

Effectiveness of Application of WHO Multimodal Strategy for Improvement of Knowledge, Practice, and Professional Quality of Life of Nurses during COVID-19 Pandemic

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Abstract

Background: The application of the WHO multimodal strategy during the periods of the outbreak of COVID-19, is of great importance for improving nurses' knowledge, practice, and professional quality of life. **Aim:** To Evaluate the Effectiveness of the application of the WHO multimodal strategy on knowledge, practice, and professional quality of life of a nurse's during the Covid-19 pandemic and compare between nurses working in intensive care unit and isolation ward about knowledge, practice, and professional quality of life. **Design:** Quasi-Experimental research design was utilized. **Setting:** The current study was carried out at general Quwesna Hospital, Menoufia governorate, Egypt. At isolation wards for COVID-19 patients and intensive care unit (ICU). **Subject:** a purposive sample of (110) nurses providing direct care for Covid-19 patients, they were divided into two groups study group one: (45) nurses in ICU and **Study group** two: (57) nurses at isolation wards. **Tools:** Tool I- nurse's socio-demographic and medical data. Tool (2): Covid-19 nurses knowledge assessment. Tool (3): Covid-19 nurses practice Observational checklist, and Tool (4) The Professional Quality of Life scale (ProQOL). **Results:** A highly significant difference was found between both groups pre/post application of WHO multimodal guidelines about knowledge and practice mean scores. Compassion Satisfaction was increased from an average level to the high level and burnout was decreased from average level to the low-level post-intervention of application of WHO multimodal strategy. **Conclusions:** The application of the WHO multimodal strategy had been proven to significantly increase knowledge, practice and Professional quality of life mean score of nurses. **Recommendations:** Applications of the WHO multimodal strategy and replication of the study using a large probability sample from a different geographical area to allow for greater generalization of the results.

Keywords: WHO multimodal guidelines strategy, Professional quality of life nurses, Covid-19.

Introduction

Coronavirus disease 2019 (COVID-19), was initially discovered in late 2019 in China, and then has been spread worldwide, prompted the World Health Organization to pronounce it a pandemic in March 2020 (WHO, 2020, Guan, 2020. Wei, et al 2020 and ECDC, 2020). Throughout the outbreak of COVID-19 periods, implementation of infection prevention and control (IPC) is essential in healthcare settings, especially concerning the personal protecting of healthcare workers (Rahmet, Imran, and Firdevs, 2020). Infection Prevention and Control (IPC) is a critical concern for healthcare systems all over the world. There is a significant possibility to minimize preventable morbidity and death through IPC at the COVID-19 pandemic period (ECDC, 2020).

Prevention measures are the effective strategy to lower the spread of infection and are focusing on the isolating patients and careful infection control, including appropriate measures are to be adopted during the diagnosis and the providing the clinical care to an infected patient (WHO, 2020). To achieve the best level of efficacy in responding to the COVID-19 epidemic, the following IPC methods to prevent or restrict transmission in health care settings should be used: 1. guaranteeing triage, early detection, and source control as isolating patients suspected of having COVID-19; 2. Implementing standard precautions for all patients; 3. Implementing empiric additional precautions (droplet and contact precautions, and, when applicable, airborne precautions) for suspected COVID-19 patients; 4. Implementing administrative controls; and 5. Utilizing environmental and

engineering controls (WHO, 2018 and Abdullelah and Farhan. 2020).

Multimodal implementation strategies are a core component of effective infection prevention and control programs according to the WHO Guidelines (2018) on Core Components of IPC programs at the National and Acute Health Care Facility Level. The guidelines' recommendations state that IPC activities using multimodal strategy should be implemented to improve practices and reduce Health care Associated Infection (HAI). In practice, this means that the use of multiple approaches in combination will contribute to influencing the behavior of the target audience usually health care workers towards the necessary improvements that will impact the patient outcome and contribute to organizational culture change.

WHO (2018) determines five elements for IPC multimodal strategy in a health care context: the change of system needed to enable IPC practices, including infrastructure, equipment, supplies, and other resources. Training and education for improving knowledge of health worker; supervision and feedback to evaluate the problem, drive appropriate change, and document practice improvement. reminders and communications to promote the desired actions, at the suitable time, including campaigns; emphasize a safety culture for facilitation of an organizational climate that values the intervention, with a focus on the involvement of senior managers, champions, or role models (Graeme, 2020 and Beijing. 2020). nurses are working to overcome or recovering from the wave of the worst pandemic humanity that has seen in the century across the world, within multi-disciplinary health teams,. They are predominantly depicted providing direct patient care; they are also well represented at every level of pandemic response from advising to leading research, coordinating with health teams, and strategizing humanitarian responses to COVID-19 (Catton, 2020).

Nurses are considered the largest component of the medical workforce, they play an essential role to develop practice, and preserve the core values of health systems all over the world. They have always played an

essential role in infection prevention, infection control, and isolation (Jackson, Bradburg, and Baptiste. 2020). Nurses on the front line in current events are showing the commitment and compassion always expected from them, however, the truth is that they put their lives at danger via their work (Patricia, et al, 2020 and WHO, World's Nursing Report, 2020). Nurses see and practice healthcare via a different lens than other health professions and are often described as the linchpin of health systems. They are the group of healthcare professionals with the closest and most constant proximity to patients and are often exposed to danger and moral dilemmas, facing impossible choices in the context of overwhelming need amid resource constraints (Kaur, Sharma and Chaturvedi, 2018 and US Department of Veterans Affairs, 2020). Nurses are uniquely placed to convene multi-disciplinary health professional teams for patient safety and wellbeing (Australian Government Department of Health, 2020 and Houghton, Meskell and Dalaney, 2020).

Data from recent research reveals that nurses are more likely to be exposed to COVID-19 and at a greater risk of COVID-19 infection than the general population. As a result, following infection prevention and control methods is crucial for reducing nurses' exposure to COVID-19 infection. Indeed, accurate and regular application of IPC guidelines reduces the likelihood of COVID-19 infection (Hacke, 2020 and Verbeek et al 2020). While nurses are urged for providing the best possible degree of care to improve healthcare quality, their quality of life, particularly during the Coronavirus Disease 2019 (COVID-19) pandemic continues to be under threat. As they go through putting themselves at risk both mentally and physically while generously taking of others, they experience a paradox of emotions that constitute the components of what is termed 'professional quality of life (Watson, 2018).

Nurses can play a critical role in decreasing healthcare-associated infections (HCAIs) by following standard practice recommendations that include basic but cost-effective strategies such as maintaining hand cleanliness, wearing personal protective equipment, and appropriate waste disposal

(World Health Organization. 2016).

Professional quality of life is described as a person's negative and good feelings regarding their profession of assisting others who are suffering or experiencing trauma, and it consists of two components: compassion satisfaction (CS) and compassion fatigue (CF). CF is divided into two parts: burnout (BO), which is characterized by exertion, frustration, anger, and anxiety, and secondary traumatic stress (STS), which is characterized by fear and work-related trauma (Stemm, 2010).

Significance of the study:

Especially nurses as the first line against COVID-19 are at a higher risk of COVID-19 viral infection during work and play an important role in fighting the COVID-19 pandemic. Findings of updated research reveals that nurses as medical professional one are more likely to be subjected to COVID-19, so, they are at a greater risk of COVID-19 infection than the general population (Wang, 2019 and Chang, Xu, Rebaza, Sharma, Dela Cruz, 2020). In Egypt, it was reported that, the first confirmed case of COVID-19 was in mid-February 2020. By mid-March 2021, a total of 193,482 COVID-19 cases and 11,472 deaths had been reported (3.5% of cases and deaths were HCWs (Ministry of Health and Population, Egypt, 2021). However, prevention remains the most effective means of safeguarding healthcare workers from the COVID-19 pandemic. Therefore, this study increases the knowledge and practice of nurses about infection prevention and control for reducing healthcare workers' exposure to infection and improves Professional quality of life.

Aim of the study:

This study aims to:

1. Evaluate the Effectiveness of Application of WHO Multimodal Strategy for Improvement of Knowledge, Practice, and Professional Quality of Life of Nurses during COVID-19 Pandemic
2. Compare between nurses working in intensive care unit and isolation ward about knowledge, practice, and professional quality of life.

Hypothesis:

1. Nurses knowledge Mean score exhibit improvement post-application of WHO multimodal strategy than pre-application.
2. Nurses' practice Mean scores exhibit improvement post-application of WHO multimodal strategy than pre-application.
3. Nurse's Professional quality of life means score exhibit improvement post-application of WHO multimodal strategy than pre-application.
4. A positive correlation illustrated between knowledge, practice, and compassion satisfaction as a subscale of professional quality of life.

Subjects and Methods

Design: Quasi-Experimental research design was utilized for this study.

Setting: The current study was carried out at isolation wards for Covid 19 patients and ICU, general Quwesna Hospital, Menoufia governorate, Egypt. This hospital is the main and the largest in Quwesna city affiliated to the Ministry of Health and provides medical services for all villages surrounding it. Throughout the COVID-19 pandemic, the hospital turned to be an isolation hospital. It contains about 100 beds for isolation, 8 beds for ICU for COVID-19 patients.

Subject: A convenience sample of (110) nurses providing direct care for Covid-19 patients selected and divided into two groups according to the place of work. All nurses in isolation wards (63) and all nurses in ICU (47). Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards and 2 from ICU:

Study group one: (45) nurses providing direct care for Covid-19 patients in ICU.

Study group two: (57) nurses providing direct care for Covid-19 patients at isolation wards.

Tools of the study:

The following tools were used to collect data:

Tool I: Nurses socio-demographic characteristics of the nurses: It was developed by researchers, it included questions related to gender, age, marital status, level of education, isolation working area, years of experience,

Tool (2): Covid-19 nurses knowledge assessment: structured questionnaire regarding infection Prevention and control against Covid-19, based on WHO multimodal strategy of infection prevention and control (World Health Organization; 2018) used to determine nurse's knowledge related to the essential infection prevention and control (IPC) precautions recommended to be followed by health care workers (HCWs) while caring for patients infected with Covid-19. In addition, three open-ended questions to identify the reasons for not following infection prevention and control (IPC) practice. It consisted of 30 multiple-choice questions; each question has 4 choices, only one is correct.

Scoring system:

Each correct answer was given a 2 score, the score ranged from 0-60 points. The total knowledge score was categorized as; **Unsatisfactory:** from zero to less than 40 grades, and **satisfactory:** more than 40 grades.

Tool (3): Covid-19 nurses practice Observational checklist: This tool was designed after a thorough review of relevant literature related to principles of infection prevention and control (IPC) during health care for patients with COVID-19; it included 30 statements to be checked by the researchers to assess nurses' practice of infection control and prevention during caring of Covid 19 patients . It included subscales of ensuring triage, early recognition, and source control (isolating patients with suspected COVID-19); applying standard precautions for all patients; implementing empiric additional precautions (droplet and contact and, airborne precautions) for suspected patients. (World Health Organization; 2018).

Scoring system:

Each item was given 2 scores for each correct practice and a zero score for incorrect

practice. The total score of the checklist was ranged from (0 to 60) and divided into two levels:

Unsatisfactory: from zero to 45 grades, and **satisfactory:** more than 45 grades.

Tool (4) The Professional Quality of Life Scale (ProQOL): was adopted from Stamm (2009), and used to assess the positive and negative effects of working with people who have experienced extremely stressful events. The scale includes subscales measuring compassion fatigue, burnout is one of the elements of compassion fatigue, and the second component of Compassion Fatigue (CF) is secondary traumatic stress (STS). The third component is compassion satisfaction. Each subscale is unique, and the results of each scale cannot be combined to give a single meaningful score. The instrument includes 30 items, 10 on each scale, which is rated numerically on a 5-point Likert scale, ranging from 0 (never) to 5 (very often). Scores outside of certain limits on the individual scales may signify a possible risk in that area.

Scoring system:

For each subscale alone, Compassion Satisfaction, Burnout, and Secondary Traumatic Stress

22 or less	Low
Between 23 and 41	Average
42 or more	High

Methods:

- **Approval to carry out the study** was obtained from the Research Ethical Committee, faculty of nursing, Menoufia.
- **An official letter** was submitted to the responsible authorities of the study sitting (Quesna general hospital to obtain their permission to collect data after explaining the research aims.
- Seven experts tested all tools of the study for content validity: three in the field of Medical-Surgical Nursing, two experts in the field of psychiatric health nursing, and two experts in infection prevention and control.
- **Reliability of the tools:** Reliability was estimated among 10 nurses outside subject using the test-retest method with two weeks

apart between them. Then Cronbach alpha reliability test was done through the SPSS computer package as the following:

Tool 2, Tool 3, showed an acceptable Cronbach α , 0.97, 0.83 respectively, and tool 4 CF/ST =.80, burnout= .72, and compassion satisfaction = .87.

- **Pilot study:** All tools were administered to 10% of nurses to test feasibility, applicability, and clarity of the study tools and detect any obstacles or problems that might arise during the actual collection of data. Data from the pilot study were excluded from the actual study finding.
- **Study period:** data was started from January 2020 to the end of May 2020 in the selected hospital and was carried out in the following **four phases:**

Assessment phase:

During the first phase, the researchers explained the aim of the study and the components of the tools. The assessment was carried out using the four tools to collect socio-demographic data, nurses' knowledge, practice, and professional quality of life.

1. Socio-demographic and knowledge assessment was carried out by asking the nurses to fill the questions related to tool (1) and (2) and return it back to the researcher
2. For assessing practical level, the researcher observes every nurse during her work using Tool 3 and professional quality of life using Tool 4 in three different shifts for three times

Planning phase:

Based on the assessment phase and current review of related literatures, planning was formulated putting into considerations priorities and expected outcomes as illustrated.

Expected outcomes:

Upon completion of application multimodal strategy:

- 1- The nurses discuss knowledge regarding items of the multimodal strategy of infection prevention and control against Covid-19 (World Health Organization; 2020).
- 2- Nurse's practices will be improved regarding COVID- 19 patients.
- 3- Improving surveillance systems, education,

and training in infection prevention and control.

- 4- Professional Quality of Life nurses will be improved.
 - An educational colored booklet was formulated based on multimodal strategy (World Health Organization 2018).
 - This booklet was designed and formulated based on the priorities of nurses' needs and distributed for each nurse.
 - All Nurses in the two groups were divided into small groups; the group ranged from three to five participants.
 - Theoretical part: Short interactive lectures and group discussions supported by audio-visual aids like PowerPoint lectures, illustrated pictures, and videos; were conducted for each group. This part is administered at the break time of work in a specific room. For each group, many theoretical sessions were ranged from 4 to 6 sessions; each one lasted about 20 minutes.
 - The practical part was administered at the site of work, at the break time for nurses, keeping the strict preventive measures of COVID 19 control of infection, each group had from (4-6 sessions), and each session lasted from 10-15 minutes.
 - Media used: Demonstration and return demonstration conducted for each group on top of using audiovisual aids.

Contents of WHO multimodal strategy (World Health Organization; 2020):

WHO identifies five elements for IPC multimodal strategies in a health care context:

1. The system should be changed to enable IPC practices, including infrastructure, equipment, supplies, and other resources.
2. Training and education to improve health worker knowledge and practice.
3. Monitoring and feedback to assess the problem, drive appropriate change, and document practice improvement.
4. Reminders and communications to promote the desired actions, at the right time, including campaigns.
5. A culture of safety facilitates an organizational climate that values the intervention, with a focus on the involvement of senior managers, champions,

or role models.

The study concentrated on the second component of the strategy, which is related to the Training of HCWS.

▪ **According to the IPC multimodal strategy in a health care context, the content is divided into two parts:**

Theoretical part:

- Definition of infection, chain, and routes of infection, infection control, and isolation precautions.
- Covid-19 definition, mode of transmission, the essential infection prevention and control (IPC) precautions recommended to be followed by HCWs while caring for patients infected to prevent the infection of Covid-19 to the family and the others, such as:
 - Rational use of PPE- when exposed to aerosol-generating procedures e.g. Nebulization, open suctioning
 - The isolation room and practice bundling of nursing interventions. Disposal or dedicated equipment.
 - How biomedical waste is should be treated?
 - How to deal with High touch surfaces such as doorknobs, bedrails, etc

Practical part:

- All techniques recommended by WHO, such as the technique of proper hand hygiene, using personal protective equipment, isolation procedures, and handling with infected secretions, supplies, and equipment, etc.
- Essential training on WHO “My Five Moments for Hand Hygiene”
- Instructional videos on five key moments for Hand Hygiene and correct Hand Hygiene techniques and PPT with HCWs.

Implementation Phase:

For all nurses in the two groups, based on the findings of the pre-test, the theoretical and practical parts were administered to nurses. The two parts were administered without interrupting the schedule of nurse's working

hours, keeping social distance, and the strict preventive measures of Covid-19 control of infection. The researchers distributed the booklet for all studied nurses. This booklet was divided into two parts theoretical and practical. It contains the aims, objectives, protection and prevention procedures, and expected outcomes for the intervention. The two parts were applied in 20 days and continuous feedback and communication were assured to clear any misunderstanding and to reinforce learning for these sessions. Observation of application of all skills related to infection prevention and control throughout caring Covid 19 patients and correctness before and after intervention (handwashing, wearing personal protective equipment, isolation procedures and handling with infected secretions, supplies, and equipment, etc.

Evaluation phase:

1. Nurses` knowledge, practice, and professional quality of life were evaluated pre, immediately post-application of WHO multimodal strategy and two weeks post using Tools from 2-4.
2. The comparison was done between nurses working in the isolation ward and nurses working in the intensive care unit.
3. Statistical analysis was done to fulfill the aims of the study.

Research Ethical considerations:

- Written informed consent was taken from each nurse after explaining the study's aim.
- Nurses' privacy was respected.
- Nurses' data confidentiality was assured.
- Right for each nurse to be withdrawn from the study at any time with no penalty.

Limitations of the study:

First, the small sample size, second, the direct observation method was used to collect data. Also, the current study concentrated only on the second component of the strategy, which is related to the training of Health Care Workers. Finally, due to the absence of a control group the observed improvements due to the WHO multimodal strategy should be interpreted carefully.

Statistical Analysis:

The collected data were organized, tabulated, and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 18, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison between two groups and more was done using the Chi-square test (χ^2). For comparison between means of two related groups (pre and post-test data) of parametric data, paired t-test was used. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p < 0.05$ for interpretation of results of tests of significance (IBM Corp., 2017).

Results

Table (1): clears that (47.1%) were male, while, (52.9%) were female, (62.7%) of the studied sample were married and had More than 10 years of experience, while the others were single, widowed, or divorced. (52%) of the studied sample had Bachelorette degree. As well, more than one-third of them (34.3%) their age was ranged between (30-40) years with a mean age of 35.6+ years ($SD=12.96$).

Table (2): It is noted that no statistically significant difference was found between both groups all through the study periods. However, a highly significant difference was found for each group between pre and the two assessments of post-application of WHO guidelines strategy concerning knowledge levels and scores.

Figure (1): this figure displayed the differences in practice levels and scores between the two studied groups regarding infection prevention and control practices. It shows that no statistically significant difference was found between both groups all through the study periods. However, a highly significant difference was found for each group between pre and the two assessments of post-application of WHO

guidelines strategy concerning practice levels and scores.

Table (3): shows the differences in the professional quality of life subscales between the two studied groups pre, immediately, and post-application of WHO strategy by 2 weeks. It indicated that Compassion Satisfaction was increased from average level to the high-level post-application of WHO strategy for both studied groups with a highly significant difference was found for each group all through the study periods. As well, at pre-application of WHO strategy, there was a highly significant difference was found between the two studied groups. However, at the post-application of the WHO guidelines strategy, there was no significant difference was found between them.

Regarding burnout and secondary traumatic stress, it is noted that Burnout was decreased from an average level to a low level immediately after post-application of WHO strategy and after 2 weeks post application for both studied groups with a highly significant difference was found for each group all through the study periods. As well, at pre-application of WHO guidelines strategy, there was a highly significant difference was found between the two studied groups. However, immediately after the post-application of the WHO strategy and after 2 weeks post-application, there was no significant difference was found between them.

Table (4): indicated that a positive correlation was found between knowledge, practice, and Compassion Satisfaction, however, knowledge, and practice were negatively correlated with Burnout and Secondary Traumatic Stress. In addition, Burnout and Secondary Traumatic Stress were positively correlated.

Table (1): Distribution of The studied nurses according to sociodemographic Characteristics (N = 102).

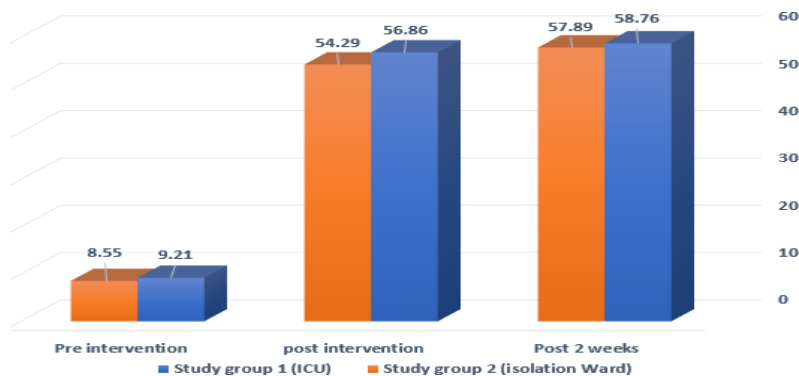
variable	N (%)	P value
Sex		
Male	48 (47.1%)	P=0.61
Female	54 (52.9%)	
Age		
20-	22(21.6%)	P= 0.87
30-	35 (34.3%)	
40-	18 (17.6%)	
50-	15 (14.7%)	
60->70 year	12 (11.8%)	
M+SD	35.6+ 12.96	
Years of experience		
1->6	18(17.6%)	P= 0.78
6->10	20 (19.7%)	
More than 10 years	64 (62.7%)	
X±SD	8.6+ 10.06	
Marital status		
Single	18(17.6%)	P= 0.55
Married	64 (62.7%)	
Divorced	11 (10.8%)	
Widowed	9 (8.8%)	
Educational Level		
Nursing diploma	49 (48%)	P= 0.65
Bachelor degree	53(52%)	
Department		
ICU	45 (44.1%)	P= 0.04
isolation Wards	57 (55.9%)	

Note: Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards, and 2 from ICU).

Table (2): Differences of knowledge mean scores between the two studied groups regarding infection Prevention and control practices.

Item	Pre Application		immediately post Application		Post 2 weeks		F-p values
	Mean	±SD	Mean	±SD	Mean	±SD	
Study group 1(ICU) (N=45)	9.21	±1.51	56.86	±3.69	58.76	±3.59	F=31.81*** P=0.000
Study group 2 (isolation ward) (N=57)	8.55	±1.57	54.29	3.56	57.89	±3.66	F=28.81*** P=0.000
T-p values	T=.90 P=0.99 NS		T=1.08 P=0.69 NS		T=.98 P=0.89 NS		

Note: Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards, and 2 from ICU).

**Figure 1.** Differences of practice mean scores between the two studied groups Pre, immediately, and post 2 weeks of application of practice of WHO strategy.

Note: Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards, and 2 from ICU).

Table (3): Differences between two groups of the studied nurses concerning mean score of Professional quality of life Pre, immediately and Post 2 weeks.

Items	Study group 1 (ICU) (N=45)		Study group 2 (isolation Ward) (N=57)		T-p value
	Mean	± SD	Mean	± SD	
Compassion Satisfaction					
Pre Application	26.31	1.98	37.31	2.42	24.63**
immediately Post Application	45.21	2.18	46.11	3.41	T=1. 78 P= 0.69 NS
Post 2 weeks	45.11	2.08	46.01	3.11	T=1. 08 P= 0.59 NS
F-p value	21.50**		20.90**		
Burnout					
Pre Application	40.28	3.13	27.57	3.16	20.22**
immediately Post Application	20.28	3.13	17.57	3.16	T=1. 18 P= 0.49 NS
Post 2 weeks	20.21	3.11	17.17	3.01	T=1. 08 P= 0.39 NS
F-p value	25.02**		17.02**		
Secondary Traumatic Stress					
Pre Application	33.24	4.76	24.38	3.27	11.11**
immediately Post Application	19.24	4.76	18.38	3.27	T=1. 48 P= 0.99 NS
Post 2 weeks	18.74	4.77	17.58	3.57	T=1. 58 P= 0.59 NS
F-p value	19.19**		21.17**		

Note: Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards, and 2 from ICU).

Table (4): Correlation between knowledge, practice, and Professional quality of life Pre, immediately and Post 2 weeks.

Items	knowledge	practice	Compassion Satisfaction	Burnout	Secondary Traumatic Stress
Pre Application					
knowledge	1.00				
practice	.61**	1.00			
Compassion Satisfaction	.72**	.71**	1.00		
Burnout	-.6**	-.52**	-.81**	1.00	
Secondary Traumatic Stress	-.43*	-.42*	-.73**	.62**	1.00
Immediately Post Application					
knowledge	1.00				
practice	.81**	1.00			
Compassion Satisfaction	.92**	.81**	1.00		
Burnout	-.86**	-.52**	-.80**	1.00	
Secondary Traumatic Stress	-.73**	-.62**	-.70**	.66**	1.00
Post 2 weeks.					
knowledge	1.00				
practice	.85**	1.00			
Compassion Satisfaction	.97**	.84**	1.00		
Burnout	-.89**	-.53**	-.81**	1.00	
Secondary Traumatic Stress	-.74**	-.69**	-.73**	.66**	1.00

Note: Eight Nurses were dropped from the study (refused to participate, 6 nurses from isolation wards, and 2 from ICU).

** . Correlation is significant at $p < 0.001$

Discussion:

The WHO multimodal strategy for infection prevention and control (IPC) practices improvement strategy has been proposed to translate into practice the WHO recommendations and is accompanied by a wide range of practical tools ready to use for implementation. The key five components of the strategy are System change, Training, education, evaluation and feedback, reminders in the workplace, institutional safety climate (Shen, et al., 2017).

Previous studies proved that this strategy was effective to enhance infection prevention and control (IPC) practices among nurses (Chang, Xu, Rebaza, Sharma, Dela Cruz, 2020, Houghton, Meskell, Delaney, 2020, Shen 2017).

The current study concentrated on the second component of the strategy, which is related to the training of Health Care Workers.

The current study aimed to evaluate the effectiveness of the application of WHO multimodal strategy on knowledge, practice and professional quality of life of a nurse's during the Covid-19 pandemic, and to compare between nurses working in intensive care unit and isolation ward to knowledge, practice and professional quality of life.

Demographic characteristics of the study subjects

The current study revealed that about half of the studied sample were female, while, less than two-thirds of the studied sample were married and had More than 10 years of experience, while the others were single, widowed, or divorced. Half of the studied sample had a Bachelor's degree. As well, more than one-third of them their age was ranged between (30-40) years with a mean age of 35.6+ years (SD=12.96), these findings were in agreement with Saleh, Ali, & Afifi, (2018), who showed that more than one-third of nurses were ranged age from 30 to 40 years, and all of them were female. In contrast, they revealed that nearly half of nurses had nursing diplomas and the majority of nurses had years of experience ranged from 5 to 10.

In contrast to the current study findings, Eid, and Abdel-Aziz, (2012) reported that most of the participants had a diploma level of education and the percentages for the participants' nurse years of experience in the workplace from 6 – 10 years.

Nurses' level of knowledge and practice of WHO multimodal strategy of infection prevention and control against Covid 19.

From the study findings, hypothesis one and two were supported, because it was found that knowledge and practice levels and scores regarding infection prevention and control practices for the two studied groups were improved from pre application to post application of WHO strategy. This might be explained by, nurses working in most healthcare systems are inadequately trained with standard infection control practices, however, the comprehensive content of the theoretical and practical parts of the multimodal WHO strategy which given to them, its relevance to the field of nurse's work, the booklet, which serves as an ongoing reference. Therefore, the changes in nurse's knowledge and practice, which occurred post-application training of the multimodal WHO strategy contributed to improvement in nurses' total knowledge and scores. **Ogoina, Pondei, Adetunji, Chima, Isichei, Gidado, (2015), and Santosaningsih, Erikawati, Santoso, Noorhamdani, Ratridewi, Candradikusuma, et al. (2017)** cited that, Quality training can act as a tool for increasing knowledge and improving nurses' competencies.

Following the study findings, Ara, Bashar, Tamal, Siddiquee, Mowla, & Sarker, (2019) reported that multimodal WHO strategy contributed to improving nurses' competencies and compliances with standard infection prevention and control practices. In addition, these results were supported by **Saleh, Ali, & Afifi, (2018) and El-Sol, Abd El-Salam, & Riad, (2021)**, who displayed the presence of improvement in both groups' knowledge and practices of infection preventive measures post-interventions than pre- interventions. As well, **Ramirez, (2019)**, emphasized that training and education about the etiology of emerging infectious disease and infection prevention and control measures would increase their

knowledge and skills of nurses who cared for COVID-19 patients.

Ara, Bashar, Tamal, Siddiquee, Mowla, & Sarker, (2019) reported that there is a dearth of evidence for the role of the multi-modal approach in increasing nurses' adherence to standard infection control practices in hospitals in Low Middle-Income countries.

So, the first and second hypotheses were supported.

Professional quality of life

The present study revealed that there were differences in the professional quality of life between the two studied groups pre/post application of the WHO multimodal strategy. Compassion Satisfaction was increased from average level to the high-level post-application of WHO multimodal strategy for both studied groups with a highly significant difference was found for each group pre/post application, as well, at pre-application, there highly significant difference was found between the two studied groups. However, at the post-application of the WHO multimodal strategy, there was no significant difference was found.

It is noticed that Burnout was decreased from average level to the low-level post application for both studied groups with a highly significant difference for each group pre/post application, as well, at pre-application, there was a highly significant difference. However, at post-application, there was no significant difference.

These results can be due to nurses are working throughout the COVID-19 pandemic on the front line against the virus, and they see their workload and working hours increase. Moreover, they may be directly subjected to the causative agent itself, because of deficiency of protective material, so, they may be afraid of infecting their family and friends, just as they may suffer from isolation and social discrimination. In addition, it is very hard to deal with patients who may die because of COVID-19. These results are supported by **Ruiz-Fernández, (2020)** who reported that nurses working in specific COVID-19 units and emergency departments had higher Compassion Fatigue and Burnout scores, while levels of Compassion Satisfaction and

perceived stress were similar regardless of the workplace. Inconsistent, **El-Sol, Abd El-Salam, & Riad, (2021)**, reported that; pre-intervention the ICU nurses caring for Covid-19 had more burnout symptoms than isolation ward nurses.

Talae. (2020); concluded that intensive care units nurses are exposed to great levels of job burnout compared to other hospital settings. After intervention burnout symptoms were reduced in both groups; these results were supported by **Khasne, (2020) & Oliveira, (2019)**. Who reported that nurses in hot areas such as intensive care units and emergency are more subjected to a high level of burnout-related work. **So, the third hypothesis was supported.**

Moreover, **Jason and Hotchkiss, (2018)** Nurses who are engaged in multimodal strategies experienced a higher professional quality of life than other nurses did.

Correlation between knowledge, practice, and Professional quality of life

The current study indicated that a positive correlation was found between knowledge, practice, and Compassion Satisfaction. This is because of enriching nurses with knowledge and practice after application of the WHO multimodal strategy which reflects the increasing in their Compassion Satisfaction. however, knowledge, and practice were negatively correlated with Burnout and Secondary Traumatic Stress. In addition, Burnout and Secondary Traumatic Stress were positively correlated.

This finding was in concordance with **Ahmed, Masry, (2017), and Joukar, Mansour- Ghanaei, Soati, and Meskinkhoda (2011)**, who cleared that, there was a significant correlation between total knowledge score and practice towards infection prevention and control measures in a way that higher knowledge is associated with better practice. As well, the results were in the same line with the results of the study done at Minia University by **El- Syed (2015)**, who reported that there was a significant correlation between attitude and total level of knowledge.

So, the fourth hypothesis was supported.

Conclusions

Application of the WHO multimodal strategy had been proven to significantly increase knowledge, practice and Professional quality of life mean score of nurses during the Covid-19 pandemic.

Recommendations

1. Applications of all five WHO multimodal component strategies are recommended.
2. Replication of the study using a large probability sample from a different geographical area to allow for greater generalization of the results.

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