Impact of Occupational Health Hazards Training Program on Nurses' Quality of Work Life

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Abstract: Background: Background: Having adequate knowledge on hospital workplace hazards and risks, being aware of preventives measures and best practices regarding occupational hazards can help hospital workers to perform better and also improve their Quality of Work Life (QWL). Aim of the study: to assess the effect of occupational health hazards training program on nurses' quality of work life (QWL). Subjects and Methods: Setting: The study was conducted in all inpatient departments of Belbeis Central Hospital, El - Sharkia Governorate, Egypt. Design: A quasi-experimental research design. Sample: All available staff nurses (n=130) in the inpatient departments. Tools: two tools were used in data collection: Health hazard knowledge questionnaire, and Quality Work Life scale. Results: Overall, 97.7% of the staff nurses reported exposure to at least one type of occupational hazards. The use of PPE increased from 23.1% preprogram intervention phase to 92.3% post program intervention. Conclusion: Staff nurses' knowledge, and QWL significantly improved after the program intervention. Recommendations: applying the training program in similar settings, with continuing education for staff nurses emphasizing the areas of deficient knowledge and skills. A comprehensive program for PPE should be developed and applied, along with training and supervision.

Keywords: Occupational health hazards, Staff nurses, Training program, Quality of Work Life (QWL).

1. Introduction

Training is vital for organization as they are a source of increasing intellectual, capital, and escalating employee commitment. Training is considered as the process of improving the existing skills, knowledge, and abilities in an individual. Specifically, training will be used to develop individual's skills and abilities, to improve performance, familiarize employees with new system, technology, procedures and methods of working, help employees and new starters to become familiar with the requirements of a particular job and of the organization, and when there is a proven need for a specific standard of skill performance and when workers are not performing up to that standards. Therefore, training may drive the organization and nurses (Al Qudah et al., 2018).

Among healthcare occupations, nurses have the highest employment number, commonly working in hospitals, physicians' offices, home healthcare services, and nursing care facilities.

Most nurses work in hospitals of various types (Armstrong, 2019). By profession, nurses are one of healthcare workers who attend to patients through a variety of preventive and curative services. However, while their attention is on providing care, they are vulnerable to hazards that affect their health . This is very common in public hospitals, especially in developing countries where health service delivery is poor with minimal safety practices against exposures to infectious agents (Teo et al., 2023).

Occupational hazard is a dangerous circumstance, substance, human activity, or condition that may cause loss of life, injury, disease, or any other health impact at the workplace (World Health Organization [WHO], 2020). This includes biological, chemical, physical, and psychosocial risks.

Occupational hazards include biological, chemical, physical, ergonomic, psychosocial, fire and explosion, and electrical hazards that threaten healthcare workers' lives, safety, and well-being (Mossburg et al., 2019). Hospitals are one of the most vulnerable places in this regard. Furthermore, occupational hazards involve work environment activities, materials, substances, processes, or conditions that have potential to increase the risk of injury or ill health (Denge and Rakhudu, 2022). In other words, occupational hazards are risks arising from one's employment and can be categorized as follows: biological, physical, chemical, and psychosocial hazards (Shetty et al., 2020).

Occupational hazards are broadly classified as biological and nonbiological. Biological hazards include cuts/wounds/ lacerations, sharps injuries, direct contact with contaminated specimens/ biohazardous materials, infectious, airborne, and vector borne diseases, as well as cross contamination from soiled materials. Non-biological hazards include physical, psychosocial, and ergonomic hazards. Physical hazards include slips, falls, burns, fractures, radiation, and noise. The psychosocial hazards include physical, psychosocial, sexual, and verbal abuse and stress. The ergonomic hazards are musculoskeletal injuries such as muscle aches/strains/ sprains and carpel tunnel syndrome (Shaheen et al., 2023).

The fundamental roles played in critical patient care requires workers to remain level-headed, and to use strategies to deal with the psychological burdens produced by the working conditions to offset tensions that may cumulatively affect their health, potentially leading to pathogens. The role includes rapid decision-making, and a keen sense of responsibility in determining priority actions; the resolution of complex problems; continuous reorganizing of activities as a result of frequent interruptions; management of large volumes of variable data due to simultaneous treatments; and a wide variety of interventions required by critical clinical conditions (Rypicz et al., 2020).

Quality of work life will show positive emotional reactions and individual attitudes towards their work (Suyantiningsih et al., 2018). Those employees having good psychological states, and able to achieve personal needs, will recognize the QWL provided by their organizations, and will be motivated to better perform (Bindi and Arumugam, 2017).

The quality of work-life (QWL) indicates employees' satisfaction with their work life and their own judgment of the working environment (Liang et al., 2023). The quality of nursing work life (QNWL) is a concept that describes nurses' perceptions of their needs (growth, opportunity, safety) met through work experience in organizations (Agusto et al., 2022).

The factors influencing the QWL of nurses include organizational commitment, emotional labor, safety climate, health status, social support, and work environment (Akter et al.,). Factors such as hospital size, number and type of patients, nurse's salary, hospital policies and physical environment may also affect the nurses QWL (Choi and Seo, 2023). Nurses in small size hospitals had greater satisfaction with their QWL. In addition, nurses in public hospitals reported higher levels of occupational stress and lower levels of job satisfaction and performance (Fragkos et al., 2020).

The QWL is important for organizational citizenship behavior, for enhancing workers' participation in job design and for the improvement of communication and job security (Hwang,

2022).
The QWL affects the performance and conscientiousness of workers in different sectors, involving healthcare settings. A high QWL is necessary to attract new staff and retain a workforce. The positive effects of QWL involve improvement of employees' jo commitment and satisfaction, better quality of care, more individuals and organizational productivity, less burnout and lower turnover (Kheiri et al., 2021).
Nurses with higher QWL demonstrate greater work productivity, job satisfaction, overall quality of life and lower rates of turnover, or intention to leave. Moreover, the quality of care that nurses provide can be affected by their perceived QWL (Colichi et al., 2017).
On the other hand, positive attitudes of nurses toward their working life, receiving salary and other job benefits regularly, and the nurses' compatibility with their working conditions can cause higher QWL and nurses with higher QWL are motivated and therefore have more ability to doing tasks (Al Mutair et al., 2022). Meanwhile, lack of opportunity for using personal skills and job promotion can be reason for the converse relationship between work ability and QWL (Awosoga et al., 2022).
Significance of the study:
Occupational hazards among hospital workers and care providers constitute a major problem worldwide. Although high levels of protection are provided to these employees in developed countries, it is still lagging in less developed countries, with a paucity of relevant data. A high level of knowledge and awareness about hospital workplace hazards and related preventives measures can help ensure a safe work environment for hospital workers.
Nurses, like every member of the healthcare team, expect to work in safe settings abiding with all recommend standards developed to promote occupational safety. Engaging nurses in relevant training programs is expected to provide them with needed knowledge and improve their performance regarding protection. This would have a positive impact on their quality of work life, with subsequent improvement of the quality of care they provide.
Aim of the study:
The aim of this study was to assess the effect of occupational health hazards training program on nurses' quality of work life (QWL) at Blbies Centeral HospitaL El-Sharkia Governorate, Egypt.
Research objectives:
1. Assess nurses' knowledge regarding occupational health hazards throughout the training program
2. Assess nurses' quality of work life (QWL) levels regarding occupational health hazards throughout the training program
3. Design and implement an occupational health hazards training program based on assessment data
4. Evaluate the effect of occupational health hazards training program on nurses' quality of work life (QWL).
Research hypothesis
There will be an improvement in nurses' knowledge regarding occupational health hazards, after implementing the training program, and this will have a positive effect on their quality of work life (QWL).

2. Subjects and methods:

Research design:
Quasi-experimental one group pretest-posttest design was utilized to fulfill the aim of the study.
Study setting:
The study was conducted in all inpatient departments of Belbeis Central Hospital, affiliated to the Ministry of Health in El-Sharkia Governorate, Egypt.

Study subjects:
The study population consisted of all available staff nurses working in the inpatient departments of the study setting at the time of the study. Their total number was 130 nurses. They were all included in the study sample with no exclusion criteria. This sample size was larger enough to demonstrate post-intervention improvements in their knowledge, practice, and QWL with a moderate effect size (Odds Ratio 2.1) at 95% level of confidence and 80% study power, and accounting for an expected dropout rate of about 10%.
Inclusion criteria:

- All three of the nursing specialties—technical, bachelor's, and diploma—were covered,
- Both sexes,
- Possessing a minimum of one year of experience and
- Agree to participate in the research.

Tools of data collection:
To fulfill the purpose of this study, two tools were used for data collection as follows:
Tool I: self-administered Questionnaire.
Tool I: Self-administered questionnaire: This tool aim was to assess the knowledge of nurses regarding hazards facing them during their work and the different methods of protection from these hazards. It was adapted from Abed-El-Aziz (2010). The questionnaire consists of the three main parts as following:
Part I: This was for participants' personal data such as age, gender, marital status, nursing qualification, as well as the work department, daily working hours, and experience years.
Part II: This part covered job characteristics of studied nurses and asked them about their exposure to different occupational hazards. It consists of 40 items grouped under five domains Use of Personal Protective Equipment (PPE) (5 items), Exposure to ergonomic hazards at work (6 items), Exposure to various types of occupational hazards(14 items), Experience of pain at work(10 items) and Overall exposure to occupational hazards during hospital work(5items).
Part III: This was intended to assess staff nurses' knowledge of the various occupational hazards associated with hospital work and related preventive measures. It consisted of 26 multiple choice questions (MCQ) covering general occupational hazards (2 items), physical hazards (2 items), biological hazards (5 items), disinfection and sterilization (3 items), safe waste disposal (1 item), dealing with hazardous exposures (7 items), psychological hazards (3 items), and social hazards (3 items).
Scoring system: Each item is scored one when the answer is correct and zero when incorrect. The totals of each area and for the total questionnaire were summed-up and converted into percentage scores. The staff nurse's knowledge was considered satisfactory if the percentage score was 60% or more, and unsatisfactory if less than 60%.
ToolI: Quality of Work Life (QWL) scale: This tool was adapted from Abd-Elmawala (2019) to assess staff nurse's quality of work life before and after the educational intervention. It consists of 35 items on a five-point Likert scale ranging from "strongly agree"5 to "strongly disagree 1." These items are categorized under six main domains: Moral (emotional) work environment (6 items), Job characteristics(6 items), Salaries and incentives(5 items), Work team(6 items), Supervisor leadership style(6 items) and Participation in decision making(6 items).
Scoring system: The responses "strongly agree", "agree", "uncertain", "strongly disagree", and "disagree" were respectively scored 5, 4, 3, 2, and 1. The scores of the items of each domain and of the full scale were summed-up and the totals divided by the number of corresponding items. These scores were converted into percentage scores. The QWL was considered high if the percentage score was 60% or more, low if less than 60%.
Content validity& Reliability:
Once prepared, the data collection forms were presented to a jury group consisting of five experts for face and content validation. These included five professors of Nursing

Administration at the Faculty of Nursing, Zagazig University. A face and content validity sheet was used for this purpose. It included one section for their general or overall opinion about the form and the relevance of each item, and another section to express their opinions and comments on the tools applicability, comprehensiveness, and understandability, and any suggestion for modification.

The reliability of scales used in the data collection forms (Occupational health hazards and QWL) was done through examining their internal consistency. They demonstrated high levels of reliability. For Occupational health hazard (0.925) and QWL(0.976).

Fieldwork

The fieldwork was achieved through four phases namely: preparation, implementation, and evaluation phases .

preparation phase: After finalization of the data collection tools, and obtaining required official permissions to collect the data, the researcher started the actual process of data collection. The researcher introduced herself to the staff nurses, explained the aim of the study and its procedures. Then, she asked for their informed consent to participate in the study and for their cooperation after informing them about their rights to participate or refuse participation.

Those who provided their informed consent to participate were given the data collection tools (1 and 2) along with clear instructions about how to fill them in. The researcher was present at all time to respond to any queries. The filled forms were then collected, and the researcher checked each questionnaire to ensure completeness of the data filling. The average time taken by each staff nurse to fill in the form was twenty minutes.

Implementation phase: The data collected from various sources during the preparatory phase was analyzed. It served as baseline or pretest data for later comparison with the post-intervention data to assess the effectiveness of the training. It also helped the researcher to identify the knowledge and skills gaps to be emphasized in the educational intervention.

Evaluation phase: Thus, the training program was based on these identified needs, with the help of pertinent literature. These identified needs were translated into a general aim and specific objectives.

Pilot study:

A pilot study was carried out on 13 staff nurses representing 10% of the study sample. They were selected from other departments. The purpose was to test the tools feasibility and understandability, and to estimate the time needed for filling-in the forms. A brief explanation of the purpose of the study was provided to every participant in the pilot study, and then they were provided with a copy of the data collection forms. The time consumed in answering the questionnaire ranged between 20 and 30 minutes, and three hours for observation. The data collected from the pilot study was reviewed and any needed changes were applied. The nurses in the pilot were included in the main study sample to avoid any bias or contamination.

Administrative and ethical considerations:

Permissions for data collection and implementation of the educational program were obtained through a letter issued from the Dean of the Faculty of Nursing to the Medical and Nursing Directors at Belbeis Central Hospital El Sharkia Governorate, Egypt. The researcher met with the nursing director of the hospital and explained the aim of the study and the tools to be used for data collection to obtain her agreement, support, and cooperation.

Ethical considerations: The study protocol was approved by the Research Ethics Committee at the Faculty of Nursing, Zagazig University. The researcher provided a full explanation of the nature, aim, and benefits of the study explained to each of the staff nurses as well as about their rights before inviting them to participate. They were informed about voluntary participation and the right to withdraw at any time and provided their informed consent to participate. All data obtained was considered confidential and not used outside this study purpose. No harmful maneuvers were performed or used.for the study.

Statistical analysis:

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations and medians quantitative variables. Quantitative continuous data were compared using Student t-test in case of comparisons between two independent groups and paired t-test for dependent groups. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In larger than 2x2 cross-tables, no test could be applied whenever the expected value in 10% or more of the cells was less than 5. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. In order to identify the independent predictors of the knowledge, practice, and QWL scores, multiple linear regression analysis was used. Statistical significance was considered at p-value <0.05 .

3. Results:

Table (1): The study involved 130 staff nurses whose ages ranged between 21 and 45 years, median of 30.0 years. The majority were females (83.1%), with a diploma degree (65.4%), and married (74.6%), the highest percentage of the staff nurses in the study sample were working in ICUs (22.3%)

Table (2) indicates that the daily working hours of the majority of staff nurses were <=8 and ranged between 7 and 12 hours. Their experience years ranged from one to 25 years, a median of 10.0 years.

Figure (1): illustrates that the staff nurses' satisfactory knowledge increased from 11.5% at the pre-intervention phase, to 87.7% at the post-intervention phase. The difference was statistically significant (p<0.001).

Table (3): demonstrates that the knowledge related to ergonomic hazards among the staff nurses in the study sample was low in the pre-intervention phase, especially regarding low back pain (26.2%). In the post-intervention phase, there were statistically significant improvements in all items (p<0.001), reaching 96.9% for their knowledge of correct lifting.

Table (4): demonstrates that the staff nurses' knowledge was low in all areas at the pre-intervention phase, especially regarding psychological hazards (9.2%). At the post-intervention phase, there were statistically significant improvements in all areas (p<0.001), reaching 96.2% regarding biological hazards.

Table (5): illustrates that slightly more than one half of the staff nurses in the study sample had high QWL at the pre-intervention phase. It ranged between 51.5% for the dimension of salaries/incentives and 56.9% for the dimension of job characteristics. The post-intervention phase revealed statistically significant improvements in all six dimensions (p<0.001), reaching 100.0% for the dimensions of work team and supervisor leadership style.

Figure (2): Overall, Figure 4 illustrates that the staff nurses' high QWL from 50.0% at the pre-intervention phase, to 99.2% at the post-intervention phase. The difference was statistically significant (p<0.001).

Table (6): points to statistically significant relations between staff nurses' knowledge and practice at both pre-intervention and post-intervention phases (p=0.002). It is evident that more nurses with satisfactory knowledge had adequate practice. Meanwhile, no statistically significant relations could be shown between staff nurses' knowledge and QWL at any of the two phases.

Table (1): Frequency distribution of studied nurses according to their personal characteristics (n=130).

Demographic characteristics	No.	Percent
Age:		
<30	53	40.8
30+	77	59.2
Range	21-45	
Mean±SD	30.9±30.0	
Median	30.0	
Gender:		
Male	22	16.9
Female	108	83.1
Nursing qualification:		
Nursing school diploma	85	65.4
Bachelor	45	34.6
Marital status:		
Unmarried	33	25.4
Married	97	74.6

Table (2): Job characteristics of staff nurses in the study sample (n=130)

Job characteristics	No.	Percent
Daily work hours:		
<=8	**106**	**81.5**
>8	**24**	**18.5**
Range	**7-12**	
Mean±SD	**8.7±1.5**	
Median	**8.0**	
Experience years:		
<10	**63**	**48.5**
10+	**67**	**51.5**
Range	**1-25**	
Mean±SD	**9.4±4.9**	
Median	**10.0**	

Table (3) Pre-post-intervention changes in work exposures as reported by staff nurses(n=130).

Work exposures	Time				X^2 test	p-value
	Pre (n=130)		Post (n=130)			
	No.	%	No.	%		
Use of PPE:						
Some	100	76.9	10	7.7		
All	30	23.1	120	92.3	127.64	<0.001 *
Exposed to ergonomic hazards:						
Some	99	76.2	32	24.6		
All	31	23.8	98	75.4	69.07	<0.001 *
Hazardous exposures:						
Some	115	88.5	12	9.2		
All	15	11.5	118	90.8	163.30	<0.001 *

(*) Statistically significant at p<0.05

Table (4) Pre-post-intervention changes in staff nurses' knowledge (n=130).

Knowledge	Time				X^2 test	p-value
	Pre (n=130)		Post (n=130)			
	No.	%	No.	%		
Ergonomic hazards:						
Satisfactory	32	24.6	89	68.5		
Unsatisfactory	98	75.4	41	31.5	50.23	<0.001*
Biological hazards:						
Satisfactory	50	38.5	125	96.2		
Unsatisfactory	80	61.5	5	3.8	98.32	<0.001*
Universal precautions:						
Satisfactory	26	20.0	105	80.5		
Unsatisfactory	104	80.0	25	19.2	96.02	<0.001*
Psychological hazards:						
Satisfactory	12	9.2	106	81.5		
Unsatisfactory	118	90.8	24	18.5	137.11	<0.001*

(*) Statistically significant at p<0.05

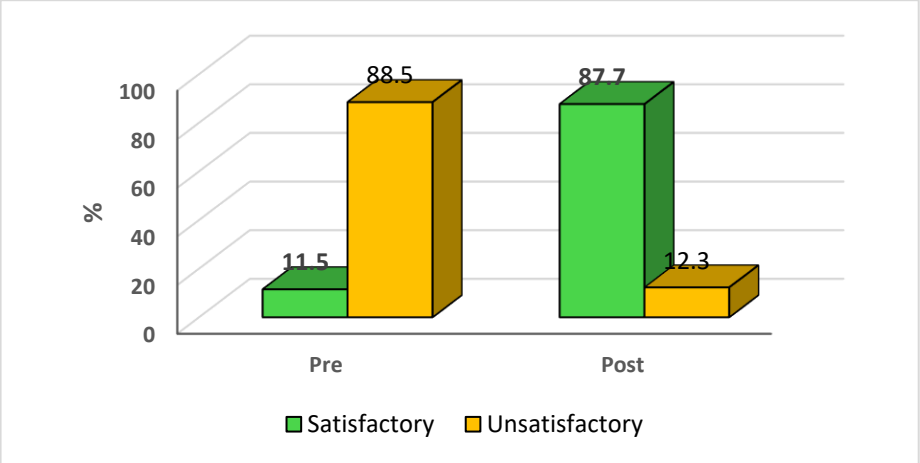

Figure (1): Pre-post-intervention changes in staff nurses' knowledge (n=130).

Table (5): : Pre-post-intervention changes in staff nurses' Quality of Work Life (QWL)(n=130).

QWL	Time				X^2 test	p-value
	Pre (n=130)		Post (n=130)			
	No.	%	No.	%		
Emotional work environment:						
Adequate	73	56.2	129	99.2		
Inadequate	57	43.8	1	0.8	69.59	<0.001*
Job characteristics:						
Adequate	74	56.9	129	99.2		
Inadequate	56	43.1	1	0.8	67.97	<0.001*
Salaries/incentives:						
Adequate	67	51.5	123	94.6		
Inadequate	63	48.5	7	5.4	61.31	<0.001*
Work team:						
Adequate	69	53.1	130	100.0		
Inadequate	61	46.9	0	0.0	79.70	<0.001*
Supervisor leadership style:						
Adequate	71	54.6	130	100.0		
Inadequate	59	45.4	0	0.0	76.32	<0.001*
Participation in decision-making:						
Adequate	71	54.6	129	99.2		
Inadequate	59	45.4	1	0.8	72.89	<0.001*

*Significant at p ‹0.05. **Highly significant at p ‹0.01. Not significant at p>0.05

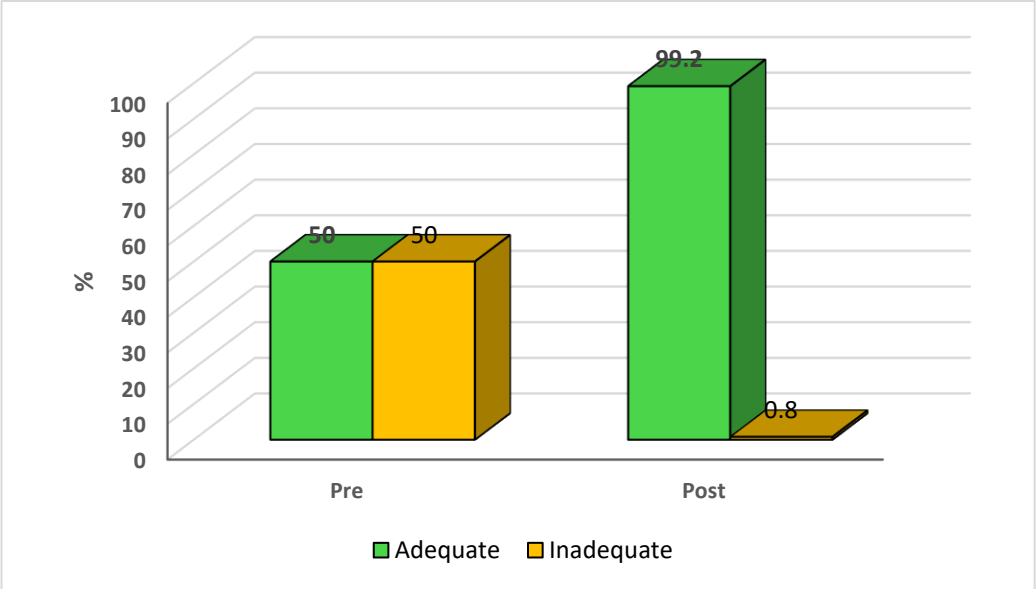

Figure 4: Pre-post-intervention changes in staff nurses' Quality of Work Life (QWL) (n=130).

Table 6: Relations between staff nurses' knowledge and QWL Pre and post program intervention (n=130).

QWL	Knowledge				X^2 test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Pre QWL:						
Adequate	11	16.9	54	83.1		
Inadequate	4	6.2	61	93.8	3.69	0.06
Post QWL:						
Adequate	114	88.4	15	11.6		
Inadequate	0	0.0	1	100.0	1.33	0.249

(*) Statistically significant at $p<0.05$

4. Discussion:

Nurses are exposed to a gamut of occupational exposures during their work in hospitals and healthcare settings. Such exposures may untoward impact on the nurses quality of life. Thus, certain exposures at work were associated with reproductive problems and pregnancy outcomes, as well as infectious diseases. Moreover, such exposures may jeopardize the safety and wellbeing of the patients under their care (Sani et al., 2024).

The aim of this study was to assess the effect of occupational health hazards training program on nurses' quality of work life (QWL). It hypothesized that there will be an improvement in nurses' knowledge regarding occupational health hazards, after implementing training program, and this will have a positive effect on their quality of work life (QWL). The results revealed significant improvements in staff nurses' post-intervention knowledge regarding occupational health hazards, as well as in their QWL. This leads to acceptance of the set research hypothesis.

The present study sample included staff nurses in early and mid-career, in the third to fifth age decades, with a median of 10 years of experience. Like most staff nurses in Egypt, the majority were females with a diploma degree in nursing and were married. Thus, the sample could be

considered a representative sample of Egyptian staff nurses According to the current study results, most of the staff nurses reported being exposed to ergonomic hazards at work. Bending was the most frequent of the ergonomic exposures, while twisting was the least. Similarly high prevalence rates of bending and twisting were reported among nurses in China (Zhang et al., 2024).

Such high exposure to ergonomic hazards as identified in the current study could lead to several musculoskeletal problems that may affect their work as well as personal life and wellbeing. In fact, a great majority of the nurses in the present study reported suffering from low back pain, and this was experienced after joining the work in the hospitals. In agreement with this, a study of ergonomic exposures among staff nurses in Oman reported a significant association between such exposures and various musculoskeletal disorders (Attia et al., 2023). On the same line, a study in Japan found that low back pain was one of the most common occupational hazards facing nurses (Kikuchi et al., 2024).

Concerning hospital work exposures as reported by the staff nurses in the current study sample, the long work and shift hours were the most frequent as mentioned by a majority of them. This is in agreement with a study on Chinese nurses where long working hours were reported by a significant percentage of them, and was associated with musculoskeletal disorders (Liu et al., 2023). Such exposure could have a negative impact on staff as they can decrease their work efficiency, stress, and fatigue, along with low morale and decreased productivity. These in turn lead to more lost time and increased costs.

This foregoing present study's finding is expected given the shortage of staff nurses in various healthcare settings in Egypt. In this respect, a study in Switzerland revealed a significant association between nurses' high workload related to high patient-to-nurse ratios and their work-life balance (Zraychikova et al., 2023). Moreover, Schwartz et al. (2024) in a study in the United States mentioned that hospitals are faced with a crisis of shortage of nurses crisis, which is anticipated to increase over the coming decade, with a heightened workload burden on nurses.

The conflict with supervisors was also an important ergonomic hazard as reported by more than three-fourths of the staff nurses in the present study. This could also have a negative influence on nurses' job satisfaction and burnout. In congruence with this, a study in the United States demonstrated that among the important factors underlying burnout and the intention to leave among nurses was the lack of efficient leadership, and the absence of responsive supervisors, with associated conflicts (Aboutaleb et al., 2024).

A paradoxical finding of the current study was that the nurses reported significantly more exposures to ergonomic hazards and occupational hazardous exposures after the implementation of the study intervention program. This could be explained by their increased awareness of such exposures after attending the educational intervention.

According to the present study results, the exposure to physical hazards was the highest, being reported by more than three-fourths of the nurses. On the other hand, the exposure to biological hazards was the least reported. The finding could be explained by the greater emphasis given to infection control precautions in comparison with the measures of protection from physical and ergonomic hazards. Thus, the absence of strict infection control measures has been associated with a very high exposure to biological hazards such as needle stick injury as reported in a study of nurses in Yemen (Abdo Almoliky et al., 2024).

As regards the use of personal protective equipment (PPE), the present study results demonstrated that only less than one-fourth of the nurses reported using them. Obviously, the personal protective equipment most used were gloves and masks which are essential in their daily work. In line with this, a study of nurses' use of PPE in Singapore found that only 20% of them were complying with their use (Chia et al., 2024). The reasons underlying low compliance with the use of PPE, as identified in a study in Australia, include fatigue, and their adverse effects on skin and respiration (McKenna et al., 2024).

Meanwhile, the implementation of the present study educational intervention led to a significant

improvement in nurses' use of PPE, reaching more than ninety percent. The finding indicates the effectiveness of the intervention, which could be attributed to its being based on nurses' identified needs and gaps of knowledge. In agreement with this, a study in India demonstrated the effectiveness of an educational intervention on nurses' compliance and correct use of PPE (Lazar et al., 2024).

The present study has also addressed nurses' knowledge of the various occupational hazards and exposures. The results revealed low levels of knowledge. Thus, less than one-tenth of them had satisfactory knowledge of the psychological hazards, while less than two-fifths had satisfactory knowledge of the biological hazards before the implementation of the pre-intervention. Overall, approximately one-tenth of the nurses had total satisfactory knowledge. Such deficient knowledge of occupational hazardous exposure explains their high exposure to all hazards.

In contradiction with this foregoing present study results, a study assessing the knowledge, attitude, and practice of nursing staff at teaching Hospitals in Kerbala City, South-Central Iraq regarding occupational health hazards found that 84% of subjects had satisfactory knowledge (Kumar et al., 2022). Meanwhile, a cross-sectional study assessing the knowledge and practice of nurses regarding needle stick injury in allied hospital Faisalabad revealed that 54% of nurses have insufficient knowledge (Baishya and Baruah, 2023). The differences might be explained by differences in the settings.

Concerning the factors influencing nurses' knowledge, the bivariate analyses better knowledge among diploma nurses, those more exposed to hazards, those who use all PPE, and those exposed to all hazardous exposures. However, in the multivariate analysis, only the level of education and the hours of work had a significant association with the nurses' knowledge. In line with this, a study assessing health workers knowledge towards Occupational Health and Safety Program in Primary Health Care Centers, Iraq found that the level education have a great effect on occupational health and safety program (Rai et al., 2021).

After the implementation of the present study intervention, the nurses' knowledge significantly improved. Thus, almost ninety percent of them had satisfactory knowledge. This improvement is undoubtedly attributed to the effect of the educational intervention as confirmed by the results of the multivariate analysis, which identified it as the main positive predictor of the knowledge score. The significant positive effect of the intervention on nurses' knowledge could be because its knowledge core content gave a major emphasis on applied information. A similar improvement in nurses' knowledge following attendance of a training program in a study in Denmark (Nielsen et al., 2024).

A second objective of the present study was concerned with staff nurses' Quality of Work Life (QWL). The findings revealed average levels of QWL in all its dimensions. The lowest dimension was related to the dimension of salaries and incentives, where slightly more than half of them had high QWL. This is quite expected given the high workload that is not compensated for with sufficient reimbursements. A similar finding was reported in a study of QWL in Ghana, where low salaries were found to be a negative predictor of respondents' QWL (Poku et al., 2023). Thus, Liang et al. (2023) in a study of the QWL of hospital nurses in Taiwan recommended a balance between effort and rewards to improve their QWL.

5. Conclusion:

The study results lead to the conclusion that the staff nurses are highly exposed to various occupational hazards, with low use of PPEs. Their related knowledge are low, with associated low QWL and they are positively inter-correlated. The implementation of the training intervention shows effectiveness in improving their knowledge and QWL. The intervention has a direct positive impact on their scores, as well as direct impacts through improving their knowledge.

Overall, the current study results point to post-intervention significant improvement in nurses' QWL. Thus, while only around half of them had high QWL before the intervention, almost all of them had high QWL in the post-intervention phase. This improvement can be attributed to the effect of the intervention, both directly and indirectly.

6. Recommendations:

Given the study findings, the following is recommended.

- The developed training program could be applied to similar settings given its proven effectiveness, along with its related manual.
- The staff nurses need continuing education and training through workshops and seminars to boost their knowledge and skills related to occupational safety and health.
- Special emphasis should be given to the areas identified as deficient in their knowledge and skills.
- The training should also include training in ergonomic principles and safe ways for handling and lifting to avoid related hazards.
- A comprehensive program for personal protective equipment (PPE) should be developed and applied, with the provision of high-quality and efficient PPE.
- Staff nurses should be trained in the proper use of PPE, and they should be monitored for their use, with a system of reward and retribution.
- The infection control committee in the hospital should have an active role in protecting healthcare workers from hospital-acquired infections and biological hazards.
- Safety policies must be available in each department in the hospital, with the orientation of nurses about these policies and their related procedures, especially for the newly appointed staff.
- The hospital administration should use the study findings related to the work environment to correct any deficiencies that could pose occupational hazards to nurses and employees.

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