics and their characteristics.

Regarding job satisfaction, the results revealed that near to three-quarters of the studied staff nurses unsatisfied with their jobs, while more than one-quarter of them satisfied with their job. The findings also revealed that the highest mean percentage was regarding the "work environment" domain of job satisfaction. In contrast, the lowest mean percentage was regarding the "Achievements." This finding may be due to hospital management had a sound work system help nurses to receive proper recognition for their efforts, great discretion in how they do their jobs, and access to support, resources, and information required to perform their work effectively. Besides, they have opportunities to advance within the hospital or to learn and grow through challenging work experiences or learning opportunities. A low perception of achievement domain might be due to workload, time schedule, and work extratime.These findings were in similarity with *Hee, Ong, Ping, Kowang, & Fei (2019)*, who revealed in their study on the Malaysian about the satisfaction factors identified as organization policy, work system, and supervision. Also, *Hamouda et al. (2018)* revealed in their study among nursing personnel at Benha University Hospital that two-thirds of nursing personnel satisfied with the work.

While, these findings were in disagreement with *Ayalew et al. (2019)* they found in their study among nurses in public health facilities of Ethiopia that majority of nurses more satisfied for recognition at work, remuneration, and professional advancement. Also, *Abuhashesh, Al-Dmour, and Masa'deh (2019)* revealed in their study among employees in the industrial sector in Jordan that Jordanian employees care and satisfy the most about their salaries and position more than any other factors. The previous findings of the present study were inconsistent with *Albagawi (2019)*, who reported in their study on staff nurses in hospital settings in Ha'il City, Saudi Arabia that staff nurses' respondents were somewhat satisfied with their work environment and professional relationships.

The current study exhibited that more than two-thirds of the studied staff nurses had a low level of job satisfaction, while more than one-quarter of them had a high level of job satisfaction. This might be due to assessment of nurses needs regarding work environment not occur, stress from unpredictable monthly work schedule and increasing work load can affect the nurses' discomfort and also create health problems. This may affect the health and wellbeing of nurses, their performance, and their job satisfaction.

This result was in the same line with *Valdez, Cayaban and Mathews, (2019)*, who revealed that a minority of study sample had a moderate level of job satisfaction, while more than one third had a high level of job satisfaction.

Also, *Banibakr, Shafie, Mohammad, & Alkuwaisi (2019)* reported in their study on nurses in Jordanian public hospitals that the majority of study sample dissatisfied and a minority of them satisfied. In the same respect *Abdelhamied, Shazly, and Abood, (2017)* revealed in their study among staff nurses at Minia University Hospital that more than two-thirds of staff nurses have low job satisfaction

The previous findings of the present study were inconsistent with *Ayalew et al. (2019)*, who revealed in their study that more than two-thirds of nurses expressed satisfaction with their job. In the same respect, *Osman & Abdlrheem (2019)* reported in their study on healthcare providers in Aswan University Hospital that higher job satisfaction scores significantly predicted between them.

The current study results revealed a non-statistically significant difference between staff nurses ' job satisfaction and their personnel characteristics. This might be due to job satisfaction not related to personnel characteristics as age or marital status but may be it related to coping with work stress according to opened mined . These findings were in similarity with *Zaidi et al. (2018)*, who revealed in their study on Sonographers in Riyadh that no significant difference was found between male and female sonographers on ergonomics and job satisfaction.

Also, *Banibakr et al. (2019)* revealed in their study on nurses in Jordanian public hospitals that there is no significant relationship between job satisfaction and personal characteristics. This result was in disagreement with the finding of *Dawal and Taha (2006)*, who highlighted in their study on automotive manufacturing companies in Malaysia that there was a significant influence of age, work experience, and marital status on job satisfaction. This result also was inconsistent with the findings of *Chien, and Yick, (2016),* who mentioned that the nurses' age, working experience in the hospital under study were significantly and positively correlated with the overall job satisfaction, their highest qualification was negatively correlated with the job satisfaction dimensions

The present study result revealed a non-statistically significant relation between staff nurses ' job satisfaction and their workplace setting. This result might be due to nurses prepared to work in any setting and their job satisfaction not related only to work setting may be related to for example related to leadership style or salary or position according to personal needs that different from person to person. This finding is in dissimilarity with *Hsiao and Lin (2018)*, who revealed in their study about new graduates who are entering the workforce from Taiwan's universities that there was a strong relationship between the employee working setting and job expertise and job satisfaction.

The findings of the present study were inconsistent with *Ali and Wang (2019),* who reported in their study on nurses from the (15) different private healthcare institutions from Bangladesh. That a significant positive correlation between work environment and promotion with job satisfaction of the nurses.

The current study exhibited a high statistically significant positive correlation between total ergonomics and total job satisfaction, as reported by studied staff nurses. This finding may be due to ergonomics can enhance and impair mental health simultaneously, and staff nurses adequately support the needs of them, so it improves their job satisfaction. These findings supported *Zaidi et al. (2018)*, who revealed in their study a significant relationship between ergonomics and job satisfaction. Also, *Dawal and Taha (2006)* showed that job and environmental factors were significantly related to job satisfaction. Also, *Yoshifumi et al. (2017)* reported in their study on employees of Draeximaier automotive industry in Kulim Hi-Tech Malaysia that there was a positive relationship for job satisfaction to ergonomic implementation.

This finding was similar to as *Ikonne, (2014)* who found that suitable workstation and equipment's designs, as well as the condition of work posture, are aspects of ergonomic factors that contributed significantly in attaining a higher level of job satisfaction.

7. *Conclusion*

The study concluded that more than two-thirds of the studied staff nurses reported that there were inadequate ergonomics, and more than two-thirds of them had a low level of job satisfaction. Also, there was a highly statistically significant positive correlation between total ergonomics and total job satisfaction.

8. Recommendations

Based on the findings of the current study, the following recommendations were suggested.

- Hospital administrators should put nurses' opinions into consideration regarding ergonomics and dealing adequately with workplace ergonomic problems.
- Hospital administration should deploy more efforts in improving the workplace ergonomics, this includes the work setting, equipment, as well as the physical and psychological work environment.
- Enhance nurses' perception about ergonomics through simple pamphlets explaining ergonomics, and its principles need to be prepared and distributed to all the departments to improve nurses' awareness.
- The work schedule and time need to improve through motivating them regarding not needed shifts and active listening to them and assess their needs. Also, fair, and justice should ensue.
- Nursing administrators should develop strategies for improving the ways of work to perform tasks that distributed throughout the shift to enhance staff nurses' job satisfaction.
- Generalization of research is needed on a broader scale of nurses on different hospital sectors.
- Training programs concerning ergonomics is recommended to be held for improving nurses' performance as well as safety for their health**.**
- Future research to investigate the relation between ergonomics and other variables such as job performance and productivity.

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