Multidimensional Nursing Interventions: It's Effect on Reducing Risk of Infection and Burnout Syndrome among Nurses Caring Covid-19 Patients.

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Abstract:

Background: Nurses more than other health care workers (HCWs) are susceptible to numerous job-related hazards, as acquiring infection of Covid-19 and burnout syndrome due to their nature of their occupations. **Aim of the study:** to evaluate the effect of multidimensional nursing interventions on reducing risk of infection and burnout syndrome among nurses caring Covid-19 patients. **Design:** Quasi Experimental design used to conduct this study. **Setting:** The current study was carried out at isolation setting for Covid 19-patient (isolation ward and ICU) at Menoufia University Hospital. **Subject:** a convenience sample of 62 nurses caring Covid-19 patients at intensive care unit and isolation ward was selected. **Tools of the study:** four tools used to collect the current data: **Tool I**: A structured interviewing questionnaire about burnout syndrome. **Tool II**: Questionnaire for assessing Burnout symptoms; **Tool III**: Questionnaire for Assessment Nurses compliance of prevented measures for Burnout Prevention and **Tool IV**: Observational checklists for Protection and preventions procedures. **The results:** after interventions most of studied nurses had good level of knowledge and practices regarding burnout management and infection control procedures; reduction of nurses' burnout symptoms after intervention within the different measurements; additional incidence rate of Covid-19 infection decreased. **Conclusion**: implementation of multidimensional nursing interventions was successful in reducing burnout symptoms and risk of infection among studied nurses. It was effective to improve nurses' knowledge and practice. **Recommendation:** establishing educational program or workshop on burnout management for all hospital nurses and nurse supervisors. Perform periodic evaluation of stressors at work place for nurses.

Keywords: Infection, Nurses, Covid-19, Burnout syndrome, Protection and Prevention procedures, Nursing Interventions.

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Abbreviation: Burnout syndrome (BOS)**; Intensive Care Unit (ICU);** World Health Organization (WHO); Center of Disease Control (CDC).

Introduction

Nurses are important personnel in any health system who considered the direct main care providers in all health institutions so puts them on the front lines of acquiring Covid-19 pandemic infection (**Choi, Skrine Jeffers, & Cynthia Logsdon, 2020**). Corona virus pandemic cases reported firstly in China 2019, and

then it had spread into most of countries around the world, nearly about 1 million cases (**Wu, & McGoogan, 2020**). In study by **Mostafa, et al 2020** reported that; in both developed and developing countries health care providers have the risk of Covid-19 infection and more than 10% of healthcare providers acquired it during caring Covid-19 pandemic patients. Covid-19 is an acute serious disease that may terminate the patient' life because of its severe complications especially of progressive respiratory complications. **(Huang, et al., 2020**).

Caring of Covid-19 patients expose nurses to excessive physical fatigue and emotional stress, decline their immunity and increase the susceptibility to Covid-19 infection (**Zhang, Liu, Xiang, Li, Zhao, et al., 2019**). Nurses are more susceptible than other health care workers (HCWs) to numerous job-related hazards, and undertake a substantial quantity of physical, mental and psychological pressures due to their occupations. Burnout syndrome is one of job-related hazards, it has a highly incidence during a pandemic outbreak of an infectious disease as Covid-19 around the world (**Talaee, et al 2020**). It can affect the nurses' health and wellbeing, and also increased the incidence of the medical errors and reduced the quality in nursing care (**Huang, et al., 2020**).

Nurses forward-facing against the spread of Covid-19 by appropriate protection and prevention procedures. These procedures recommended by the World Health Organization (WHO) and Center of Disease Control (CDC), to reduce transmission of Corona virus among health care providers included nursing team (**WHO, 2020 & Birihane et al., 2020**). Prevention procedures include application of isolation precautions; through two-tiered; a) standard precautions as perform proper hand hygiene, wearing personnel protective equipment; b) transmission- based precautions are contact; airborne and droplet precautions as N95 respirator more recommended than other and working within 3 feet of the infected patients (**Ağalar, & Engin, 2020**).

Nurses' burnout symptoms can be reduced by several methods as Practice Self-Care through maintaining a healthy diet, daily sleeping about eight hours per night, performing regular physical and deep breathing exercise, relaxation technique, therapeutic massage, performing carrying out some preventive measures as mediation, Yoga, use strategies for stress management and coping strategies as Resiliency which help for reducing burnout through taking days off to regroup and rest, take breaks during the shifts and plan unit-bonding activities (**Stewart, et al 2019& Mahmoud NN, and Rothenberger D 2019**).

Significance of the Study:

Health care worker's specially nurses who working in intensive care unit and other nurses caring critical patients are liable to highest levels of job burnout by contributing factors as high workload joined with lack of time to adequately address the patient's needs. Additionally they are at a high mortality rate **(Elshaer, et al., 2018)**. In study by **Kassem, et al., 2020** on 138 healthcare workers included nurses documented that; positive tests for nurses infected by corona virus represented 21.3%.; moreover they stated the predisposing factors to nurses acquiring infection were insufficient usage of personal protective equipment (PPE) and hand hygiene, so emphasizing the significance of appropriate implementation.

Around 66.5% to 87.8% from healthcare providers complain of Burnout syndrome. Many studies reported most of them are nurses. In general caring of patients particularly critical ill patients as Covid-19 put nurses in risk of Burnout syndrome, which characterized by physical, mental and psychological symptoms, so they provide poor quality of nursing care, which had a negative feedback on patient outcomes and increased the possibility of fatal medical mistakes (**Aryankhesal et al., 2019 & Panagioti, et al.,2018).** Furthermore no previous nursing research on this issue; and this study will be the first one in conducting location in the study setting.

Aim of the study:

To evaluate the effect of multidimensional nursing interventions on reducing risk of infection and burnout syndrome among nurses caring Covid-19 patients.

Hypothesis:

1) The incidence of infection by Covid 19 among both groups may be lower after intervention.

2) The level of nurses' knowledge and practice about protection and prevention measures against Covid 19 improved after interventions in both groups.

3) There will be difference in burnout symptoms and improvement between both groups.

Subjects and Methods

Design: Quasi Experimental design was utilized for this study.

Setting: The current study was carried out at isolation setting for Covid 19- patient (isolation ward and ICU) at Menoufia University Hospital, Egypt.

Subject: a convenience sample of 62 nurses caring Covid-19 patients. They were divided two equal groups 31 nurse in each as follows: **Study group (1):** nurses who caring Covid-19 patients at isolation ward. **Study group (2):** nurses who caring Covid-19 patients at ICU.

There were no inclusion and exclusion criteria, because the researchers took all nurses available in both settings.

Tools of the study: Four tools were being developed to collect the current data; as follows:

The tool I- A structured interviewing questionnaire: It developed by researchers; divided into two parts as follows: Part (1): Socio-demographic and medical data of the nurses included (age, gender, marital status, number of children, nurse's education, isolation working area, number work years, history of medical disease and Previous Covid-19 infection; Part (2): Assess nurses' knowledge about Covid-19 protection and prevention procedures and burnout syndrome (14 questions related to guidelines for infection control and 5 questions for knowledge about burnout syndrome).

Tool II: Questionnaire for assessing Nurses' Burnout symptoms: This questionnaire developed by tool **Maslach, C. & Jackson, S. E. (2011)**; modified by the researchers to assess and measures nurses' overall burnout symptoms, it divided into 9 questions for frequent somatic symptoms, 4 questions for mental exhaustion symptoms and 5 questions for psychological exhaustion symptoms.

Tool III: Questionnaire for Burnout Prevention Assessment: It Adapted by Michelle 1981 modified by the researchers to assess nurses' compliance for interventions of Burnout Prevention measures.

Tool IV: Observational checklists for Protection and preventions procedures**:** they developed by **Taylor, et al., (2015)**, they were 60 steps for assess nurses' implementation of infection control procedures during caring of Covid 19 patients as proper hand hygiene technique, donning and removing personal protective equipment and handling with infected secretion, supplies and equipment.

Scoring system:

Nurses' compliance for interventions of Burnout Prevention measures: Each question was given a score of two if comply with measures, a score of one if comply to sometimes and a score of zero with no compliance.

Nurses' Knowledge questionnaire: Total score ranged from (1-19) grade. It's defined as follows; from 1-9 grade or < 50% that indicated poor knowledge, from 10-14 grade or 50 - < 75% that indicated fair knowledge, and from 15-19 grade or ≥75% that indicated good level of knowledge.

Observational checklists for infection control procedures application: Total score ranged from (1 to 60) grade. It divided into three levels as follows; 1-30 or < 50% that meant unsatisfactory level of application, 31-45 grade or 50 - < 75% that meant satisfactory level of application of and 46-60 grades or ≥75% that meant good application of infection control procedures.

Validity of the tools:

All tools were tested for its content validity by three experts in the field of Medical Surgical Nursing, Faculty of Nursing, Menoufia University, and two experts in the field of health psychiatric nursing, Faculty of Medicine, Menoufia University. Modifications were done accordingly.

Reliability of tools:

Reliability was estimated among 10 participants by using test retest method with two weeks apart between them. Then Cronbach alpha reliability test was done through SPSS computer package. It was 0.80 for **interviewing questionnaire with the following** Cronbach alpha reliability values for its parts:

1.knowledge about burnout syndrome, infection control and isolation measures: 0.97,

2.practice regarding protection and prevention measures: 0.83

Regarding tool 2 (**questionnaire for assessing burnout symptoms)** It was 0.94 **with the following** Cronbach alpha reliability values for its subscales:

1. Physical exhaustion symptoms: 0.81,
2. Mental exhaustion symptoms SE: 0.88,
3. Psychological exhaustion symptoms: 0.93

Concerning tool 3 (**Questionnaire for burnout prevention assessment)** Cronbach alpha reliability values was 0.87

Concerning tool 4 (**Observational checklists for infection control procedures)**: Cronbach alpha reliability values was 0.81

The Cronbach alpha reliability for the three tools and their subscales indicate that the three tools are reliable to detect the objectives of the study.

Pilot study: was done by 10 % of nurses to evaluate the effectiveness of the study tools, clarity, techniques and the availability of the study sample; and subjects who participated in the pilot study were included in the study sample.

Ethical considerations:

The official permission to conduct the study was obtained by the researchers from the dean and ethical committee of the Faculty of Nursing after comprehensive explanation of study purpose and data collection procedures. An official permission was obtained from hospital manager, executive of the Menoufia University Hospital and from head nurse of isolation ward and ICU. The contributors were informed that the participation in this study is voluntary and they can withdraw at any time without giving reasons. The purpose of the study was explained to them and they were reassured that any information obtained would be confidential and would be used only for the study purpose.

Field work:

Duration of study: Data were collected from the beginning of October 2020 to the end of March 2021.

Objectives of the interventions are refreshing nurses' knowledge and application of isolation procedures correctly to reduce incidence of acquiring Covid-19 infection; and reducing nurses' burnout, encourage nurses to invest efforts to improve their wellness and finding a way to balance the nurses' energy give to others and recharging them so that they can continue to patients' care effectively.

The researchers explained the aim of the study to the participants, obtained their agreement for sharing in the study, each participant has a right to withdrawal from the study when he/she want, then distributed the knowledge questionnaire (Tool I) to them. The needed time for completing questionnaire was about 20-30 minutes.

The researchers disturbed a booklet for all studied nurses about protection and prevention procedures and burnout syndrome (this booklet divided into two parts theoretical and practical) which included aim, objectives & expected outcomes for the intervention. Definition, chain and routes of infection, also it included information about guidelines of infection control by application of isolation precautions.

Moreover burnout syndrome; its definition, causes, symptoms, management and preventive measures. Multidimensional nursing intervention to reduce burnout symptoms; divided into two methods: Method (1) Practice Self-Care included eating healthy diet rich in vitamins, fresh juice, increasing fluid intake, avoid junked saturated food, sleeping 8 hours per night for maintain balance between sleep, and suitable nutrition beside a period of rest time would lead to diminish nurses" burnout symptoms; furthermore regular participation in physical activity has positive effects on physical, social, and mental health. Performing deep breathing exercise, time management is organizing tasks and activities for helping nurses done more and better work in a short period of time.

Method (2) Develop Resiliency Skills**.** Resiliency is the cure to burnout.

It's the capability to rebound spinal next sensation of somatic, mental and psychological tiredness. Also taking days off, rest breaks during the shifts and plan unit-bonding activities; relaxation technique, some preventive measures as mediation, Yoga, use of strategies for coping and stress management as techniques of relaxation; mediation; physical exercises, deep breathing exercises.

Arrangements were made to prepare an effective learning environment before the multidimensional intervention began.

First, classification of nurses into small groups; 2 nurses from each setting and shift. For teaching sessions: short interactive lectures and group discussions supported by audio-visual aids as power point lectures, illustrated pictures and videos; were conducted for each group and demonstration and re-demonstration

The theoretical part took 10 sessions (repeated 5 sessions) during the first two weeks from Sunday to Thursday; each session lasted (30) minutes, 5 sessions were covered in the first week and the same sessions repeated in the second week, the same session is presented 2 times a day; first session for the morning group and second session for the afternoon group.

Continuous feedback and communication were assured to clear any misunderstanding, and to reinforce learning for these sessions.

Followed by the practical part was done during the second two weeks (week 4th), which consisted of 10 sessions, each one lasted during (30) minutes and covered around 2 weeks, it's done through demonstration and re-demonstrations utilized on top of using audiovisual aids.

The interventions continue 6 months, the researchers taken 2 measurements to assess knowledge pre-post – interventions and 2 assessments incidence of Covid-19 infection among nurses; and 4 assessments burnout symptoms, performing and compliance of burnout preventive measures and 4 measurements for proper applying isolation and other infection control procedures. The first measurement before the interventions (pre-intervention); second measurements or follow up after 1 month for compliance of interventions (post 1-intervention); third measurement after 2 months of post 1 measurement or follow up(post 2-intervention) and fourth measurement after 2 months of post 2 measurement(post 3-intervention). Comparison of both groups was done. The phase took approximately 20 minutes.

Statistical Analysis:-

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using word program. Quantitative data were presented by mean (X) and standard deviation (SD), and it was normally distributed. Accordingly, it was analyzed using student t- test for comparison between two means, and ANOVA (F) test for comparison between more than two means. Correlation coefficient (r) was used to test the correlation between two quantitative variables. Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2) test. However, Level of significance was set as P value <0.05 for all significant tests.

Results

Table 1. Showed that; mean age of studied sample was (32.1 ± 5.5, 32.3 ± 5.4) respectively. The majority of the studied sample was female and married. More than half of studied sample was technical institute education. Mean duration of work experience of studied sample was 10.9 ± 6.3, 11.23 ± 5.6 respectively.

Figure 1. Revealed that; there was a definitely improvement in knowledge level regarding burnout syndrome and protection measures among studied nurses where more than three quarter of the nurses (76.2%) have good knowledge after intervention compared to 20.9% before intervention.

Figure 2. Presented that; there was an improvement in practice level regarding infection protection and burnout preventive measures among studied nurses where, about one third of the nurses (33.9%) who have good knowledge before intervention replaced by 87.1% after intervention. However 6.5% only have unsatisfied practice compared to 59.7% before intervention.

Table 2. Indicated that; there was an improvement in burnout physical and mental symptoms revealed in post2 and post3 than post1 and the difference was statistically significant. Mean score of burnout psychological symptoms was high in study group2 (11.3±2.8) than group1 (8.9±2.8) pre interventions. The improvement in psychological symptoms more apparent in post2 and post3 than post 1 for two groups and the difference was statistically significant.

Table 3. Revealed that; mean score of nurses compliance was high in study group1 (22.7±4.3) than group2 (19.9±4.6) pre interventions. The improvement in nurses' compliance of burnout preventive measures revealed in post1, post2 and post3 for two groups and the difference was statistically significant.

Table 4. Revealed that, there was a positive correlation between duration of experience and burnout symptoms pre intervention.

Table 5. Concloded that; burnout symptoms were slightly high in group2 than group1 but the difference was not statistically significant. Also there wasn't statistically significant difference between study groups in relation to their total knowledge score and compliance of preventive measures.

Fig. 3. Displayed that; decreasing in Covid19 infection rate among studied sample (from 71% pre to 8.1% post intervention).

Table: 1. Distribution of the studied nurses according to their socio-demographic Characteristics (No. 62).

Socio demographic characteristics	Study1 N0.	%	Study2 N0.	%	P value
Age (Years):					t= - 163-
Mean ± SD	32.1 ± 5.5 Y		32.3 ± 5.4 Y		P= 0.871
Gender:					
Male	4	12.9	5	16.1	X^2 =0.13,
Female	27	87.1	26	83.9	P=0.718
Educational Level					
Diploma	6	19.4	6	19.4	X^2 = 0.85,
Technical institute	16	51.6	19	61.3	P= 0.651
Faculty of nursing	9	29	6	19.4	
Marital status:					X^2 =1.18,
Single	4	12.9	5	16.1	P= 0.55
Married	27	87.1	25	80.6	
Divorced/Widow	0	0%	1	3.2	
Work area:					X^2 =.08,
Ward	31	100	0	0	P= .000
ICU	0	0	31	100	
No. of children:					t =0.384
	2.5 ± 1.3		2.3± 1.3		P=0.702
Duration of experience :					X^2 =0.19,
	10.9 ± 6.3		11.23 ± 5.6		P=0.61
Total	31	100	31	100	100

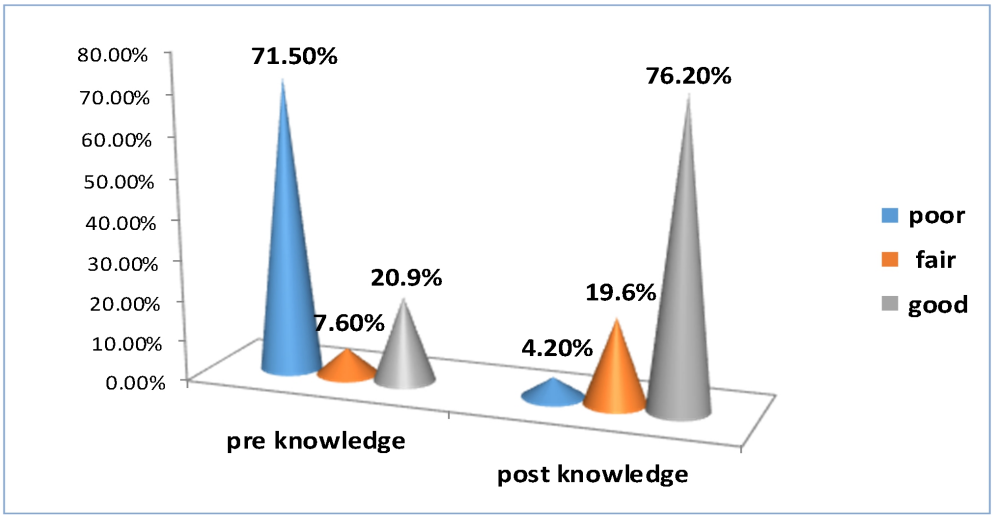

Figure 1. Comparison between pre and post intervention knowledge categories among studied nurses.

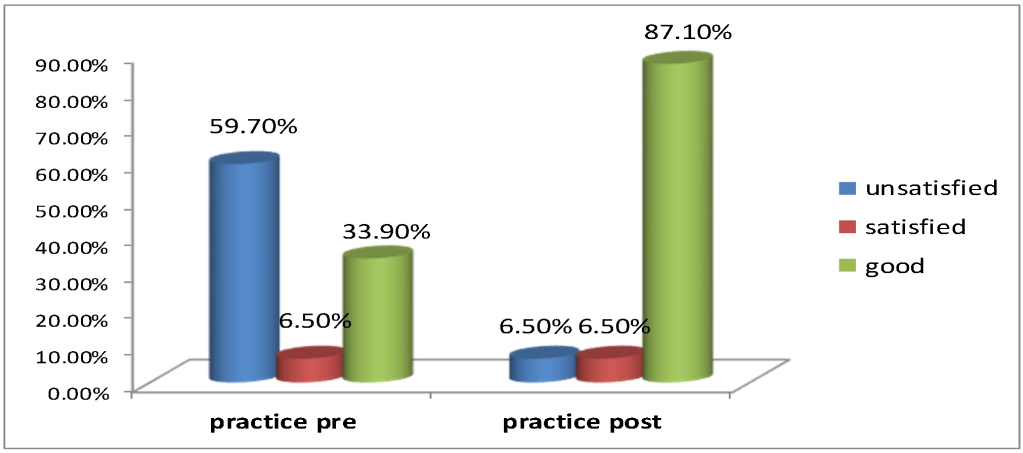

Figure 2. Comparison between pre and post intervention practice categories related to infection protection and burnout preventive measures among studied nurses.

Table: 2. Effect of multidimensional nursing intervention on burnout symptoms among studied nurses for two study groups.

Study groups	Burnout symptoms				p. value
	pre	Post 1	Post 2	Post 3	
	Physical symptoms				
Group 1	14.3±2.7	13.5±2.6	10.2±1.2	9.2±0.90	F= 1848.01 P= .000
Group 2	15.8±3.2	15.4±3.2	10.2±1.6	9.06±0.24	F= 1267.2 P= .000
	Mental symptoms				
Group 1	7.9±2.3	7.1±1.5	4.5±1.02	4.1±0.2	F= 953.5 P= .000
Group 2	9.2±2.3	9.1±2.4	5.4±1.7	4.1±0.3	F= 622.8 P= .000
	Psychological symptoms				
Group 1	8.9±2.8	8.3±2.3	5.7±1.2	5±0.90	F= 698.01 P= .000
Group 2	11.3±2.8	11.1±2.7	6.7±2.2	5.2±0.63	F= 590 P= .000

Table: 3. Effect of multidimensional nursing intervention on nurses' compliance of burnout preventive measures for two study groups.

Study groups	Nurses' compliance of burnout preventive measures				p. value
	Pre	Post 1	Post 2	Post 3	
Study group 1	22.7±4.3	25.4±3.7	36.8±2.3	41.8±1.5	F= 5371.7 P= .000
Study group 2	19.9±4.6	20.1±4.1	31.9±3.9	40.2±2.6	F= 2192.2 P= .000

Table 4. Correlation coefficient between duration of experience and burnout symptoms pre intervention.

Burnout symptoms	Duration of experience	
	r	P
Physical symptoms	.751	.000
Mental symptoms	.789	.000
Psychological symptoms	.785	.000

Table 5. Comparison between study groups in relation to their total knowledge, burnout symptoms and compliance of preventive measures pre intervention.

	Study group1 Mean± SD	Study group2 Mean± SD	p. value
Total knowledge pre	5.8±1.8	6.1±2.1	t = .635 P= .528
Physical symptoms	14.3±2.7	15.8±3.2	t= 2.01 p= .049
Mental symptoms	7.9±2.3	9.2±2.3	t= 2.04 P= .046
Psychological symptoms	8.9±2.7	11.3±2.7	t= 3.23 p= .002
Compliance of preventive measures	22.7±4.3	19.9±4.6	T= 2.51 P= .015

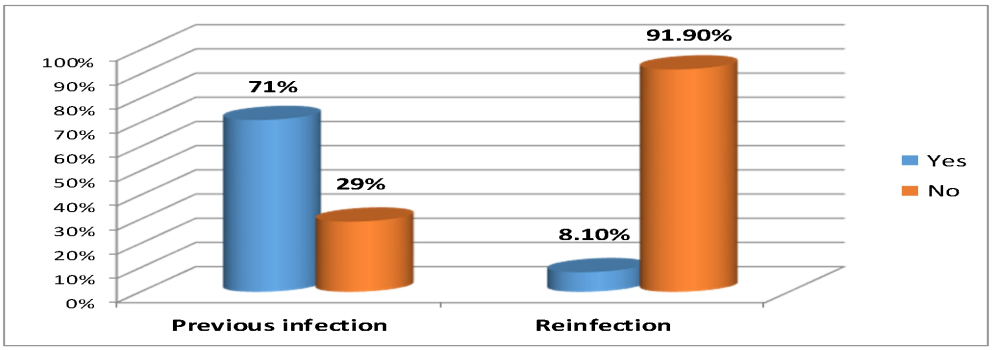

Fig. 3. Comparison between Covid 19 infection pre and post- intervention.

Discussion

Application of protection and prevention procedures was recommended by World Health Organization and Center of Disease Control to reduce transmission of Corona virus. Caring of infected patients during a pandemic outbreak of an infectious disease as in Covid-19 put nurses under stress and job burnout. **Aim of the study:** to evaluate the effect of multidimensional nursing interventions on reducing risk of infection and burnout syndrome among nurses caring Covid-19 patients.

Effect of multidimensional interventions on reduction of burnout syndrome:

In relation to burnout symptoms between both groups:

The presented study reported that; pre-intervention the ICU nurses caring Covid-19 had more burnout symptoms than isolation ward nurses; these results in the same line with **Talaee, et al., 2020**; they said intensive care unities nurses exposed to great levels of job burnout compared to other hospital settings. After intervention burnout symptoms reduced in both groups; these results supported by **Khasne, et al., 2020** & **Oliveira, et al., 2019**; they stated that; many interventions as promoting resilience strategies and life style modification decreasing burnout among the studied sample. These results supported by hypothesis three. Nurses' work in ICU may face more stressors so they may suffer burnout symptoms than others.

Regarding to nurses' knowledge and practices of preventive measures of burnout syndrome:

The current study documented that; presence of improvement in nurses' knowledge and practices of preventive measures post-interventions than pre-interventions related to burnout syndrome and; these results supported **by Oliveira, et al., 2019** they observed that; alterations in nurses' knowledge and practices after implementing of an educational program on healthy lifestyle and other strategies for stress management and comparing between pre-intervention and three months post-intervention regarding burnout syndrome. These findings supported hypothesis two. Nurses should be in continuing learning in order to acquiring information that help in meeting their needs and improve patient' outcome.

The relation between nurses' Preventive measures compliance and reduction of burnout syndrome:

The present study revealed that; with continuous performing of multidimensional nursing interventions including preventive measures of burnout the nurses' symptoms of burnout syndrome diminished; these results in the same line with **Zhang, et al; 2020** who documented that; the nurses practicing constantly the planned Interventions, their symptoms of burnout reduced. Application of measures as mediation, Yoga, use of strategies for coping and stress management as relaxation techniques, physical exercises, deep breathing exercises can help in reducing burnout symptoms.

Effect of multidimensional interventions on reduction of Covid-19 infection among nurses

Regarding to nurses' knowledge and practice about protection and prevention procedures:

The existing study approved that; presence of improvement in both groups ' knowledge and practices of infection preventive measures post-interventions than pre- interventions; these results supported by **Ramirez-Baena, et al 2019**, they determined that training and education about the etiology of emerging infectious disease and infection control measures would increase their knowledge and skills of nurses who cared for COVID-19 patients. These findings supported hypothesis two. Educational sessions about protective and preventive measures that supported by short interactive lectures and group discussions with audio-visual aids can enhance and

increase knowledge and practice among nurses.

In relation to Covid 19 infection pre and post- intervention:

The current study reported that; nearly half of studied groups had covid-19 infection in pre-interventions while most of them hadn't infection post intervention, the findings agreed with **Ağalar & Engin**, **2020** they found that; application of proper wearing of personal protective equipment, hand hygiene and other infection protection measures lowering acquiring infection of Covid-19 among nurses and laboratory personnel. These results supported hypothesis one. Adhering and proper use of protective measures can help in reducing the rate of infection.

As regards the relation between duration of experience and burnout symptoms:

The present study revealed that; there was a positive correlation between duration of experience and burnout symptoms pre intervention, the finding supported by **Hamed, et al 2020** they reported that, the development of nurses' burnout is affected by multiple factors; one of the potential determinants is number of clinical experience years. Nurses who have more duration in their work may have extra responsibilities that lead to feeling of burnout symptoms.

Conclusion

Implementation of multidimensional nursing interventions was successful in reducing burnout symptoms and risk of infection among studied nurses. In addition to it was effective in improving nurses' knowledge and practice.

Recommendation

Establishing educational program or workshop on burnout management for all hospital nurses. Guidance and counseling services should be provided to nurses in order to find out stressors affecting them and how to overcome. Periodic evaluation of stressors can be done at work place for nurses. Further study with large sample in different settings by more demographic variables.

Conflict of interest:

There is no conflict of interest and no fund from any institution.

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