

Human Capital Sustainability Leadership Educational Interventions: A Key for Promoting Nursing Managers' Green management practices and Resilience

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Abstract:

Overall, human capital plays a key role in attaining sustainable development through promoting economic expansion, reducing poverty, fostering social welfare, and guaranteeing resource efficiency.

Purpose: To evaluate the effect of a human capital sustainable leadership educational intervention on nursing managers' green management practices and their resilience. **Methods:** A quasi-experimental design was utilized using study and control groups. A convenience sampling technique was conducted, a total sample of 80 nursing managers at Menoufia University Hospital were assigned into two groups randomly; the study and control groups. Three instruments were the Human Capital Sustainability Leadership Questionnaire, the Green Management Questionnaire, and the Individual Resilience Scale.

Results: All nurse managers in both the study and control groups had a low mean score regarding total human capital sustainable leadership (HCSL), green management practices, and resilience before educational intervention. It was revealed a highly statistically significant improvement in HCSL, green management practices, and resilience among nurse managers in the study group after intervention. Also, this result revealed a highly statistically significant difference between the study and the control groups post-intervention. **Conclusion:** Based on the study findings, the human capital sustainable leadership educational intervention was positively effective in promoting nursing managers' green management practices, resilience, and HCSL. **Recommendation:** Integrate human capital sustainable leadership, green management practices, and resilience into strategic planning to adapt to climate change effects and reach objectives regarding Egypt's Vision 2030.

Key Words: Human capital sustainability leadership educational intervention, Green management practices, Resilience.

Introduction

Leadership as a notion is changing in conjunction with organizational dynamics. However, leadership in human resources management is a topic that is discussed more frequently. (Khalil, et. al. 2021) Human resource management calls for a new style of leadership. A new integrated construct of human capital sustainability leadership was designed and placed within this framework. (Di Fabio and Peiró (2018).

A crucial component of sustainable development is human capital. It has a significant effect on social advancement, economic expansion, and environmental preservation. Achieving sustainable development objectives, especially the decrease of poverty, requires spending on health and education, two crucial aspects of human capital development. Enhancing human capital can result in better societal well-being and human resource quality. (Ugnich and Chernokozo, (2021).

The Human Capital Sustainability Leadership (HCSL) is a new and advanced organizational theory. By taking a cohesive, constructive approach, it transcends the traditional definition of sustainable leadership. Under a psychological and sustainable perspective, HCSL

integrates additional modern leadership facets that are pertinent to the operation and development of human capital. (Di Fabio and Peiró, 2018). The HCSL attempts to greater integration across various characteristics of leadership including; 1) Ethical leadership; 2) Mindful leadership; 3) Servant leadership, and 4) Sustainable leaderships; (Bashir, and Hussain (2023).

Ethical leadership aims to enhance ideal-aligned actions, fair goals, and enforce ethical standards. It seeks to harmonize actions with ideals by incorporating ethical concepts into managerial decision-making. It gives members of the organization more authority and promotes empathy, generosity, and concern for others. (Bashir, and Hussain, 2023).

The mindful leadership is a key component in understanding collaborators and their needs, as well as their strengths and weaknesses. It acknowledges the significance of emotional self-control, particularly under pressure. Consequently, the phrase "mindful leadership" refers to the ability to remain emotionally stable even under pressure by being aware of one's own emotional state and paying attention to the present. It additionally pertains to the consciousness of an individual's existence and its influence on other

individuals and society. (Sophia and Sonnentag, (2018).

Also, the servant leadership acknowledges the leader's moral responsibility toward collaborators. It helps and encourages people to recognize their needs and passions. According to this viewpoint, all of the leadership philosophies covered by HCSL entail self-awareness as well as interpersonal and organizational balancing of various intrapersonal, interpersonal, and organizational components. (Di Fabio, and Peiró 2018).

Finally, sustainable leadership refers to responsibility and sharing accountability and in order to prevent wasteful loss of financial and human resources, and environmental infractions (Xuecheng et al., 2022).

Besides, the focus of nursing sustainable leadership is on increasing organizational appeal, making health organizations profitable both now and in the future, and promoting sustainability ideals at the individual, group, and societal levels. (Hassan et. al. (2024). Sustainable leadership consider essential role in creating green human management practices. Belief in achieving organizational goals and practices, such as "green human resource management" procedures, is the outcome of reciprocal interactions between superiors and followers. (Ababneh et. al., 2019).

Hospital green management is the process of integrating environmentally friendly practices and guidelines into the running and administration of medical facilities. (O'Hara, et al., 2022). Promoting a culture of sustainability and environmental stewardship within the healthcare organizations is the ultimate goal of green management in hospitals. (Adu, et al., 2020).

Encouraging green management is essential for nurse managers to minimize the environmental impact of healthcare facilities. (Paillé et al., 2020). Important first steps include doing a waste audit, implementing recycling programs, using energy-efficient equipment, promoting sustainable transportation options, putting water-saving measures in place, and educating staff members on the importance of sustainability. These initiatives could lead to more sustainable healthcare facilities in the future.

[Saleh, et. al. 2023]. Therefore, in addition to legal concerns, organizations' green management needs to incorporate practices and strategies like green outcomes, green marketing, and green designs, as well as integrating green considerations into their long-term goals. (Elshaer and Fayyad, 2023).

The idea of HCSL can be applied in workplaces to support resilient and flourishing

employees, and enable strategic initiatives for creating a more sustainable human environment. (Di Fabio and Peiró (2018). Employee resilience is a person's ability to engage with pressures in a creative and adaptable method, also, it is one of the core components of a useful framework that requires more research. (Harms, et. al., 2018, Iqbal, and Piwovar-Sulej, 2022).

Resilience is the ability to continue making constructive adjustments in the face of adversity so that the organization comes out stronger and more resourceful. When they refer to "challenging conditions," they mean both ongoing risks (such as competition), tensions, and strain, as well as isolated mistakes, scandals, crises, shocks, and interruptions of routines. (Visser and Jacobs, 2019).

Determining whether resilience is viewed as a quality, an action, or a consequence is necessary, and doing so frequently leads to the use of a dual perspective when describing the existence or absence of resilience, (Hartmann, et al., 2021).

The persons' ability to recognize all available resources to overcome challenges or preserve balance once they have occurred is considered a key component of resilience. (Djourova et al., 2020).

The focus of nursing sustainable leadership is on increasing organizational appeal, making health organizations profitable both now and in the future, and promoting sustainability ideals at the individual, group, and societal levels. (Mahfouz, et. al., 2024, Xuecheng et al., 2022).

Sustainable leadership provides educational leaders with invaluable opportunities to network and support one another in accomplishing current and future organizational objectives. It also helps nurse managers advance their knowledge and proficiency in the management of organizational and green resources. (Vesudevan et. al. 2024, Silalayi, et. al., 2018).

Significance of the Study

Managing an organization's human resources sustainably is getting harder and harder. Sustainability research has grown beyond the examination of obvious variables like waste reduction and resource efficiency due to its complexities, (Gabel, 2022). Also, due to a lack of awareness about human capital sustainability leadership, many hospital managers may only have a cursory understanding of human capital sustainability leadership and their potential advantages. It is advised to arrange training courses and awareness programs targeted at teaching managers about human capital sustainability leadership and their major contributions to accomplishing the institution's

sustainability objectives in order to improve understanding and knowledge toward promoting nursing managers' green management practice and resilience.

So, the purpose of the current research was to evaluate the effect of a human capital sustainable leadership educational intervention on nursing managers' green management practices and their resilience. **The following objectives should be achieved in order to meet this purpose:**

- 1- Assess levels of human capital sustainability leadership dimensions (Ethical leadership, Sustainable leadership, Mindful leadership, Servant leadership), green management practices, and resilience among nursing managers before and after interventions for both study and control groups.
- 2- Evaluate the difference between study and control groups regarding human capital sustainability leadership, green management practices and resilience among nursing managers before and after intervention.
- 3- Evaluate the effect of human capital sustainability leadership educational intervention on nursing managers' green management practices, and resilience for study group.

Research hypothesis

H1- Nursing managers who will acquire the educational intervention on human capital sustainability leadership will have higher score on the dimensions of human capital sustainability leadership, green management practices, and resilience than nursing managers who will not acquire the intervention.

H2- There will be significant improvements for the study group regarding human capital sustainability leadership, green management practices, and resilience after educational intervention.

Methods:

Research Design:

In this study, a quasi-experimental design was utilized to assign the nurse managers under study to either the study or control groups based on pre- and post-test results. Equal numbers of nurse managers under study are assigned to the study and control groups.

Setting

This study was conducted at Menoufia University Hospital, in the specialty units (the emergency unit, urology O.R., surgical O.R., orthopedics O.R., cardio-thoracic O.R., obstetrics and gynecology O.R., ICU, surgical ICU, pediatric ICU, neonate, hemodialysis and burn units) and general departments (medical, surgical, pediatrics,

urology, cardiology, obstetrics and gynecology, ENT, chest, orthopedics, and oncology department) at Shebin El-kom, Menoufia governorate, Egypt.

Sample:

The total sample 80 of nursing managers were assigned into a study group (N=40) and control group (N=40) randomly.

Sampling technique:

convenience sampling technique, a total of 80 nursing managers, from the previously mentioned settings, they were randomly assigned into two groups; the study and control groups who accepted to participate in the study were recruited in this study.

Sample size:

In order to calculate the sample size required to determine the effect of an educational intervention to assess level of green management practices and Resilience among Nursing Managers before and after intervention for study and control groups.

The sample size was calculated according to the following equation. Considering α type I error of 0.05, β type II error of 0.20, a test power of 0.8, $m = n1$ =size of sample from population 1, and $d = 2$ as the least significant difference, $z1$ = standard normal deviate for two-tailed test based on alpha level (relates to the confidence interval level), p = percent of unexposed(control) with outcome (Percent of improvement in Green management practice and resilience among Nurses Managers' post intervention than pre intervention), and N = The calculated total sample size(study and control groups). (Diggle, Heagerty, Liang & Zeger, 2013).

$$N = \frac{2(z_{1-\alpha} + z_{1-\beta})^2 \sigma^2 \{1 + (m-1)p\}}{md^2}$$

Based on the sample size measured, a total of 76 nursing managers who were approximate to 80 to save guard against lost to follow up in the post intervention (40 for each group), and agree to participate, will be included in the study.

Instruments

Instrument one; Human Capital Sustainability Leadership Questionnaire:

It was developed by the Di Fabio and Peiró (2018). This instrument contained two main sections:

The first section concerned with personal characteristics of nursing managers, including; (age, educational qualification, years of experience and the units of work).

The second section: It includes 16 items to assess level of human capital sustainability leadership among nursing managers which contains four dimensions; ethical leadership (4 items), sustainable leadership (4 items), mindful

leadership, (4 items), and (servant leadership, (4 items).

Scoring system:

Scoring system for each item; Each item was five points Likert scale (1 – 5) as (1) for none, (2) for little, (3) for sometimes, (4) for much, and (5) for very much. The Sustainability questionnaire was evaluated giving a score of 16 -80. The total score of each studied nursing manager was categorized arbitrary into “low Human Capital Sustainability Leadership” when he/she achieved less than $< 60\%$ of the total score, “Moderate Human Capital Sustainability Leadership” when he/she achieved 60% to less than or equal $\leq 75\%$ of the total score, and “High Human Capital Sustainability Leadership” was considered when he/she achieved more than $> 75\%$ of the total score. Accordingly, if the total Human Capital Sustainability Leadership score of him/her was “16-47”, he/she was classified as had Low Human Capital Sustainability Leadership, and if the total score of he/she was “48 – 60”, he/she was classified as had Moderate Human Capital Sustainability Leadership, and if the total score of he/she was “61– 80”, he/she was classified as had High Human Capital Sustainability Leadership. Each sub item of Human Capital Sustainability Leadership (HCSL) composed of 4 items. Each item was five points Likert scale (1 – 5) as (1) for none, (2) for little, (3) for sometimes, (4) for much, and (5) for very much. Each sub item of Human Capital Sustainability Leadership (HCSL) was evaluated giving a score of 4 -20. For each sub item, if the total Human Capital Sustainability Leadership score of him/her was “4-11”, he/she was classified as had Low sub item “Human Capital Sustainability Leadership, and if the total score of he/she was “12 – 15”, he/she was classified as had Moderate Human Capital Sustainability Leadership, and if the total score of he/she was “16– 20”, he/she was classified as had High Human Capital Sustainability Leadership.

Instrument two:

Green Management Questionnaire that adopted from Mohammed, et al. (2023) and modified by the researchers based on various literature as Ibrahim et al. (2023), Raut et al., 2019 and Mousa & Othman, 2020. It includes 10 items.

Scoring system:

Concerning nursing managers’ Green Management Questionnaire, we studied it in a list of 10 items. Each item was examined in a three points Likert scale (0 – 2) as (0) for never, (1) for sometimes, and (2) for Always. The questionnaire was evaluated giving a score of 0 -20. The total score of each nurse manager was categorized

arbitrary into “Poor green management practice” when he/she achieved less than $< 60\%$ of the total score, “Moderate GMP” when he/she achieved 60% to less than or equal $\leq 75\%$ of the total score, and “Good GMP” was considered when he/she achieved more than $> 75\%$ of the total score. Accordingly, if the total Green management practice score of he/she was “0 - 11”, he/she was classified as had Poor GMP, and if the total score of he/she was “12 – 14”, he/she was classified as had Moderate GMP, and if the total score of he/she was “15– 20”, he/she was classified as had Good GMP.

Instrument three:

Individual Resilience Scale developed by Conner and Davidson, (2019) to assess level of resilience among nursing managers. This instrument included 10 items.

Scoring system:

Regarding nursing managers’ resilience scale, we studied it in a list of 10 items. Each item was examined in a 5 points Likert scale (0 – 4) as (0) for not at all true, (1) for rarely true, (2) for sometimes, (3) for Often true, and (4) for True nearly all the time. The questionnaire was evaluated giving a score of 0 - 40. The total score of each nurse manager was categorized arbitrary into “Poor resilience” when he/she achieved less than $< 60\%$ of the total score, “Moderate resilience” when he/she achieved 60% to less than or equal $\leq 75\%$ of the total score, and “Good resilience” was considered when he/she achieved more than $> 75\%$ of the total score. Accordingly, if the total resilience score of he/she was “0 - 23”, he/she was classified as had poor resilience, and if the total score of he/she was “24 – 30”, he/she was classified as had Moderate resilience, and if the total score of he/she was “31– 40”, he/she was classified as had Good resilience.

Validity of instruments:

The validity of the three Instruments was done by three experts in Administration Nursing Department who interviewed the questionnaires for content accuracy and internal validity. Also, professors were asked to judge the items for completeness and clarity (content validity). Suggestions were incorporated into the three instruments.

Reliability of the three instruments:

Reliability was estimated among 10 nursing managers by using test retest method with two weeks apart between them. Then Cronbach alpha reliability test was done through SPSS computer package. It was 0.83 for the first Instrument (Human Capital Sustainability Leadership Questionnaire (HCSLQ).

Regarding the second Instrument: Green Management Questionnaire, it also had high internal consistency with Cronbach alpha (α) = 0.91. Furthermore, Cronbach alpha reliability test was done for the third instrument: Individual Resilience Scale and it was 0.89. The results of Cronbach alpha reliability test for the three instruments indicate that they are reliable to detect the objectives of the study.

Ethical Consideration

After receiving the approval of the Faculty of Nursing Ethical and research committee from the selected hospital, the study was conducted. Ethical and Research Committee Decision No; (956), June 2023. The respondent's rights were safeguarded by ensuring voluntary participation, so that informed written consents were obtained after explaining the purpose, nature, time of conducting the study, the potential benefits of the study and how data was collected. The respondents were assured that data was treated as strictly confidential. Furthermore, the respondents' anonymity was maintained as they were not required to mention their name.

Pilot study

The purpose of the pilot study was to ascertain clarity, relevance, applicability of the study instrument and to determine obstacles that may be encountered during data collection. The pilot study was carried out on 10 % of the study subjects (8 staff nurses). The study did not include the sample from the pilot study.

Data Collection procedure

A letter outlining the goal and procedures for gathering data was sent from the dean of the Faculty of Nursing to the director of the Menoufia University Hospital. Official approval was acquired from the Menoufia University Hospital Administration. An inventory was created prior to gathering data. Then, using a number drawn at random from a pool, the researcher issued code numbers to each participant. From the first of August 2022 to the last day of January 2023, a six-month timeframe was used for the research.

Human capital sustainability Leadership educational intervention was divided into four phases: assessment, planning, implementation, and evaluation phase.

I. Assessment phase:

Assessment level of human capital sustainability Leadership dimensions (Ethical leadership, sustainable leadership, mindful leadership, servant leadership), was done afterwards, assessment level of green management practices and resilience among nursing managers was conducted.

II. Planning phase:

Based on the findings of the human capital sustainability leadership questionnaire, green management questionnaire and individual resilience scale among nursing managers before human capital sustainability leadership educational intervention, the educational intervention was planned. It started at the beginning of June 2023 and ended in mid-July 2023.

III. Implementation phase:

The study group who receives educational intervention contains 40 nurses were divided into four groups; each group contains 10 nurse managers. Each nurse received 12 hours theory. Each group received six theoretical sessions (each session was two hours) and two practical sessions. The human capital sustainability leadership educational intervention lasted for six weeks for each group with 2 hours weekly for each group. Each group received 6 sessions. ***The educational intervention contents conducted in 6 sessions for each group as the following:***

- **The first session:** Theoretical and practical information about human capital sustainability leadership and its dimensions contain ethical leadership and sustainable leadership.
- **The second session:** Theoretical and practical information about mindful leadership and servant leadership.
- **The third session:** Theoretical and practical information about concept and its benefits of green management and how to apply green management practices in nursing.
- **The fourth session:** Theoretical and practical information strategies of green management practices and its application in healthcare organizations. Examples of green management strategies.
- **The fifth session:** Theoretical and practical information about recycling programs, using energy-efficient equipment, promoting water-saving measures.
- **The sixth session:** Theoretical and practical information about individual resilience.

IV. Evaluation phase:

Evaluate the human capital sustainability Leadership intervention two-month post intervention with the nursing managers to evaluate effectiveness of the educational intervention.

Data Analysis

Data was formatted and coded in a unique way so that it could be entered into a computer. Version 22 of the SPSS (statistics Package for Social Science) statistics package was used to enter and analyze data. Graphics were created with the Excel software. The standard deviation (SD) and mean (X) were

used to display quantitative data. Numbers, percentages, and frequency distribution tables were used to display the qualitative data. Using the chi-square (χ^2) test, it was examined. But if any of the table's cells had an expected value below 5, the Fisher Exact test—applied if the table contained four cells—or the Likelihood Ratio (LR) test—applied if the table contained more than four cells. For all significant tests, the P value <0.05 was used as the threshold of significance.

Results

Table 1 Include personal characteristics of nursing managers and shows that the studied nursing managers ages were 30 to less than 40 years (65%) in the study group, while, studied nursing managers ages were 40 to 50 years (92.5%) in the control group. Also, the nursing managers experiences were 10 to less than 15 years (75%) in the study group, while, nursing managers experience were 15 to 25 years (55%) in the control group. The majority of studied nursing managers had Bachelor (72.5, 97.5) both study and control groups respectively.

Table 2 Showed that there is no statistics are computed because each of Groups of total sustainability leadership, total ethical leadership, and grand total sustainability leadership, are constants.

Table 3 highlighted the efficacy of the Nursing educational intervention about Human Capital Sustainability Leadership on grand total Human Capital Sustainability Leadership (HCSL), as well as its four sub items among study and control groups, post intervention. Among study group, post intervention program revealed a highly significant improvement ($p<0.0001$) in the different four sub items of (HCSL), as well as grand total sustainability leadership. Majority of nurses managers showed High level of each HCSL sub item which ranged from 82.5% (for sustainability, mindful, and servant sub items) to 92.5% (for ethical sub item).Also, moderate HCSL level was ranged from (7.5% for ethical sub item to 17.5 % (for sustainability, mindful, and servant sub items).No nurse manager among study group, showed low level of any of HCSL sub items or grand total sustainability Leadership (zero % for each).In addition, Comparing previous results with control group, all nursing managers in control group, showed low levels in the different four sub items of (HCSL), as well as grand total

sustainability leadership (100% for each). Moreover, the post program' total arithmetic means the different four sub items of (HCSL), as well as grand total sustainability leadership of nursing managers was highly significantly higher among study group than among control group (grand total mean HCSL (68.07 ± 3.65 vs 27.90 ± 3.01 , $p<0.0001$).

Table 4 presented that there was no significant difference between study and control groups regarding Green management practice and resilience levels as well as their mean total score, pre intervention. ($p>0.05$ for each).

Table 5 highlighted the efficacy of the Nursing educational intervention about Human Capital Sustainability Leadership on total green management practice, as well as resilience, among study and control groups, post intervention. Among study group, post intervention program revealed a highly significant improvement ($p<0.0001$) in the levels of both green management practice, as well as levels of total resilience. Among study group, more than ninety percent of nursing managers showed good green management practice level (95%) compared to zero % level among control group. Also, moderate green management practice level was 5% among managers in control group, showed poor green management level. Moreover, the post study group compared to zero % among control group, and the difference was highly significant difference ($p<0.0001$). Comparing previous results with control group, all nursing program' total arithmetic mean of green management practice among study group was higher with high significant difference than that among control group (11.37 ± 0.95 vs 1.60 ± 0.71 , $t = 52.1$, $p<0.00001$).

In addition, we used paired t test to compare the mean total score of green management practice among study group pre and post intervention (1.55 ± 0.98 vs 11.37 ± 0.95 , and paired t test was 35.7, $p<0.0001$). Similar trend was observed regarding resilience where we used paired t test to compare the mean total score of resilience among study group pre and post intervention (14.55 ± 3.77 vs 38.30 ± 1.38 , and paired t test was 55.7, $p<0.0001$).

Table 1: Distribution of personal characteristics of studied nursing' managers (N=80)

PERSONAL CHARACTERISTICS	STUDY GROUP		CONTROL GROUP		TEST OF SIGNIFICANCE
	No.	%	No.	%	
Age groups: 20- < 30 years	6	15	0	0	X ² =49.5, P<0.0001
30 - < 40 Y	26	65	3	7.5	
40 - 50 Y	8	20	37	92.5	
Mean ± SD years	34.3 ± 2.5 Y		45.2± 7.9		t= 8.3, p<0.003
Education: Bachelor	29	72.5	39	97.5	X ² =9.8, P<0.007
Master	11	27.5	1	2.5	
Experience: 5 - < 10 Y	10	25	0	0	X ² =35.0, P<0.0001
10 - < 15 Y	30	75	18	45	
15 - 25 Y	0	0	22	55	
X Mean ± SD years	12.3 ± 3.7		19.8± 5.6		t= 6.9, p<0.005
Working unites: Specialty unites	8	20	33	82.5	X ² =31.3, P<0.0001
General Wards	32	80	7	17.5	
Total	40	100	40	100	

Table 2: The difference between study and control groups regarding grand total human capital sustainability leadership and its four sub-items pre intervention.

HUMAN CAPITAL SUSTAINABILITY LEADERSHIP (HCSL) GROUPS		GROUPS		X ² /LR	P VALUE
		study	control		
Groups of total ethical leadership	Low total ethical leadership (4 -11)	40 (100%)	40(100%)	NA	NA
X ± SD		4.95 ± 1.10	5.27 ± 1.02	t=1.41	=0.12 NS
Groups of total sustainability leadership	Low total sustainability leadership (4 -11)	40 (100%)	40(100%)	NA	NA
X ± SD		6.75 ± 1.30	7.17 ± 1.02	t=1.48	=0.14 NS
Groups of total mindful leadership	Low total mindful leadership (4 -11)	39 (97.5%)	40(100%)	LR=1.40	P=0.23 NS
	Moderate total mindful leadership (12 -15)	1 (2.5%)	0		
X ± SD		6.52 ± 1.13	7.25 ± 1.03	t=1.59	=0.11 NS
Groups of total servant leadership	Low total servant leadership (4 -11)	34 (85%)	40(100%)	LR=8.8	P<0.003
	Moderate total servant leadership (12 -15)	6 (15%)	0		
X ± SD		8.17 ± 2.04	7.42 ± 1.03	t=1.49	=0.14 NS
Groups of Grand total sustainability leadership	Low grand total sustainability leadership (16 -47)	40 (100%)	40(100%)	NA	NA
X ± SD		26.30 ± 3.60	27.12 ± 4.02	t=1.54	=0.16 NS
Total		40 100%	40 100%		

NA =Not applicable. No statistics are computed because each of Groups of total sustainability leadership, total ethical leadership, and grand total sustainability leadership, are constants.

Table 3: Effectiveness of human capital sustainability leadership educational intervention on grand total of (HCSL), and its four sub-items between study and control groups post- intervention.

HUMAN CAPITAL SUSTAINABILITY LEADERSHIP (HCSL) GROUPS		STUDIED GROUPS				X ² /LR	P VALUE
		Study		Control			
		N	%	N	%		
Groups of total ethical leadership	Low total ethical leadership (4 -11)	0	0	40	100	LR=110.9	<0.0001 HS
	Moderate total ethical leadership (12 -15)	3	7.5	0	0		
	High total ethical leadership (16 -20)	37	92.5	0	0		
X ± SD		17.38 ±1.53		6.5 ±1.03		t=36.9	<0.0001
Groups of total sustainability leadership	Low total sustainability leadership (4 -11)	0	0	40	100	LR=110.9	<0.0001 HS
	Moderate total sustainability leadership (12 -15)	7	17.5	0	0		
	High total sustainability leadership (16 -20)	33	82.5	0	0		
X ± SD		16.97 ±1.42		6.57 ±1.17		t=35.6	<0.0001
Groups of total mindful leadership	Low total mindful leadership (4 -11)	0	0	39	97.5	LR=104.8	P<0.0001 HS
	Moderate total mindful leadership (12 -15)	7	17.5	1	2.5		
	High total mindful leadership (16 -20)	33	82.5	0	0		
X ± SD		16.75 ±1.27		7.30 ±1.39		t=31.6	<0.0001
Groups of total servant leadership	Low total servant leadership (4 -11)	0	0	40	100	LR=106.9	P<0.0001 HS
	Moderate total servant leadership (12 -15)	7	17.5	0	0		
	High total servant leadership (16 -20)	33	82.5	0	0		
X ± SD		16.97 ±1.42		7.45 ±1.25		t= 31.6	<0.0001
Groups of Grand total sustainability leadership	Low grand total sustainability leadership (16 -47)	0	0	40	100	LR=80.0	P<0.0001 HS
	High grand total sustainability leadership (61 -80)	40	100	0	0		
X ± SD		68.07 ±3.65		27.90 ±3.01		t=53.7	P<0.0001
Total		40	100	40	100		

Table 4: The difference between study and control groups regarding green management practice and resilience pre-intervention.

LEVELS OF GREEN MANAGEMENT PRACTICE		GROUPS		X ² /LR	P VALUE
		study	control		
Green management practice	Poor green management practice (0 – 6)	40 (100%)	40(100%)	NA	NA
X ± SD		1.55 ± 0.98	1.95 ± 1.02	t=1.61	=0.11 NS
Levels of resilience	Poor resilience (0 -23)	40 (100%)	40(100%)	NA	NA
X ± SD		14.55 ± 3.77	15.17 ± 3.11	t=1.46	=0.15 NS
Total		40 100%	40 100%		

Table 5: Effectiveness of human capital sustainability leadership educational intervention on green management practice and resilience levels between study and control groups post- intervention.

GREEN MANAGEMENT GROUPS		STUDIED GROUPS				X ² /LR	P VALUE
		Study		Control			
		N	%	N	%		
Groups of total Green management	Poor total green management (0 -6)	0	0	40	100	LR=110.9	<0.0001 HS
	Moderate total green management (7 -9)	2	5	0	0		
	Good total green management (10 -12)	38	95	0	0		
X ± SD		11.37 ± 0.95		1.60 ± 0.71		t=52.1	<0.0001
Groups of total Resilience	Poor total resilience (0 -23)	0	0	40	100	LR=110.9	<0.0001 HS
	Moderate resilience leadership (24 -30)	0	0	0	0		
	Good total resilience (31 - 40)	40	100	0	0		
X ± SD		38.30 ± 1.38		15.12 ± 3.14		t=42.6	<0.0001
Total		40	100	40	100		

Discussion

Cultivating organizational backing for sustainable nursing practices is emphasized for nurses to effectively reduce the health hazards associated with climate change (Jana et al.,2024). To promote sustainable practices in organizations and society at large and to propel economic growth, effective sustainable leadership is essential (Mahfouz et al., 2024).

Leadership needs to change in order to support employee welfare in human resource management. In order to create strong, long-

lasting organizations that focus on developing resilient employees, a new integrated construction of Human Capital Sustainability leadership (HCSL) is created. This HCSL style includes four dimensions of leadership ethical, sustainable, mindful, and servant leadership (Di Fabio and Peiró, 2018).

Thus, the current study aimed to evaluate the effectiveness of human capital sustainable leadership educational intervention on nursing managers' green management practices and resilience.

The first one was related to Human capital sustainability leadership, Green practice, and resilience levels Pre HCSL educational intervention; According to study result, all nurse managers at both study and control group at pre educational intervention had low level regarding HCSL and its dimensions (sustainable leadership, ethical leadership, mindful leadership). Furthermore, the all control group and the majority of study group had low servant leadership.

According to researchers' view, these results may be related to that nurse manger didn't feed with basic knowledge regarding HCSL and its subitems in their previous education as they graduated for a long time. This outcome, which is well known worldwide, may be the presumption that Sustainability leadership in nursing is still recent presented in health system so, there was no information on this topic in previous undergraduate nursing curriculum but is being recently in postgraduate studies.

In fact, there was a gap in this point of research as there are rarely research which study HCSL and more related to that HCSL is recently developed concept. But it found that various studies had study the development of each HCSL dimensions as alone (sustainability, ethical, mindful, and servant sub items). In a similar vein, Fabio et al (2023) study highlighted the presence of limitations and the need for more study regarding HCSL.

Regarding, nurse managers low level sustainability leadership results, there are various studies supported these results and their rationales. As Mahfouz et al. (2024) reported that the studied nurse managers had inadequate knowledge of sustainability leadership as they had not previously completed any educational courses on this concept.

Moreover, Jana et al. (2024) assured that incorporating climate change education into nursing curricula and cultivating organizational backing for sustainable nursing practices is emphasized for nurses. Similarly, Elshall et al. (2022) study revealed that studied nursing student had low level of knowledge regarding sustainability and it is related to sustainability development is still fairly recent for nursing students.

Furthermore, Di Fabio and Peiró (2018) reported that Human Capital Sustainability Leadership is newly developed. On the other hand, Algabar et al. (2023) study revealed that more slightly more than tow third of nurse managers had a high-level of sustainable management

behaviors, and around half of nurses had a high level of sustainability consciousness.

Regarding to a low level of ethical leadership among nurse managers at both groups that may be related to nurse manger didn't prepare well to act as ethical leader with work challenges. So, nurse managers have difficulties in behaving with ethical decision like being less correct when perform a task, and rarely keep promise to their collaborators.

These study results are supported with Mahran et al (2023) study which stated that more than half of nursing supervisors had low levels of ethical leadership behavior. In the same line, Saad et al. (2021) study showed that over two thirds of people participating at the people orientation dimension and over one third of the percentage at the fairness dimension reported having low ethical leadership levels. This could be as a result of an ethical leader who is overly concerned with justice, which could lead to unease or conflict.

Also, Hakko (2018) and the European Nurse Directors Association (2017) reported that Organizations routinely present ethical challenges to nurse managers, and these challenges may lead to unethical behavior on the part of nurse managers. However, this finding was unmatched with Aryati, and Sudiro (2018) study which studied effect of ethical leadership to deviant workplace behavior found that more than half of nurses had moderate ethical leadership level.

Additionally, the result showed that all nurse managers at both study and control group had a low level of mindful leadership. These results may be explained by the researchers to that nurse manger had difficulty to be mindful leader in anticipating the requests of their staff, didn't aware of the strengths and the limitations of them and lastly, didn't recognize the value of self-control to them, even in stressful situations

Similarly, Shurab et al. (2024) assured that low levels of mindfulness were observed prior to program implementation among the nurse managers under study and improved over time. Also, Abd Elmawla et al, (2020) reported that a low percentage of head nurses had high levels of overall mindfulness prior to the program, but this level quickly improved after it. However, Abdel Azem & Hassan (2021) study are disagreement with study result that stated that half of study participant rated highly mindfulness and leadership effectiveness, respectively.

Regarding to results of servant leadership as last dimension of HCSL, all of control group and the majority of study group had low level. This outcome may be explained that nurse managers weren't qualified well to practice this style so they

passively promote a positive group climate at work, and have difficulty in showing interest in the professional and personal lives of their staff.

Fortunately, in the same direction Sorour et al. (2021) showed that most staff nurses used the servant leadership method at moderate or low levels. These could be the result of an authoritarian leadership style and centralized decision-making, which typically excluded nurses from participation in crisis or quality teams.

Also, Barry (2020) was in harmony with study result as this study assured that nurse managers should give staff nurses the chance to advance, gain confidence, and be empowered to make critical decisions about their careers. Also, studied nurse manager reported that the implementation toolkit was beneficial. As they had highest-rated servant leadership practices.

While, the results of the current study were contradicted by Mustard's (2019) which study on servant leadership in the health administration. As this study guaranteed that staff perceptions of their managers' and leaders' servant styles were higher and had a highly significant positive impact on employee job satisfaction.

As a nurse manager, encouraging green management is crucial to minimizing the environmental impact of healthcare facilities regarding climate change (Paillé et al., 2020). The current study result revealed all nurse manager at both study and control groups had low level of green management practice at pre educational intervention.

This result may be related to the recently develop of green management and how to perform green practice. So, they passively promote sustainability initiatives to staff and stakeholders. Similarly, nurse managers rarely prioritize the use of environmentally friendly products in the workplace and how to regularly monitors energy consumption.

The foregoing findings of the present study were consistent with various studies as Ibrahim et al. (2023) and Tarkar (2022). Those studies illustrated that, studied nurses have inadequate knowledge regarding green practice and there was highly statistically significant difference improvement of nursing management staff knowledge level regarding it after program.

In the same road, Mohammed A. et al. (2023) study stated that all of studied nurses had lack of knowledge and practice regarding green practice so human resources came at the first as a barrier followed by infrastructure, so the study recommended the importance of implementation educational program for nurses regarding green practice in hospital units.

The present study disagreement with Abdelmonem et al. (2022) who noted that over two thirds of head nurses had a positive impression of green human resource management techniques. Furthermore, Leppänen et al. (2022) revealed that Perioperative nurses and nurse managers understand the importance of ecological and economic sustainability that is basic to green practice.

Nurse managers were under tremendous pressure to provide safe staffing resources as a result of the COVID-19 pandemic Everyday obstacles that nurse managers should overcome call for a high level of resilience. A multifaceted collection of behaviors that are acquired over time as a result of encountering challenges is known as resilience. Low nurse managers resilience is an important area of focus (Carter and Turner. 2021).

Regarding the study result related to resilience, the study presented that all nurse manager at both study and control groups had low level of resilience at pre education intervention. These results may be related to nurse managers rarely adapt to change, and under pressure, they stay unfocused in the same direction nurse managers didn't think themselves as a strong person when facing challenges, and lastly had difficulty to handle unpleasant feelings.

Similarly, the study results supported with Mounib et al. (2023) and Elsayed and Abdelraof (2020) who showed that the studied nurses had low level of resilience before implementation of educational program. Also, After the program was implemented, the study group's level of resilience was extremely high as useful strategy for assisting nurses in managing stressful situations at work is resilience training.

On the other contrary, the study results are dissimilar to Salem et al (2022) study which revealed that the majority of control group have moderate resilience level pre-program. Whereas most of study group have moderate resilience level pre implementation of the program. Similar, Roberts et al. (2021) showed that almost two thirds of the nurses who were examined had a moderate level of resilience in their study.

The second was associated with the effectiveness of human capital sustainability leadership educational interventions on promoting nursing managers' green management practice and resilience for study group. This section highlighted that post HCSL intervention revealed a highly significant improvement in all HCSL dimensions for study group than control group. Also, the most of nurse managers reported a high level of each HCSL dimensions (sustainability,

ethical, mindful, and servant leadership) post-intervention for study group.

According to researchers' point of view these results may be related by developing education intervention about HCSL, nurse managers knew about this concept and related dimensions (ethical leadership, sustainable leadership, mindful leadership, servant leadership). So, they had learned about how to be sustainable leader able to face climate change challenges in the hospital by developing rather than exhaust human resources and support their staff in their growth. Similarly, nurse managers are prepared well to make ethical decision even in ethical dilemma and to act in ethical manner.

While, the control group which was received the education interventions, had no improvement because they still didn't know about HCSL and sub items. They didn't have the necessary knowledge to behave as ethical, Sustainable, Mindful, and Servant leader.

It is found that, Mahfouz et al. (2024) study was in harmony with study results. As this study revealed that the educational program led to improve in knowledge and practice of nursing managers regarding to sustainable leadership. Additionally, Shurab et al. (2024) assured that high levels of mindfulness were observed after program implementation among the nurse managers under study.

Correspondingly, Saad et al. (2021) highlighted the efficacy of ethical leadership educational program for head nurses in enhancing level of ethical leadership. similar, Barry (2020) stated that following the education, nurse managers had highest-rated practices regarding servant leadership.

Similar, Mohammed, S. et al. (2023) showed that the training program significantly improved the level of climate change and sustainability knowledge and practices among nursing internship students. In the same line, Elshall et al. (2022) study revealed that nurse student who enrolled in sustainability educational intervention had increased their knowledge regarding it. While, the present study findings was unsupported by Sorour and Elkholy (2021) study that showed that the majority of the participants had a moderate level of SD behaviors in different categories among nursing staff without having education intervention.

Regarding green practice and resilience post HCSL educational intervention. The study results highlighted the efficacy of HCSL educational intervention on total green management practice, as well as resilience among study post intervention. As study group post intervention

program revealed a highly significant improvement in the levels of both green management practice, as well as levels of total resilience.

Also, among study group more than ninety percent of nurse managers showed good green management practice level compared to zero level among control group. Also, by Comparing previous results with control group, all nurse managers in control group, showed poor green management level. Moreover, the post program' total arithmetic mean of green practice and resilience among study group was higher with high significant difference than that among control group.

Thus, these results approved the second research hypothesis in this study which stated Nurses Managers' who will receive the Human Capital Sustainability Leadership educational intervention will have higher level score of green management practice and resilience than Nurses Managers who will not have the educational intervention. As well as the third hypothesis that stated there will be a significance improvement for study group regarding human capital sustainability leadership, green management practice and resilience post-educational intervention.

Certainty, these results may be related to HCSL educational intervention increase green practice awareness to nurse managers. Thus, they begin actively promote sustainability initiatives to their staff and prioritizes the use of environmentally friendly products in the workplace and how to regularly monitors energy consumption. Similar, nurse managers by developing HCSL education intervention can adapt to change and handle unpleasant feelings which promote their resilience.

Similarly, according to literatures it is found rarely studies regarding the impact of HCSL educational intervention on Green practice and resilience. However, Fadda, J. (2020) study was in harmony with study results.

This study outlined that one of the main components of Green Healthcare System is sustainability leadership. Leadership is essential at all levels towards safety and sustainability key organizational priorities, through education, goal setting, accountability, and incorporating these priorities in all external relations and communications.

In the same line, Pinzone et al. (2019) stated that green management is a strategy that involves integrating environmental sustainability ideas into organizational management procedures. In order to minimize the environmental impact of your

healthcare institution, it is crucial for nurse managers to put their staff's occupational safety first.

Moreover, the present study was in agreement with Kamath et al., (2019) who conduct engineering green hospitals, an Imperative for a sustainable future and noted that, there is a highly statistically significant difference between nursing management staff practice post educational compared to pre educational program.

In the same road, Weber (2023) study supported the study results. As this study revealed that majority of studies view organizational resilience as an element of sustainability or, conversely, organizational sustainability as a component of resilience. Also, this study highlighted the study of resilience and sustainability in the organizational context is becoming increasingly important. Furthermore, Di Fabio and Peiró (2018) ascertain that promoting resilient workers was the outcome of HCSL style which enhancing healthy organizations.

On the contrary, studies done by Mohammed, A. et al. (2023) and Ibrahim et al. (2023) are in disagreement with study results. As these studies revealed that there was significant improvement at nursing managers' knowledge about green management practices who attended green management practice program at post and follow up. Also, the results of the intervention showed a significant improvement in the level of green management among nursing managers.

Furthermore, Mounib et al. (2023) and Elsayed & Abdelraof (2020) are in disagreement with the study results. As those studies showed that nurse who attend resilience training had a very high level of resilience post program which could be attributed to the changes of nurses' knowledge about resilience via program.

Conclusion

In the light of the present study findings, it can be concluded that the human capital sustainable leadership educational intervention was positively effective in promoting nursing managers' green management practices, resilience, and HCSL. Certainly, HCSL educational intervention was an effective key for promoting nursing managers' green management practice, resilience, and HCSL dimensions ethical leadership, sustainable leadership, mindful leadership, servant leadership.

As the result demonstrated that all nurse managers at both study and control group had low mean score regarding total HCSL, green management practice, and resilience before intervention. The result also highlighted that post intervention revealed a highly significant improvement on HCSL, green management

practice, and resilience for nurse managers at study group. On the other hand, the study findings revealed a highly significant difference between the study and control groups regarding HCSL, green management practice, and resilience after intervention.

Recommendations

Considering the study 'results and the evaluation of the literature, the following recommendations are made;

- Education intervention and workshops about Human Capital Sustainability in Leadership, however, all nursing levels should be encouraged to participate in ongoing, regular, and updated HCSL and its dimensions.
- Human Capital Sustainable Leadership should be emphasized in the nursing curricula of post and undergraduate by using different educational strategies.
- Increase awareness of hospital administration and nursing educators about Human Capital Sustainable Leadership to refresh their knowledge in this area in order to promote the resilient and green practice culture among nurses.
- Hospitals should integrate Human Capital Sustainable Leadership, green management practice and resilience into their strategic planning to adapt climate change effects and reaching objectives regarding Egypt's Vision 2030.

Limitations

The primary constraint of this investigation is that the study just utilized research data from nurse managers. Consequently, it is advised that future research acquire a sample from a range of nursing specialties in order to generalize the results.

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Conflict of Interest

No conflict of interest is disclosed by the writers.

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